

**Dissertation title:**

**Method to improve the crossdomain collaboration during the engineering process in special purpose machinery construction**

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Special purpose machinery construction for Manufacturing Systems is characterized by individual customer requirements and a high level of innovation. This demands a lot of engineering effort which is why the efficiency of engineering is a critical success factor in special purpose machinery construction. However, the lack of collaboration between the domains involved, mechanics, electrics and software, results in errors and repeated work that considerably reduces engineering efficiency.

Based on this problem statement, this thesis develops a method to improve the crossdomain collaboration during the engineering process in special purpose machinery construction: the *Manufacturing System Dependency Model (MaSDeM)*. The central idea of the concept is to introduce a common platform on which the domains commonly create, discuss and optimize the solution principle. A representation of the solution principle is developed based on the physically observable function. The function serves as the common abstraction layer and ensures the cross-domain understanding of the solution. This model is underpinned by a functional categorization of automation components that are used as the building blocks for the manufacturing system. Thereby a substantiated cross-domain solution principle is established in the early stage of the engineering process and forms the basis for elaborating the final solution. All information in the solution principle can be seamlessly transferred to the domain specific tools where they are concretized and detailed. This creates an integrated engineering process, both from a pure data as well as contextual perspective, from the definition of the requirements right up to the complete Manufacturing System.

Thanks to the enhanced cross-domain collaboration, a high-quality solution and a consistent and integrated working method can be achieved in the early phase of the engineering process. This reduces cost- and time-intensive modifications in the later stages to a minimum and raises the engineering efficiency.