

## Chapter 9

# **KEY METRICS SYSTEM BASED MANAGEMENT TOOL FOR VARIETY STEERING AND COMPLEXITY EVALUATION**

In part two of this book, we have presented a comprehensive information system that copes with the internal and external complexity problems in mass customization. The information system consists of two main components, namely an advisory system at the front end and a multi-agent system at the back end. The advisory system captures the objective customers' needs in a fast-paced manner. It adapts dialogs and simplifies the elicitation process so that the customers are not overwhelmed by the large product assortment. The goal of the multi-agent based system is to find product configurations with the best chances to fit particular customer requirements. The module agents that are associated with the module variants are able to provide information about themselves in order to support variety steering decisions.

But at the management level, one would require tools that evaluate the orientation on the objective customers' needs. In this context, the first question is: "does the information system actually reduce the external complexity level by efficiently leading customers to select product variants that correspond to their objective needs?" Furthermore, the information system only makes proposals within the scope of variety steering. The final decisions about eliminating or retaining module variants have to be exclusively made by human managers. Subsequently, the second question is: "should the module variants that are proposed by the information system actually be eliminated?" Moreover, an efficient updating of the production program in mass customization not only deals with the elimination of superfluous product variants, but also with the introduction of new variants

that correspond to objective customers' needs. Therefore, the third question is: "does the introduction of the new variants induce high complexity and if yes, to which extent?"

All three questions relate to variety and complexity. Whereas the first question deals with the evaluation of the external complexity, the second and third questions relate to decisions that aim at keeping internal complexity under control. To be able to efficiently answer all of these questions, human managers have to be supported by adequate management tools. In the technical literature, there are some methods for supporting management decisions with respect to complexity. The next section will deal with the evaluation of the suitability of the identified methods.

## **1. INSUFFICIENCIES OF CURRENT DECISION-SUPPORTING METHODS IN COPING WITH COMPLEXITY**

As discussed in chapter three of this book, complexity in mass customization is mainly induced by product variety. Thus, coping with complexity relates to making optimal decisions with respect to internal as well as to external product variety. In this context, it is important to distinguish between two approaches, which are variety management and variety steering. Variety management includes concepts for increasing component and process commonality levels during a company's operations. The main goal is to master operations complexity and to profit from the advantages of both economies of scale and scope when producing variety. Examples of variety management concepts include strategies such as standardization, part families, building blocks, modular product architectures, and platforms (Wildemann 2003, p. 58-59). In contrast, variety steering assumes that some variety management concepts have already been implemented. Variety steering methods can be defined as the set of concepts that aim at the determination of the product variants to be eliminated or introduced to the production program. The main concern is to provide an optimal achievement potential based on (objective) customers' needs by optimizing internal and external complexities. For an automaker, manufacturing cars around platforms and a modular architecture is a variety management decision. For example, a decision may be to consider an engine as a module. Thus, the main objective is to determine the main building blocks and the interfaces that are necessary for assembly. However, variety steering essentially deals with the retention, elimination or introduction of module variants. In the case of the engine module, this means to make