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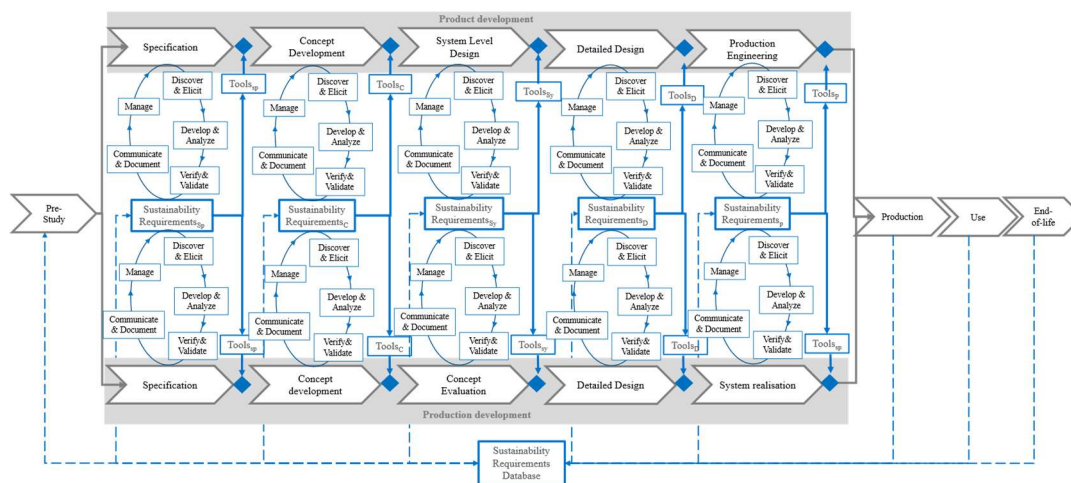
Methods and Tools for Working with Sustainability Aspects in Product and Production Co-Development from a Requirements Management Perspective

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The need to prevent crossing planetary boundaries has accelerated sustainable product and production development, both in industry and research. Methods and tools to support this are introduced at high pace. However, practice is still challenged by changing requirements, regulations, guidelines, and the plethora of methods and tools. Here, the focus is on methods and tools that support the transformation of sustainability aspects into technical requirements and their application during product and production development, as identified through a systematic literature review of articles in the engineering design and manufacturing fields from 2014 to 2024.

Result

There is a lack of knowledge and guidance to address sustainability risks, and the overwhelming number of methods and tools to work with sustainability aspects during development causes challenges in the practical implementation. The results indicated that most existing methods target product development, with limited support for production development and co-development of product and production systems and there is potential for utilisation of requirements management processes. Furthermore, most of the methods focused on design engineers, while other stakeholders in the development process lacked adequate support to identify and communicate their sustainability-related requirements. This gap can lead to the omission of key sustainability aspects across different phases of the product lifecycle during the development process. Analysis of the data suggests that a requirements management-based framework could unify different methods and streamline the integration of sustainability aspects during product and production development.



The proposed framework brings together the sustainability requirements from different lifecycle phases into a database from which it can be used as input to different development phases and particular tools supporting those phases. It can also support sustainability knowledge reuse and stakeholder collaboration during the requirements management process, considering the evolving nature of the requirements and alignment for product-production co-development. This framework forms the base for upcoming research work, focusing on further development and evaluation of this framework.

