Chapter 5
Methodology and Computer-Aided Tools - a Powerful Interaction for Product Development

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Abstract  The fundamental bases of modern product development are elements and systems, design methods and computer-aided tools. The interaction between methodology and computer support, mastered by competent engineers, can help to meet the challenges of future product development.

The adaptation of existing methods and the creation of new ones that focus on interaction with computer-supported tools are a necessary and important part of design methodology. Methods that can help use the increasing power and capacity of future computers and allow a holistic view on the complete process of product realization are demanded. This paper describes the potential arising from an effective and powerful interaction between methods and tools. More support in decision-making is needed within the process of product development. Solutions based on an interaction between methods and CAx tools can provide powerful assistance to engineers in this field.

5.1 Introduction

The demand for sophisticated, complex and often individualized products in areas such as traffic, energy, medicine, and the environment will increase in the future global economy. To be successful in these markets, even if the number of competitors is increasing, companies must be able to develop customer-driven, high-quality products.

The need, therefore, is for engineers who are masters in the fields of product development: elements/systems, design methods, and computer-aided tools. The interaction of methods and tools at various steps in the process of product development is an important factor for success. The future development of design methodology will proceed more slowly than the development of computer-supported tools. Nevertheless, precise and sometimes customized interaction between methods and tools will provide engineers with better support in predictive

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engineering and decision-making. There is, therefore, a need to adapt design methods so that they can be used in combination with various CAx tools. The design process is the driver for determining the best method or tool to be used.

This chapter gives an overview of the range of design methods and CAx tools, along with some examples of their successful interaction. The examples form the basis for a brief look at future development.

5.2 The Fundamentals of Product Development

The basic areas of product development are:

- Machine Elements and Systems
- Design Methods
- Computer-Supported Tools

Efficient interaction between these areas is dependent upon well-educated engineers who manage the fields along the whole process of product development and realization. Machine elements offer a huge number of solutions so it is necessary to distinguish between designing with machine elements and the designing of machine elements. Although they represent an excellent stock of solution elements, machine elements are not dealt with in this paper. Rather, the focus is on the interaction between methods and tools, the slaves of engineering masters as well as masters of the process of product development.

5.3 The Interaction between Design Methods and Computer-Supported Tools (CAx Tools)

Developing good products involves examining and developing a holistic understanding of the entire product cycle from inception to disposal, also known as "cradle to grave". In reality, there is a wide variety of proven and effective design methods and CAx tools available. An engineer can choose the method or tool most appropriate to the task and stage of the product development process.