

## **Abstract**

This dissertation is concerned with opportunities and challenges for design arising in the context of technological possibilities with a focus on new materials and production techniques. The main goal has been to provide a better understanding of combinations of design and technological aspects. As a consequence, the aim is to support the design process so that it can lead designers towards becoming more skilled in making use of these possibilities early in their activities. The investigation has been carried out in the field of furniture in which new materials and production techniques are considered as an integral element throughout the design process and which develops design solutions that are adapted to these possibilities.

The research project is based on the idea that nowadays, technologies suggest the use of new materials with improved properties and shaping techniques which can constantly expand the range of possible solutions. They offer an enormous potential to think about the concepts of form anew, resulting in the fact that the product does not only meet the functional requirements but also triggers emotional and intellectual pleasure. At the same time, these possibilities can create a complex and multifaceted set of decisions for designers.

The concern of this dissertation is three-fold. Firstly, it is concerned with a new understanding of technological possibilities in relation to different aspects of design in order to improve the designers' access to information about these available possibilities at an early stage of the design process. Secondly, it aims at examining the designers' point of view with the objective to expand their understanding of the design process and to alter their methods of designing by incorporating new types of information into their design processes. In this respect, it is finally important to study the nature of

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cooperation between designers and engineers when introducing new materials or techniques into the design process.

Two types of research activities have been carried out to understand these tasks which are quite manifold: On the one hand, theoretical research activities have been carried out, based on a review of publications to study the state-of-the-art of the existing technologies. This overview of recent publications on this topic reveals the enormous range of options related to different aspects of furniture design. On the other hand, empirical research activities aim at gathering 'external' knowledge about design processes that benefit from these possibilities. To carry out the empirical studies, three main methods of inquiry were used: questionnaire surveys, in-depth interviews and action research. The results of both approaches revealed, for instance, that although there are several sources of information on technologies few of them appeal to designers. As a consequence, they do not regard new technologies as being interesting or useful. They also indicated that designers need supportive methods that enable them to capture effective types of information offered by technologies which can have an influence on their designs. Additionally, the empirical studies revealed that there are different barriers which emerge in communication situations between designers and engineers, such as perceptual gaps, the use of different languages, and the lack of tools to describe the interplay between material attributes, shaping techniques, and form aspects. Barriers like these need to be overcome at any rate.

In the course of this thesis, different methods and procedures for supporting designers will be proposed: An analytical procedure has been developed to explain and refine the possibilities offered by technologies related to different design goals. Furthermore, synthesis methods are provided which display how the perception of product attributes can be enhanced due to certain types of information resulting from technologies. The other procedures help to establish channels for improving communication, with the attempt to expand cooperative efforts between design and engineering disciplines.

As the main contribution to design, this thesis finally proposes an approach to build a model supporting the design process which is based on these methods and procedures. This model describes a process with the help of which designers shall become more skilled in making use of the possibilities offered by new technologies early in the design process.