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Development and Application of the "Checklist for Sustainable Product Development" on Innovative Lightweight Technologies

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Early phases of product development are very important not only for the reduction of costs but also for the improvement of a product's sustainability performance. This particularly holds true for innovative lightweight concepts since they require the application of new materials and the development of new practices and processes, on which there is only insufficient data and experience concerning their sustainability aspects available. This lack of information and a high uncertainty hinder the application of traditional sustainability assessment tools, such as life cycle assessment. Therefore a selection of eco-design and design for sustainability tools were analyzed on their applicability under these particular circumstances. The result of this analysis revealed the need of a new tool based on the following research question: “How can a sustainability perspective be integrated into early product development phases?” and the following main requirements for the tool were defined. The tool should:

- allow the qualitative assessment and valuation of sustainability aspects in early phases of product development with a specific focus on innovative technologies,
- facilitate the integration of awareness for sustainability into day-to-day business,
- foster life cycle thinking among executives, designers and engineers, and
- support decisions over different technologies based on the sustainability evaluation.

In order to meet these requirements, the resulting tool, the Checklist for Sustainable Product Development (CSPD), was designed as a checklist comprising of polar questions which are categorized into the four life cycle stages engineering, production, usage and end-of-life phase. The questions aim at the consideration of sustainability aspects which derive from a top down analysis of key categories for sustainability in automotive development and are linked to one or more of the four sustainability principles of the framework for strategic sustainable development (FSSD). The main aim of the evaluation with the CSPD is to reach a state, in which all relevant sustainability aspects are taken into account. Therein is another link to the FSSD since it encourages a backcasting from sustainability principles. Due to its qualitative design, the CSPD can be applied as decision support tool as early as in the first concept development phase, since it provides a holistic overview over the sustainability performance of the technology under consideration. However it is also applicable for more detailed assessments and the evaluation of necessary actions and solutions for overcoming violations of the FSSD sustainability principles occurring during the whole product development process. The focus of this paper is on a case study in which the CSPD was applied to nine innovative automotive lightweight technologies. This case study revealed that the developed tool helps to assess a technology's sustainability performance at an early product development stage and to define sustainability related improvement options.