Chapter 21
Flexible Classification Standards for Product Data Exchange

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ABSTRACT
One essential part of e-business is the exchange of product data between business partners. Classifications have been developed as a means to clearly describe the semantics of product descriptions. They provide schema elements like properties and classes and define their semantics by some formal relationships and some textual (informal) definitions. This chapter gives an overview about the modelling levels that have to be considered for the development and use of classifications. In addition, it introduces briefly ISO 13584 (PLIB) as one important data model for classifications and it characterizes a number of classifications which are used in today’s product exchange processes. Many of the classification standards use a quite primitive data model which leads to problems in their use and maintenance. By exploiting some features of more advanced data models, many of these problems can be overcome. The authors propose the introduction of additional class hierarchies as an example for adding more flexibility to a classification and discuss this proposal in the context of eCl@ss, an important European classification.

INTRODUCTION
A fundamental requirement for implementing full e-business is the ability to exchange product information between different business partners and their software systems. As far as product-numbers, prices, delivery information, etc. are concerned, exchange is possible on the basis of general models which are applicable for any kind of product. But the technical diversity of products leads to a diversity of technical descriptions. This makes it impossible to define a general model covering all aspects of all types of products in a concise way: The description of e.g. bolts and
nuts requires fundamentally different information than the description of integrated circuits or refrigerators.

Whereas STEP, a series of standards on product modeling (International Standardization Organisation, 1994), defines a big number of models for various domains to describe e.g. geometry or other representation models of a product, the exchange of technical product information in e-business and e-engineering is basically done by describing products by their characteristics or properties. This information exchange is normally based on a meta data approach: Information about a property of a product is exchanged as a pair (property_ref, property_value), where the property_ref is an identifier of a concept in a classification (often also called a dictionary or product ontology). For the correct interpretation of the property_value, the receiving system has to refer to the classification, where the meaning of the property is defined (textually and possibly supported by graphical means) and further information is available like names (in different languages), synonyms, data type, unit of measure, relationship to other concepts, etc. Thus, we have a very simple structure for the exchange, but we need classifications as additional resources which are referenced from the exchange structure.

The consistency and accuracy of the elements of these classifications is important for users: If the resources of a classification standard are not able to describe their products appropriately they will not be able to transmit the required information and to use the classification standards in their product data exchange processes.

Most classification standards are developed and maintained by a consensual process which is based on industrial working groups which consider the change requests from users and decide on their integration into the existing classification standard. The difficulties of these activities should not be underestimated, in particular in view of the growth of the classification systems over time. Today, classification standards often consist of more than 10,000 classes, several thousands of properties, and an even bigger number of class-property relations. Due to the increase of product areas which are being integrated in product classifications and the increase of requirements of applications, the growth of classification standards is enormous. For example, Table 1 shows the development of the number of classes and properties over the last versions of eCl@ss (figures obtained in personal communications with members of the eCl@ss-office, some information can also be obtained from CEN, 2010).

Thus, current classification standards have to face a number of problems:

- The classification standards are growing, so that the organization of the maintenance process becomes more difficult.
- Different user groups put different requirements on the classification standards.
- Classification standards are based on simple data models which put limitations on the expressiveness and flexibility of classification standards.

Based on an overview of classification models and standards, we will argue in this chapter that future classification standards have to provide

| Table 1. Growth of classes and properties in eCl@ss |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|           | V4.0 | V4.1 | V5.0 | V5.1 | V5.1.1 | V6.0 | V7.0 |
| Commodity Classes | 10,190 | 12,565 | 20,379 | 21,100 | 22,203 | 32,590 | 37,868 |
| Properties | 2,303 | 5,504 | 3,667 | 5,525 | 6,941 | 10,930 | 15,397 |
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