Dissertation title:

Method of a situation based adaption and protection of the manufacturing capability of series assembling

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Assembly systems which are characterized by a volume production of customized products are influenced by the market and the customer. This complicates a structured planning of the production. Shorter product life cycles and the request for innovative and individual products create higher variability in volumes considering incoming orders and lot sizes within an assembly system. Due to this fact, an increasing need for permanent adaptations of assembly system structure arises, to be able to operate efficiently. Especially for companies which are located in high wage countries, given that short time based adaptations ensure an efficient operation of assembly systems. A permanent and structured adaptation of assembly systems is therefore not any longer optional.

Therefore a method for situation-based adaptation and validation of the manufacturing capability of assembly systems was developed, which enables a permanent and structured adaptation of assembly systems considering internal and external turbulences. By analyzing approaches and methods which pursue the increasing of the flexibility and changeability of production systems, short comings and requirements were identified, which are needed to perform a situation-based adaptation. Based on this a method was developed, which is suitable to efficiently support workers in developing adaptation concepts of assembly systems.

This method is structured in five steps, which enable a permanent adaptation considering short time based influences driven from order compositions, product variants and last minute changes as well as technical disruptions. Additionally the method considers the enhancement of the overall adaptation ability to support even less adaptive assembly systems. An app-based digital tool was developed to support the workers in the process of developing a model of the assembly system. This tool employs a specialized data model and a resource library to support an efficient model development. Additionally the digital tool contains a structured modeling procedure to accelerate the development of adaptation concepts. The developed method was validated within two practical applications.

This research project makes a contribution to enhance the ability for short-term adaptations with-in assembly systems regarding short-term influences. The possibility the encounter these with situation-based adaptations and actions enhance the economic efficiency of the assembly system operation and ensure the ability to compete within a global production.