Classification Systems

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INTRODUCTION

Classification systems are an easy way to assign objects such as products, services, or even company profiles to a category. Classifying information offers many advantages when dealing with a large amount of different information. For example, it enables one to find information by group or to easily detect similar items. They are meaningful wherever a large set of different, but sometimes similar information is managed. In order to clarify the meaning and the application of classification systems, the following text starting with an example in the area of electronic product catalogs. Important background information about classification systems is given as well as a list of typical classification systems. The text will describe the advantages of classification systems and their meaning for future e-commerce scenarios. The main problem of classification systems today is focused as is the compatibility of classification standards and therefore the reclassification process.

BACKGROUND INFORMATION

The area of product classification gains more and more importance in the e-commerce domain. Within the e-business domain, e-commerce is practically not feasible without the usage of classification mechanisms. The increasing stress of competition of the last years leads to shorter product cycles and to an increasing amount of products. An assignment of products into an organizational structure helps to keep an overview about a large amount of products (see Hentrich, 2001). An essential characterization of e-business is to offer products from more than one manufacturer in a single electronic catalog, for business-to-business relationships as well as for business-to-consumer commerce. There are often catalogs, containing a large number of different products from various manufacturers. In order to group similar products, it is necessary to arrange products into product groups. Classifying products with the help of classification systems can boost this process. When adding classification data to a product description, those products can be found faster and easier and a comparability of products is supported as described in Wollin (2002) and Ramakrishnan (2000). In order to classify them, a number of different classification systems were developed, which differ in their purpose, domain and general structure; that is, in using hierarchical structures. An overview about established classification systems is for example given by Omelayenko and Fensel (2001a) and a short overview is also given within this section. Abecker, Tellmann, and Grimm (2001) can be recommended for an overview about common B2B standards. A product catalog that is based on a classification system provides a large economy of time when searching products and comparing them to similar products. An integration of new products into an existing e-business catalog is eased significantly, since all products contain information about their category. Groups and classes are unchangeably defined by a classification system (see Grabowski, Lossack, & Weißkopf, 2002), which means that all products can be classified based on the defined categorization of the classification system. The advantage is that a single string is sufficient to classify a product. For example the string *49-23-15-13* in the UNSPSC-System[1] means that the product is classified as a *toy train*. Integrating new products into an existing group structure is simplified when interpreting classification information. For example, if you own a web shop and you already defined a category *toys*, then you can simply add all products, starting with the classification string *49-23-15* to your category if they are classified using the UNSPSC-System.

Product classification is only one example for the usage of classification systems. There are also a broad number of other use cases. For example, classification systems are often used to classify services in registries such as web services in UDDI- or ebXML registries (see Dogac, Laleci, Kabak, & Cingil, 2002). The North American Industry Classification System (NAICS)[2] can be used for classifying business establishments. For example, the classification code *339932* in NAICS identifies *Game, Toy, and Children's Vehicle Manufacturing*. There are many other situations where classification systems are used. In general its usage is meaningful wherever a large amount of different but sometimes similar objects are

managed including product catalogs, service registries and company catalogs.

Managing Different Terminologies and Taxonomies

When dealing with a big amount of similar information, as done in electronic product catalogs or registries such as UDDI or ebXML, there are many ways to organize and group similar items. For example, in the domain of product catalog, there are product groups, defined within each catalog. A product group contains several products. It can contain a set of sub-groups and can therefore be connected to a parent-group. This makes it similar to classification systems. There is, however, a significant difference. Classification systems are defined independently from the concrete catalog or registry. Contrary to this, product catalogs and similar concepts are defined for each set of objects separately. For example, in many cases, each product catalog defines its own catalog groups with its own structure (taxonomy) and its own names for categories (terminology). This means, that taxonomy and terminology differs from catalog to catalog. When using classification systems, only a reference to an entry of a classification system is added to the object. For example *49-23-15-13* is added to the product data. This means that there are no conflicts in the terminology and no different taxonomies since the same element is referenced, independent from the concrete catalog. This makes an integration and combination of multiple catalogs or registries much easier. Hence, it is very advisable to add additional classification information, even when using other concepts such as catalog groups.

Vertical and Horizontal Classification Systems

Classification systems are developed for usage in a defined domain, such as the classification of products or the classification of services. As described in Omelayenko and Fensel (2001b) classification systems can be divided into two different groups:

The first group consists of horizontal classification systems. Those try to cover all areas of a certain domain. Well-known examples are the ECl@ss-system and UNSPSC. UNSPSC is a hierarchical system, based on four hierarchical levels. It consists of more then 12,000 different product groups, which are located on the fourth level (for details, see Ramakrishnan, 2000). UNSPSC is the best known international classification system for products. A direct competitor is ECl@ss, which is based on four hierarchical levels, too. Furthermore, ECl@ss defines attributes for all of the >12,700 categories.

Although the number of categories is very high, horizontal classification systems are not detailed enough for all applications. For example the number of categories for classifying toys might not be high enough for a company that is specialized on producing toys. This manufacturer will not need any other classification area than those dealing with toys. For this purpose, the usage of vertical classification systems is common. Vertical classification systems concentrate on a certain part of a domain but they tend to define this part in a very detailed way. An example for a vertical classification system is ETIM, which was defined for classifying electro-technical products. Figure 1 shows the mentioned concepts graphically.

Structure of Classification Systems

The easiest way of defining a classification system is by providing a simple table with classification codes and their description. Many classification systems are, however, structured more complex. In order to use advantages derived from inheritance information, most classification systems have a hierarchical structure. For example, UNSPSC contains a category *toys*, which contains a subcategory *musical toys* and *toy vehicles*. This hierarchical structure enables not only a selection of entries that belong to a certain category but also to select all entries that belong to a parent category.

Figure 1. Horizontal and vertical classification standards
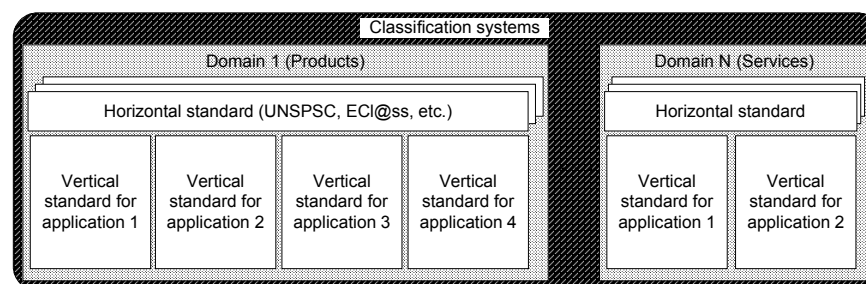
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