Editorial
The Digital Factory: An Instrument of the Present and the Future

Gert Zülch, Sascha Stowasser

In a time of shortened product life cycles and the consequential product changes, increasing product variety and shrinking delivery times, survival in the market demands an enterprise to possess agility and flexibility. One route taken by many enterprises is that of shortened planning times and the flexible configuration of the planning process, which in turn influence the production in such a way that a quicker adaptation to changing circumstances is possible and the time needed to bring a product onto the market is shortened drastically.

In this scenario, the "Digital Factory" is seen as the planning instrument of the future. A large part of the factory planning, production- and product planning is already supported by digital tools. These various planning phases are not integrated and thus are generally carried out in isolation. The VDI (Association of German Engineers) defines the Digital Factory as "*a comprehensive network of digital models, methods and tools, including simulation and 3D/VR-visualization, which are integrated through continuous data management*". The goal is to achieve a holistic planning, evaluation and continuous improvement of all significant processes and resources in the factory in connection with the product. All elements within the production should be modelled during planning by means of computer-supported methods, in such a way that the physical manufacturing of the product meets all quality, time and costs goals (VDI 2004).

The computer-supported models within the Digital Factory must document and visualize all the elements of the future factory as well as describe their interplay. Only when the digital product has successfully passed through the Digital Factory, the product is released into the real factory. This digital safeguarding leads to an increased planning quality and security since alternative solution concepts can be evaluated reliably in early planning phases, thus considerably lowering costs and time requirements.

Nearly all German automotive manufacturers have acquired experience with the Digital Factory planning approach and advocate it unconditionally. The DaimlerChrysler Corporation expects to have realized substantial parts of the Digital Factory by 2005 so that production facilities will no longer be planned, built or run before it has been completely secured digitally (see SCHILLER, SEUFERT 2002). The Adam Opel Corporation expects the digital planning to result in considerable reductions in the implementation phase (shortened by 30 percent), lower start-up costs (minus 15

percent), reduced floor space requirements (minus 20 percent) and improved utilization values (a robot utilization increase of 30 percent; cf. KÖTH 2003). Audi showcases the fact that the time span of 48 months between the first definition of the new vehicle to the start of series production has been reduced by several months (LANDAU 2004, p. 8).

While the industry places the realization of the Digital Factory in the foreground, the scientific world is concentrating primarily on the development of new and/or the improvement of existing methods for modelling and visualization, simulation and evaluation of planning alternatives and for data and information management. The cooperation between the scientific world and industry has proven to be a main factor for success – as this is most effective route for the transfer of technology and research results into industrial practise and the realisation of new and novel ideas sustainable products and processes.

At the International Working Conference of the IFIP Working Group 5.7 “Integration in Production Management”, held in Karlsruhe (Germany) in October of 2003 on the topic of “Human Aspects in Production Management”, the Digital Factory represented a central theme. In numerous lectures and discussions, the Digital Factory approach was seen not only from a research point of view, rather also was contemplated and further developed from the user perspective.

The selected contributions from this conference are expanded in this special issue and put forward to a broad readership. This special issue contains seven articles on the Digital Factory and has the following structure:

The articles by Bracht et al. and Wenzel et al. represent overview of the topic of the Digital Factory and clarify the state of the research, sketch possible approaches to the standardization in the modelling of businesses and work out new research outlooks. Both the articles from Woerner et al. as well as from Biennier et al. deal with aspects of data security which at present constitute challenges in Computer-supported co-operative development engineering (CSCDE) that need to be met in practise. The visualization during the planning process and the planning results play a decisive role in the success of the application of the Digital Factory. The contribution from Dangelmaier et al. describes the architecture of a digital factory system which uses the technologies of Augmented and Virtual Reality. Up until now the integration of occupational health and safety has been neglected in the research and realization of the Digital Factory. The article from Zülch et al. attempts to fill this gap. Finally, the contribution from Wöhlke

et al. presents a Good-Practise example of the implementation of the Digital Factory within the DaimlerChrysler Corporation.

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Prof. Dr.-Ing. Dipl.-Wirtsch.-Ing. Gert Zülch, studied Mechanical Engineering at the Technical University of Braunschweig and completed his postgraduate studies in economical science at the University of Technique in Aachen. He was then a scientific assistant, and later Managing Engineer, at the Research Institute for Rationalization (FIR) in Aachen, where he then earned his doctorate in 1979. From 1980 to 1985 he worked in the central department for industrial engineering at the Siemens Corporation in Munich. Since 1985 he has held a professorship and is the head of the ifab-Institute of Human and Industrial Engineering of the University of Karlsruhe. The institute concentrates on research in the fields of communications ergonomics, assembly planning, personnel employment and organizational structure planning.

Dr.-Ing. Sascha Stowasser, is currently Managing Engineer at the ifab-Institute of Human and Industrial Engineering at the University of Karlsruhe. Graduated in 1996 in industrial engineering he earned the doctoral title in human factors at the University of Karlsruhe. His main field is the planning and evaluation of computer-supported ERP/PPC systems. He is member of different professional associations like DIN, VDI and UPA. He is also certified with the Euro-Ergonomist degree.

Address: University of Karlsruhe
ifab-Institute of Human and
Industrial Engineering (ifab)

Kaiserstrasse 12
D-76131 Karlsruhe
Phone : +49 721 6084250
Fax : +49 721 6087935
sascha.stowasser@ifab.uni-karlsruhe.de