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Methodical Approach for the Integration of a Digital Factory Twin into the Industry 4.0 Processes

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Abstract : The orientation of flexibility and adaptability with regard to factory planning is at machine and process level. Factory buildings are not the focus of current research. Factory planning has the task of designing products, plants, processes, organization, areas and the construction of a factory. The adaptability of a factory can be divided into three types: spatial, organizational and technical adaptability. Spatial adaptability indicates the ability to expand and reduce the size of a factory. Here, the area-related breathing capacity plays the essential role. It mainly concerns the factory site, the plant layout and the production layout. The organizational ability to change enables the change and adaptation of organizational structures and processes. This includes structural and process organization as well as logistical processes and principles. New and reconfigurable operating resources, processes and factory buildings are referred to as technical adaptability. These three types of adaptability can be regarded independently of each other as undirected potentials of different characteristics. If there is a need for change, the types of changeability in the change process are combined to form a directed, complementary variable that makes change possible. When planning adaptability, importance must be attached to a balance between the types of adaptability. The vision of the intelligent factory building and the 'Internet of Things' presupposes the comprehensive digitalization of the spatial and technical environment. Through connectivity, the factory building must be empowered to support a company's value creation process by providing media such as light, electricity, heat, refrigeration, etc. In the future, communication with the surrounding factory building will take place on a digital or automated basis. In the area of industry 4.0, the function of the building envelope belongs to secondary or even tertiary processes, but these processes must also be included in the communication cycle. An integrative view of a continuous communication of primary, secondary and tertiary processes is currently not yet available and is being developed with the aid of methods in this research work. A comparison of the digital twin from the point of view of production and the factory building will be developed. Subsequently, a tool will be elaborated to classify digital twins from the perspective of data, degree of visualization, and the trades. Thus a contribution is made to better integrate the secondary and tertiary processes in a factory into the added value.

Keywords : adaptability, digital factory twin, factory planning, industry 4.0
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