

Enhancing Customer Relationship Management using Enterprise Information Integration with Topic Maps

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Abstract: In most companies the landscape of used computer software is very heterogeneous; this causes a need for data integration. This is especially difficult to achieve for small and mid-sized enterprises, as they face the problem of relatively high costs for the existing standard solutions spread only on a small scale. Open standards can be a solution for that. In this context, terms such as RDF, OWL and SPARQL tend to be heavily stressed whenever knowledge integration and data management is addressed; only very few works on the use of Topic Maps have been published. In this paper it will be explored on an example of Customer Relationship Management how the basis for an effective and efficient Customer Relationship Management can be provided by the technology of Topic Maps and how the technology works.

Key-Words: Small and Medium Enterprises (SME), Enterprise Information Integration (EII), Customer Relationship Management (CRM), Semantic Web, Topic Maps

1 Introduction

In a typical company's daily life the landscape of used computer software is very heterogeneous; many different computer programs are in use. Every employee uses several programs at his desk to fulfill his every-day tasks. On the one hand some of those programs are the same for most of the employees as for example presentation and writing software. On the other hand some software programs are special computer applications that are only in use for some special tasks and are mostly used by a single department or few people in a firm.

These different applications sum up to quite a large number of different programs, growing with the size of the company and the diversity of tasks. As there is diversity in the programs used, there is also a great diversity of software manufacturers causing poor interoperability of the software in use.

For example a small business school of 110 employees is using, after an expert's estimation, around 40 different programs. Due to the big variety even the expert could only guess the figure as nobody has an overview over the multiplicity of computer applications and thus nobody knows the exact figure [1].

2 Need for Data Integration

Precisely because there is even in small and medium enterprises and organizations such a big multiplicity in computer software there is a high complexity in the firm specific system architecture of programs.

Some programs are compatible with each other. This can be seen as a small reduction in complexity as the content may be assessed using different programs. Some software makes it also possible to work with programs supporting a different data format upon import and export of data and information. Those programs are very well compatible with other programs.

Still some programs cause the users difficulties to integrate data and outputs of different data formats and thus to use this information in another way. In such cases there is a need of integration for the user, which makes it possible to use the information gathered in one program in another one.

This leads to additional work in every day's life of the employees and cause inefficiency and thus costs. Sometimes this implies not considering all the available information and thus not using all the existing data and knowledge, which might cause lacks in effectiveness.

To have a closer look at the severity of these problematic aspects in a business context one has to differ between small and mid-sized enterprises (SME) and big companies.

2.1 Big Companies

In Germany big companies represent only 20% of the firms [2]. Those companies have quite big resources and can afford customized data integration systems. This means they get software programs programmed that integrate those and make different programs in use of the firm compatible with each other. Big companies can either afford their own departments being in charge with data integration or they outsource it. Moreover for big firms standardized programs for data integration like SAP are available and at that scale they are worth buying [3]. For those reasons bad compatibility of different software causes no substantial problems to big companies but they have to invest heavily in these systems and the maintenance.

2.2 Small and Medium-Sized Enterprises

SMEs compose 80% of German companies [2]. For SMEs data integration is a bigger issue, as they are more cost sensitive. Moreover their companies do not have the size that standardized integration solutions pay off. For this they use mostly manual integration from one program to the other [3]. This means in many cases copy-paste-solutions. Exploratory studies show, that there is a need for small and medium enterprises to find an easy and most notably inexpensive way to get their data integrated also on a small scale [3]. This shows that there is a need for data integration in particular in small and mid-sized firms.

3 Objective of the paper

The aim of this paper is primarily to explore the applicability of the evolving ISO 13250 standard, Topic Maps, concerning its relevance to Enterprise Information Integration for SMEs. To achieve this, the requirements in the special area of application of customer relationship management will be depicted. After those requirements the adoption of Topic Maps for those will be explained and evaluated. Closing Topic Maps will be examined after the defined criteria and the specific requirements made for customer relationship management.

4 Problem Solution

Deriving a solution to the problem of data integration especially for SMEs three major criteria have to be met. First, it should not be necessary to make a major change in all the used programs, as this would need much time and effort and the employees would have to learn working with new programs. Second, the costs should be lower than for existing solutions. Costs in this context are split in implementation costs, maintenance costs and license costs. Third, the solution should be reliable and

cause as little problems as possible. Thus it should be intensively and widely tested.

Topic Maps are the only official ISO standard for the representation of knowledge structures and the associations between them [4]. The ISO 13250 standard is an open standard not requiring expensive licensing. Furthermore, a growing amount of free software is available, reducing the software costs to a minimum. While it is possible to handle complex data structures, as needed in companies, their constituting elements are simple and easy scalable. Therefore this technology is an interesting candidate for an enabling technology in the knowledge management of SMEs.

After a small exemplary CRM business case is discussed, the Topic Map technology will be introduced in terms of the scenario. Lastly it will be discussed what has been achieved by the use of Topic Maps.

4.1 CRM as a business application

One business application for the use of Topic Maps could be customer relationship management (CRM).

After Payne and Frow CRM is a strategic approach that is concerned with creating improved shareholder value through the development of appropriate relationships with key customers and customer segments. It unites the potential of marketing strategies and IT to create profitable long-term relationships with customers and other key stakeholders. CRM provides enhanced opportunities to use data and information to both, understand customers and co-create value with them [5]. For an effective and efficient CRM the following requirements have to be fulfilled [6]:

1. Synchronization of the central customer touch point marketing, sales and service,
2. integration of all communication channels between customer and firm,
3. as well as the needed consolidation and analysis of all clients information.

In our business case the firm "abc.com" wants to do CRM and that wants to address clients in a differentiated way, but the information on the customers is distributed all over the company.

The marketing department knows in which target group the customer fits and most likely gathers information on gender, family status, hobbies and interests. The marketing department keeps a database like Microsoft Access™ up to date for their information.

The sales department knows what products the customer usually buys and at what frequency. Moreover they know where he buys it or where it should be delivered. This information is all saved in an inventory planning system comparing to SAP.

The finance department has information on the customer's billing information like the numbers of bank accounts and credit cards. They also know about the customer's credit worthiness and his payment behavior.

All this is tracked in a table-calculation program like Microsoft Excel™.

The Call Center controls the telephone as a communication channel to the customer. It knows the customer's telephone number and about the customer's complaints and tracks the telephone. The Call Center uses its specially engineered software programmed by the internal IT-Department of "abc.com", where calls and subjects are tracked and all the information regarding previous telephone contacts to the customers are saved.

The so-called "Customer Service Center" consists of three employees receiving and answering all the e-mails of customers. The three employees save the received e-mails and the replies to it in the e-mail format in Outlook under folders named after the customer.

This means for abc.com, that all the information necessary to address a customer in a differentiated way is distributed over a multitude of programs [6]. Thus for abc.com it is quite difficult to do an effective and efficient CRM, as the synchronization of the marketing and the sales department is on the level of data very difficult, they cannot just integrate the data from the marketing department to the inventory planning system of the sales department. And the other way around the problem stays the same.

The integration of the communication channels telephone and e-mail works is assumed to work at the moment only on request. If the Call Center is called and asked after an e-mail response, the employees of the call center contact the Customer Service Center. The e-mail exchange is not observable for employees of the Call Center. Neither has the Customer Service center insight in the call communication.

Each department does consolidation and analysis of all clients' information when they have a need for that. In this case they contact the other departments for information and often copy the information in their systems.

4.2 The business application in Topic Maps

Topics are the generic and central concept in the Topic Map standard. A topic can represent everything, from a company or its products to people. Generally speaking, a topic represents a "thing", called "subject", and makes it accessible to be an object of statements within a topic map. The relation between a topic and its subject is the relation between a word and the thing it stands for [7]. Thus the term "topic" marks a node in a topic map that represents a real world thing.

In the context of CRM topics represent things such as a consumer as well as a product or a service. The topics are grouped according to their type. For example, a customer "Customer_A" would be of the type "Customer". A topic "TV-1000" would be of the type

"TV-Set". Such typed topics are instances of the type they belong to.

Types are topics, too. "Customer" and "TV-Set" are to be declared in the topic map as types if they are used as types.

Topics can be assigned with multiple names but don't have to be. While topic map standard acknowledges the need a standard name, it has the freedom to add domain specific name types (e.g. the name used for a product inside the company).

The topic map standard allows topics to be connected to a number of resources, called occurrences, relevant to the topic. For example, an occurrence could be the birth date of Customer A or a textual description of him and his preferences.

Like topics, occurrences can be typed as well, allowing to describe the kind of information in the occurrence.

Topics are connected upon associations with each other to express relationships between them. Examples are such as Customer A purchases the TV-1000, with "Customer_A" and the "TV-1000" associated by "purchase".

Associations have to be typed, to group the relationships between topics. The association type for our example association "purchase" is "Contract".

Furthermore, topics engaged in a association play a particular role in that association, the called "association role". In the case of the association "purchase" between Customer A and TV-1000, these roles are "buyer" and "product" respectively. Chart 1 depicts graphically a fragment of the topic map as discussed. Following the symmetry of Topic Maps, association roles have to be typed as well.

A central incentive to use Topic Maps is to ensure that all CRM data is integrated and synchronized. Thus, information about the customer "Customer_A" has to be accessible via one single topic, representing Customer A. However, information is distributed created and manipulated between the customer touch point marketing, sales and service. In such a scenario it is necessary to draw attention to guarantee the coherence between topics representing the same things; thus, to the problem of appropriate merging.

For example, the Customer Service Center receives an e-mail from a customer, named Customer A, and creates a topic, representing Customer A's remarks.

In the case that the Customer Service center has already access to the topic map containing the information about Customer A, the information can be integrated upon an association between the topic representing Customer A and the topic representing his remarks.

In case the Customer Service center has not access, by whatever kind of reason, to the topic representing Customer A or created, by some other reason, a second topic representing Customer A the information about Customer A has to be merged.

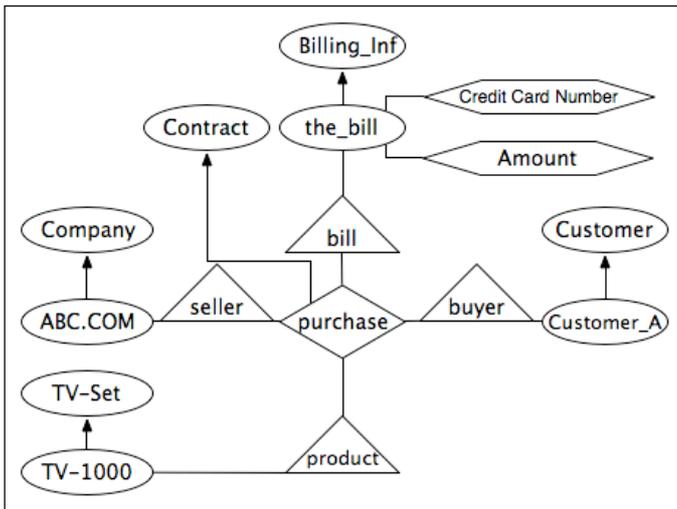


Chart 1: Exempling topic map scheme

Subject identity is the concept to allow this and realized through the subject identifier of the topics in question. A subject identifier is a unique address to unambiguously identify the subject (Customer A) represented by a topic. In the case that two topics share this same unique address, they are considered to be equal to a single topic that has the union of the characteristics of the two individual topics in question. The process of the consolidation of the topic map results in a one on one relationship between subjects and the topics representing them, ensuring that all relevant information on a topic is easily accessible.

As has been shown, the Topic Maps Data Model allows three kinds of statements to be made about topics: i.e. its occurrences, its names and its associations with other topics. However, all statements have a context within which they are valid; this context is known as scope. The scope of a statement is a set of topics that defines the context of a statement. Continuing with our small example Customer A may state that he didn't receive the purchased TV-1000, while the delivery service claims to have delivered the product. In order to avoid the ambiguity about whether the product had been properly delivered Topic Maps consider any assignment of statements to a topic only valid within a certain scope. Thus Customer A's remark about the product not being delivered is scoped with the topic representing him, while the assertion of the carrier of having delivered the product is scoped with a topic representing the carrier. Besides just removing ambiguity the scope of statements can bring much more utility; it can also allow different views on the available information [8]. For example the finance department and the Customer Service center can be provided with a different view on the customer Customer A allowing each department with a perspective on Customer A according to the tasks of the department.

4.3 What has been achieved by using Topic Maps

This example demonstrated that the three needs of CRM in data integration could be reached by using Topic Maps.

1. Synchronization of the central customer touch point marketing, sales and service is achieved as the department can draw all the information on Customer A no matter which department entered the information in the first place and even if the information about Customer A had been temporarily scattered.
2. The integration of all communication channels between customer and firm is attained as all the communication is linked to the topic representing Customer A. Like this the Call Center cannot only see the tracking of calls but also what e-mails Customer A wrote without especially contacting the Customer Service Center.
3. The needed consolidation and analysis of all clients' information can be easily done via Topic Maps Technology [9]. For example if the marketing department should calculate the rate of complaints per year they access directly all (not split in e-mail or telephone call) communications done between Customer A and the firm without contacting the Call Center or the Customer Service Center.

4 Conclusion & Perspective

To conclude it can be seen, that there is a need for data integration in SMEs but also in big companies. If the tasks of data integration are performed in a reliable way they gain efficiency and effectiveness to the firm. In this paper we explored the means of Topic Maps to reach that goal of data integration.

The existing cost issue can be overcome, as the open standards are used and implementation can be reduced to adopting already existing software [10,11]. Also the reliability of Topic Maps has been proven in the process of standardization. The Norwegian government and post are using this technology extensively without any severe problems [12]. Also the Danish national library and the US Tax agency are working with Topic Maps.

The requirements also lined out that there should not be necessary a major change in all the used programs. Still this point is the big challenge for the widely apportion of the Topic Maps technology – a challenge that emerged in the past and is still prevailing. This point might sound insignificant but is of big importance. The standard of Topic Maps is not common; only few organizations work successfully with Topic Maps, yet. But the restricted coverage by Topic Maps leads to the fact that most data formats are not adapted yet. This is the major weakness of Topic Maps and has to be overcome in future.

To represent a real advantage and solve the data integration problem for small to mid-sized firms the topic map standard has to be spread and thus become integrated with existing data formats. By this the integration of data and the work with data will become far easier and ease a lot the daily life of companies.

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