User-oriented Product Information Management with Semantic Technologies

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*Abstract— **Product information is important for companies' employees and customers and thus, for the companies' overall success. There is the need to manage and represent complex product information in a way that addresses different user capabilities and perspectives because individuals may have different information needs and different perspectives on product information. This paper describes the idea that product information can be represented and managed user-oriented with the help of semantic technologies.***

Keywords-product information management; user-orientation; semantic technologies.

I. INTRODUCTION

Today, business transactions, including business processes and acquisition of data, are almost entirely electronic in nature. With regards to product information, enterprises are faced with the challenge of how to handle more and more information about products [1]. Adding to the challenge is customer demand for mass customization. This requires the management of even more information about relations between product parts and product features. Information systems may help to reduce the complexity of product information for users, but for this the information systems need functions based on specific technologies. Accordingly, this paper describes the idea of representing and managing product information user-oriented with the help of semantic technologies. In Section 2, product information management (PIM) as a part of enterprise information technology will be described. Section 3 shows challenges for companies that want to apply PIM. The idea of using semantic technologies for PIM will be discussed in Section 4. Finally, Section 5 describes the approach of how to develop a solution.

II. PRODUCT INFORMATION MANAGEMENT

Internally, information about products is not always consistent. Product information is created by specialized departments, or its employees, which have different perspectives on information [2]. Also, product information is created outside of a company, managed, passed on and taken over both by other companies, e.g., suppliers, manufacturers and by individuals like customers [3]. If a company stores and manages the different information about products in a central and media neutral way, the expense of maintaining, searching for and presenting product information can be reduced significantly [4]. Thus, the company will also able to reuse product information consistently in different departments. Furthermore, consistent product information can reduce the number of customer requests and wrong orders and deliveries.

The establishment of electronic business processes brought a number of improvements for companies, e.g., automatic handling of purchasing and selling products. Therefore, data and information about products are almost exclusively managed in companies' information systems [5]. That being said, not all information systems have the ability to fully encompass the PIM needs of a company. For example, Enterprise Resource Planning (ERP) systems are set up to represent all business processes of a company in order to increase the overall cost-effectiveness [6]. Often, ERP systems do not include product marketing descriptions, product pictures or complementary technical product data. Additionally, there are a number of other types of information systems, with which product information can be managed, e.g., Content Management Systems or Customer Relationship Management Systems. Finally, PIM systems provide centralized and media neutral data storage, data management, and data output of product information [7]. PIM systems offer a number of functions, which enable companies to use product information consistently inside and outside of the company. For instance, PIM systems can assist companies and employees with product classification, translation management, media asset management and data output to different media (e.g., print catalogue, technical data sheets, online shop, or other third-party systems) [4].

III. CHALLENGES

One challenge for managing product information is ensuring a consistent description and interpretation of product information by users [8]. Therefore, it is necessary to implement syntactical, as well as semantical restrictions or defaults to avoid redundant statements or wrong interpretations. Another challenge is to capture and represent complex product information, e.g., relations between products or product features. When composing a configurable product it has to be taken into account that selecting a certain product feature may exclude other product features. This information is essential for

employees, who are responsible for maintaining product information but also for customers, who want to configure a product or satisfy their information need. Accordingly, it is necessary to capture, manage and present the information in a clear and easy to understand manner. PIM systems are often advertised as being able to manage a large variety of relations between products and product features. Also, they should be able to present the products and relations between product features in different media easily. This shows that there might be alleged solutions already with which product information can be gathered and displayed in individual formats. However, it is unclear, on which technology and approaches the providers are basing their PIM systems. Also, it has not yet been analyzed whether existing solutions take different user perspectives into account and if they do, how satisfying are they.

IV. SEMANTIC TECHNOLOGIES

The use of semantic technologies, when creating and representing information and relations between concepts, can help interpret complex information by identifying the corresponding context. Semantic technologies can make it easier to understand the meaning and purpose of complex concepts as well as share knowledge for humans and machines [9]. For PIM, semantic technologies can be based on simple approaches like glossaries (lists of words and their definitions), taxonomies (hierarchies for terms) and thesauri (relations of similarity and synonyms) to avoid syntactical and semantic problems when creating and interpreting product information. Approaches with more semantic richness are topic maps [10][11] and ontologies [12]. Besides describing product information these two semantic technologies can be utilized to also capture and represent the relations and connections to other products, product components, product features and further product information. With ontologies it is also possible to represent rules which are associated with the relations mentioned before. Hepp [13] and Brunner et al. [14] are examples for describing and linking products and services with the help of ontologies.

Normally, the complex labels and structures of semantic technologies are created with complex tools (high range of functions, programming skills necessary). It cannot be expected that users, who are responsible for maintaining product information in a company, are able to easily understand and utilize these structures and tools. Even more problems can arise when a user has to modify or customize the structures of the implemented semantic technologies. For example, when a product taxonomy has to be modified, because product lines are merged. Thus, a user not only has to get to know the tool for modifying but also has to understand structures and relations of a product taxonomy. Only then will the user be able to make useful modifications without causing errors, inconsistencies or contradictions. This shows that employees and customers can handle complex product information more easily if structures and

relations of semantic technologies for PIM are represented in an understandable and user-oriented way.

V. APPROACH

The idea of this paper is to utilize the concept of semantic technologies for user-oriented representation and management of product information. First step will be a literature review to provide an overview of the current concepts in research and the research needs in the context of user-oriented representation of complex product information and semantic technologies. Also, companies using PIM will be interviewed for user requirements analysis. Next steps will be to develop a method and a software prototype to support user-oriented PIM. This method and prototype will be evaluated with the help of companies using PIM.

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