
Editorial

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Biographical notes: Lennart Karlsson is a Professor and Chair of Computer Aided Design at Luleå University of Technology. He was Vice President of the university during 2001–2006, Vice Dean of Faculty of Engineering during 1991–1997, initiator and Centre Director for the VINNOVA Excellence Center the Polhem Laboratory for Integrated Product Development, and for the Faste Laboratory for Functional Product Innovation during 2007–2011. His main research interests are modelling and simulation of welding and global simulation-driven product development.

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Magnus Löfstrand is an Assistant Professor in Computer Aided Design at Luleå University of Technology. His research interests include work process modelling and simulation as well as distributed collaborative work applied in industrial product development processes. One of his main research interests lies in the area of product development for function provision, with focus on modelling system availability and cost. He has published research papers in international journals and conference proceedings.

Today, industrial companies must develop products with an increasing level of complexity, i.e. functional products in which hardware, software, support system and management of operation are combined. These complex products further need to reach the market earlier than before, which requires efficient product development processes. One critical enabler for increased product development efficiency is the utilisation of suitable simulation strategies. So far, many companies have adopted verifying strategies whereby simulations are typically used to accept or decline design suggestions (often proposed by other people than the ones running the simulation). However, such strategies

can be expensive, time-demanding and may even be innovation-inhibiting. To solve these challenges, research has been conducted on additional, more efficient, strategies for how to use simulations during product development. One strategy, which is highlighted in this special issue of *International Journal of Product Development*, is called *simulation-driven product development*. This strategy aims at arriving at optimal solutions as fast as possible, often while managing multiple and conflicting design criteria. The five contributions briefly summarised below contribute to our understanding of different aspects of this research field.

In the first paper, ‘An integrated product design approach for development of a desktop organiser: CAD/CAE and design for environment as enablers of integration’, by Chowdary and Kanchan, development of cost-effective and environmentally friendly products is in focus. The authors present a framework where Design For Environment (DFE) guidelines are combined with CAD/CAE principles. A case study was conducted to demonstrate the efficiency of such an approach and a prototype was further designed for validation purposes.

In the second paper, ‘Exploring the parametric design space to manage computational weld mechanics analysis using design of experiment’, by Asadi and Goldak, the development of a Computational Weld Mechanics (CWM) framework that automates multiple setups and evaluations to practically explore a design space by given design of experiment (DOE) matrices is demonstrated. Actual CWM problems with continuous and/or discontinuous parametric design spaces are solved in this framework to minimise weld distortion using derivative-free optimisation algorithms and DOE matrices that become attractive in this framework.

In the third paper, ‘Simulation Driven design of functional products: a tool for evaluation of hardware reliability and maintenance’, by Reed, Andrews and Dunnett, the context is functional products, where guaranteed availability and fixed costs are offered to the customer with consequently increased risk to the supplier. The authors describe a criterion for comparing design choices that accounts for supplier risk aversion along with a simulation tool that can predict the performance of a product in development. Together, these can be used to drive the product design and show the influence of supplier risk aversion on the optimal design.

In the fourth paper, ‘State of the art in simulation-driven design’, by Karlberg, Löfstrand, Sandberg and Lundin, the research evolution and state of the art of simulation-driven design is presented. This review paper comprises an extensive literature review in which the history, various definitions, criteria and effects of using simulation-driven design approaches are discussed.

In the fifth paper, ‘Simulation of the effect of geometrical variation on assembly and holding forces’, Wärmefjord, Söderberg and Lindkvist present results related to a simulation method for prediction of required assembly forces and holding forces in an assembly of parts that are to be joined by welding, riveting or using clip fasteners. The three joining techniques are discussed with respect to assembly and joining forces.