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Titel:

Digital Engineering – Foundation for Digital Transformation in Production Companies

Abstract:

The product development process (PEP) requires an integrative interaction of the methods, tools, models and processes used, especially in complex technical systems. Digital engineering can be understood as end-to-end application of functionally suitable IT processes and software tools for the development, manufacture and use of products. In particular, the term also includes the management of the required information over the entire product life cycle, combined with appropriate forms of representation and a systematic approach or coordinated processes. The processes of digital engineering are constantly evolving as supporting technologies such as cloud computing and services develop exponentially, opening up new opportunities. Today's technologies will soon be outdated and replaced with faster and more efficient tools. The way we develop products and implement projects is constantly changing. Collaborative real-time processes for co-design and review come to the fore and replace conventional paper-based processes. Drawing-free production, for example, is now being implemented in industrial companies, although it has been technically available for at least two decades. In the future, artificial intelligence (AI) will play an important role in the product as well as in the process or in supporting software applications for digital engineering. In the case of engineering tools, the development is to automate the "ideation phase" more fully, i.e. for a given problem with corresponding requirements for a product, the developer can use AI methods as many possible solutions as possible. In this way, retracted thought patterns can be broken up or incremental developments reduced and thus the development of disruptive innovations is to be supported. For AI in products, the challenge for the engineering process is, in particular, to ensure robust behaviour of adaptive or cognitive systems, or to model the boundaries or corridors of adaptive behaviour in operation in the engineering phase, and integrate the training process for Machine Learning (ML) applications into the product development process. This also leads to corresponding new requirements for the competences of future product developers. The article shows the challenges posed by what

solutions look like, the implementation of digital engineering in industrial companies, and the research and development needs.