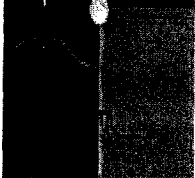# ECIS 2003

naples 16-21 June
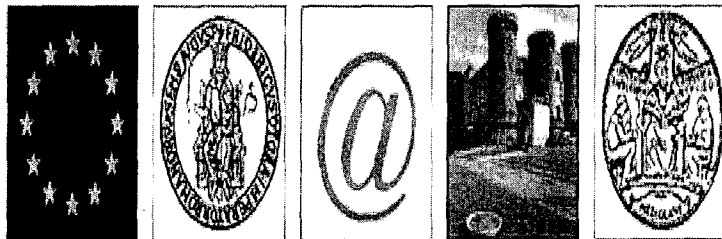
www.ecis2003.it

New Paradigms in Organizations, Markets and Society

Proceedings of the 11th European Conference on Information Systems

Università di Napoli Federico II
Università Cattolica del S. Cuore, Milano

Under the Patronage of Regione Campania and Comune di Napoli

ENGINEERING INGEGNERIA INFORMATICA

UNISYS

Intesa FORMAZIONE SUD

Schlumberger
WORLDWIDE IT PARTNER

(it)aldata
Gruppo Siemens Business Services

TSF

Halgol

Atitech
Gruppo Alitalia

Do you know your terms? – A procedure model for terminology management

Stefan Kremer
Institute of Information Management
University of St.Gallen
CH-9000 St.Gallen, Switzerland
phone +41 71 224 24 20, fax +41 71 224 27 77
stefan.kremer@unisg.ch

Lutz Kolbe
Institute of Information Management
University of St.Gallen
CH-9000 St.Gallen, Switzerland
phone +41 71 224 24 20, fax +41 71 224 24 09
lutz.kolbe@unisg.ch

Walter Brenner
Institute of Information Management
University of St.Gallen
CH-9000 St.Gallen, Switzerland
phone +41 71 224 24 20, fax +41 71 224 24 09
walter.brenner@unisg.ch

Abstract

Due to the extensive development und use of information technology, a lot of companies gained access to vast internal and external information sources. Yet nonetheless, efficiency when dealing with information and trying to find the right content is not on an appropriate level. Managing terms and classifying information has a long tradition in Knowledge Management, namely by the usage of glossaries and taxonomies as two instruments of Terminology Management. But even with today's portals, search engines and auto-classifiers, it does not work without human interaction and high costs. Therefore, we propose a procedure model for Terminology Management to build up and maintain glossaries and taxonomies. To discover the evidence of our approach three action research cases have been analysed. The first focuses on the introduction of a glossary for a Swiss insurance company whereas the second case illustrates the initial activities and results for setting up a corporate taxonomy at an international professional services firm. Based on the learnings we developed a prototype (third case) which combines glossary and taxonomy for document classification and retrieval. We conclude that only a well suited trade-off between centralized and decentralized Terminology Management activities will be sustainable.

Keywords

Terminology Management, Taxonomies, Retrieval, Glossaries

1. Introduction

In this chapter we will first introduce the challenges of Terminology Management. After that, we define the objectives of our article and illustrate our solution approach. At the end of chapter 1 we present the structure of our article.

1.1 Challenge

Due to the extensive use of information technology (IT), a lot of companies gained access to vast internal and external information sources. Intranets and Enterprise Portals have become popular and give all employees the possibility to use explicit knowledge, enshrined in electronic documents (Latham 2001, Web/CKS 1999). The World Wide Web (WWW) with its myriads of servers and millions of documents can be a valuable information source as well. Yet nonetheless, efficiency when dealing with information and trying to find the right content is not on an appropriate level. "Information management must begin by thinking about how people use information..." (Davenport et al. 2001), otherwise a practical usage is not possible.

Even though employees today have access to an astonishing number of different information resources, we observe major deficits in handling information like:

- Disappointing search results: An intranet search query for certain topics might sometimes be frustrating because even if the user knows that some information already exists, no match will be included in the search results.

- Fuzzy naming: Looking at an internet site of a company from the financial services sector, products like "structured financial products" and „alternative financial products" are listed below each other without a description, although the correct pair of terms "structured / unstructured" would be expected. This problem is mainly caused by inconsistency in the classification schema and vague use of terms.

- Misleading use of terms: When analyzing communication between people, it is remarkable that a lot of coordination effort is caused by the fact that requests and replies deal with the clarification of term usage.

Interestingly, similar challenges are successfully managed in other areas. In the medical or pharmaceutical sector, we also discover equivalent problems. It is essential for two surgeons to talk precisely about the same part of the human anatomy, for example in the case of a liver transplantation. Linguistics as an example of humanities also concentrates on the use of terms (Hoffmann et al. 1999).

Looking at these scenarios, the control of semantic (meaning of terms) and orderly classification of terms used in a business environment is the key to success in order to minimize these deficits (Dale 2001, Felber & Budin 1989). It would also help to avoid having to develop the same components (e.g. in software development) several times because of the imprecise use of language, which makes it impossible to recognize that they are the same (Ottmann & West 1995).

These challenges are manageable today: Terms from different scientific areas are flanked by the theory of Terminology Management as its own scientific discipline (McDavid 1996, Bailey 1994), which is "the conducting or supervising of the technical or special terms used in a business, art, science, or special subject" (Felber & Budin 1989). In other words,

Terminology Management is the sum of organizational units, processes and instruments that support the creation and management of terms and classifications in a specific subject area. The resulting tools of Terminology Management are glossaries and taxonomies (classification schemes) that serve as the foundation for search, navigation, storage and communication services between persons and/or systems. Furthermore, the activities concerned with Terminology Management are also of significant importance.

Yet, even though the benefits of a taxonomy and a glossary seem to be obvious, the question is why only few information-centric companies have already implemented these two instruments to minimize their terminological deficits, despite surveys illustrating that the demand for improved search and indexing capabilities within portals (which can be enhanced using these tools), for example, is still on top of the wish list (YankeeGroup 2000, DelphiGroup 1999).

Looking at the relatively evident suitability of the instruments taxonomy and glossary to solve terminological deficits, one might wonder why the widespread use of these instruments cannot be observed yet in a business setting. One of the reasons for this observation might be the existence of factors that hinder a rapid implementation of Terminology Management, such as:

- A lack of awareness of terminological problems, their costs and the existing initial approaches to solve them;

- A lack of standards for term classification;

- Unspecified support processes which are to be responsible for solving terminological defects.

1.2 Objective and research approach

The overall objective of this paper is to propose a procedure model for Terminology Management. Following the established business engineering approach (Österle 1995) we aim at a high level of formalization. To ensure a systematic development of the procedure model itself we will use a research discipline that has been termed method engineering (Gutzwiller 1994, Österle & Heym 1993). It has already been used in the definition of various methods which are being used successfully in practice.

Although a complete method includes techniques, result documents, roles, and a meta model, we focus on a procedure model that contains the recommended sequence of all top-level activities (Alt et al. 2000) to show the synergetic effects of the two proposed instruments (glossary and taxonomy) illustrated by three practical cases on the process and systems level.

Research and descriptive processes are based on action research (Whyte 1991, Gummesson 2000) with several corporate partners, namely results from workshops and projects with research partners over a time period of two years. Results are currently tested and expanded with further partners.

1.3 Structure of article

Chapter 2 illustrates related work in the area of Terminology Management and introduces the two tools we focus on, glossary and taxonomy. Knowing the capabilities and constraints of these tools we then propose a procedure model for Terminology Management in chapter 3. Chapter 4 gives three examples of successful implementation of our approach. The first two cases will focus on the single usage of either glossary or taxonomy while the third case

shows the combination of both realized with a corresponding IT solution. In the completing chapter 5 we will draw a conclusion and propose directions for further research.

2. Tools for Terminology Management

We first outline related work in Terminology Management in this chapter. Then, glossaries as tools for control of semantics (the meaning of a term) will be introduced. Last, taxonomies which focus on orderly classification of terms will be presented.

2.1 Related research

The problems caused by an insufficient definition of terms have already been dealt with in a variety of situations (Buchan 1994, Symons & Tijsma 1982, McDavid 1996, Brenner & Österle 1986). Especially in natural sciences, classification schemes and other means of describing terms and their relationships play an important role. Further examples can be found in chemistry or linguistics, where especially translation services are naturally very concerned with glossaries that make it possible to assign terms or entire phrases to expressions in other languages. Here, the term itself as well as the context plays an important role, which can make the process very complex.

But also in business administration and in the practice of business-life, a precise definition of the meaning of terms has become increasingly essential. Up to now, this principle has mainly been used for dealing with transaction-oriented data, which can be managed company-wide with enterprise resource planning systems (ERP) like SAP R/3. These systems integrate means of managing terms used in their context. SAP, for instance, provides a comprehensive glossary for their terms (SAP 2002).

However, low structured data such as documents, emails or reports have not been of great concern in the past, especially since they are not part of traditional ERP systems. Yet, low structured data is at the center of attention today in connection with the field of Knowledge Management, which is concerned with how an organization can make low structured information (e.g. knowledge) accessible so it can be retrieved and reused (Probst 2001, Bach et al. 2000, Davenport & Marchand 2001). The important role of Terminology Management can be found e.g. in the "Customer Knowledge Management" model, developed at the Institute of Information Management at the University of St.Gallen (Gebert et al. 2002).

As the preceding paragraphs have illustrated, Terminology Management needs to be perceived as an interdisciplinary approach, which is useful in a variety of fields. In this paper, a special focus is the application of these interdisciplinary findings to the field of knowledge management in order to solve the defects outlined in the introduction.

The foundation of Terminology Management with its term, term system and term description is essential for information and knowledge processing (Felber & Budin 1989). A Terminology Management system should provide tools which aid humans to trace the life cycle of terms, i.e. to acquire, maintain, modify, and disseminate terminological information (Ahmad et al. 1994). Furthermore, (Felber & Budin 1989) point out that two very important tools for Terminology Management are document thesauri (glossaries) and classification schemes (taxonomies).

As stated in the introduction, glossaries and taxonomies address different issues. Glossaries deal with the control of semantics (the meaning of a term) by providing a collection of terms

with meanings, whereas taxonomies focus on orderly classification of terms (Wayne 1991, Moriarty 1990, Logan 2001, Rich 1992).

2.2 Glossaries

A Knowledge Management glossary e.g. defines all basic and relevant terms concerning this particular area. These definitions are mainly relevant to a closed group or domain like a company or a division. It is important that all participants of this group have a common understanding of theses terms and are involved in the definition process. To run through a definition process, all participating persons have to agree on the "definition framework". The "definition framework" consists of attributes and values, which have to be defined for each term (Ortner 1997). It does not only contain the term itself, but also the intension, extension and source control attributes, e.g. primary key, version, expiration date, etc. The intension is the definition of the term, while the extension is the sum of other terms which are included in the original term to which the intension applies. To some extend it makes sense to define a relevant domain for a term, e.g. one ore more organizational units to differentiate between similar terms with different meaning.

A considerable problem when standardizing terms is the aspect that it can be very time-consuming. The definition of the term "portal" during a workshop conducted by our Institute with partner companies took nearly one hour. Still, it is crucial that this standardization is achieved in a bottom-up process to create a common understanding that reflects business reality. As (Champe 1996) points out, "when people need to discuss the description of some word, it is very important that everyone understands the description in the same way". Knowing this, it is re-commendable that only important or company-critical terms should be defined to reduce the effort to a minimum.

One way to reduce the time for defining terms is to search for existing industry-specific or subject-specific glossaries and to establish these as standards (Logan 2001). Institutes for standardization like the International Organization for Standardization (ISO) or Chambers of Commerce are good starting points to look for existing glossaries, e.g. (BMWA 2002). The "Deutsche Telekom AG" as a market leader for telecommunication in Germany offers a specific telecommunications glossary. However, while this facilitates communication to external partners, it might create an acceptance-problem inside the company.

2.3 Taxonomies

As stated above, a taxonomy is a classification schema to organize information in a hierarchical manner (Gaus & Leiner 2000, Bailey 1994). Complexity reduction and navigation facilitation are the main reasons for using taxonomies (Logan 2001).

In the area of Knowledge Management taxonomies are often used to structure Corporate portals' content. One public example is the Open Directory Project's taxonomy (Figure 1) where over 3.8 million web sites are organized in over 460,000 categories (DMOZ 2002).

Figure 1. The Open Directory Project's taxonomy

Whereas dmoz.org's results are based on the manual work of over 53,000 editors, no cost-oriented organization could ever afford such a complexity. Unfortunately, mere technical solutions like automatic classifiers cannot solve the problem yet (Warzecha 2001, Hagen 2000). Human intervention is still necessary, e.g. deciding on taxonomy node names or labels. For many enterprises, no single set of categories will satisfy all users. Some terms, even if they are common across the enterprise, may not be uniform. As already stated in the previous chapter a specification of a domain is necessary, e.g. to build taxonomies for different organizational units within a company. Again, a trade-off between centralization and decentralization of terminological work is required.

Today, a lot of hierarchical classification schemes are available in the WWW. Time reduction can be achieved by using and adopting these taxonomies. A link list for Controlled vocabularies, thesauri and classification systems available in the WWW can be found on Lund University Libraries web site (Koch 2002).

3. Procedure Model for Terminology Management

The combined usage of the two instruments taxonomy and glossary can be shown to solve the defects described in the introduction. The use of a taxonomy enables the adequate classification of information, thereby improving search results that are not only based on the appearance of key words. By using a glossary, the search results can be further improved since it ensures that the users have a common denominator concerning the meaning of terms they are searching for. As (Gilchrist 2001, Varian & Lyman 2000) point out, "our ability to store and communicate information has far outpaced the ability to search, retrieve and

present it. Some see taxonomies as part of the answer to this problem." The example of fuzzy naming within different financial products could be resolved by applying a glossary that explicitly allows the definition of relationships between terms. At the same time, a defined taxonomy will eliminate inconsistencies in the classification schema. These inconsistencies also existed in the example of the mixed storage within a file server, where a taxonomy can be used to eliminate them. The misleading use of terms in everyday communication could be improved by introducing a company-wide glossary, especially if it covers multiple languages.

These examples in particular show that ideally both tools should be used together, since they complement each other. One can imagine that a taxonomy would not work if there was no common understanding of included terms and dimensions and if they were interpreted differently, leading to ambiguous classifications.

One requirement in order to overcome these problems is a systematic way of introducing Terminology Management to a company, a process that can become very complex in a large organization. A careful trade-off between decentralization and centralization of activities has to be made. Therefore, we would like to illustrate a process for the initial development of a glossary and a taxonomy , which was derived by action research. It cannot be overemphasized that after an introduction, both the taxonomy and the glossary can be very dynamic when employed in a business environment (in contrast to a scientific context) because terms go through a lifecycle that constantly refreshes a corporate vocabulary (Figure 2).
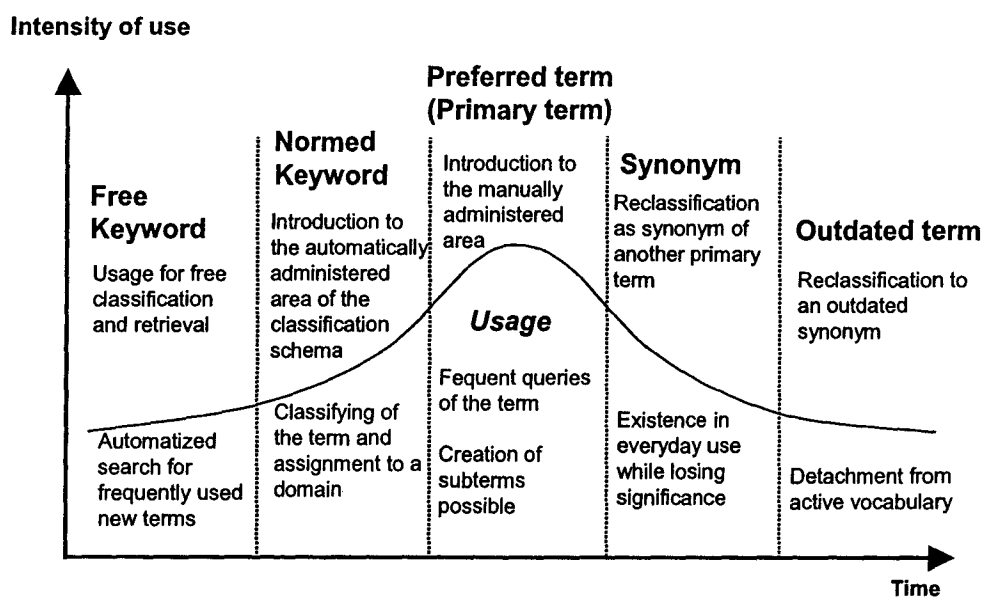
Intensity of use

Figure 2. Lifecycle of terms [Kremer & Riempp 2001]

This causes not only new terms to appear, but also the disappearance of old terms. Therefore, the lifecycle needs to be taken into consideration when defining processes for the management of the terminology in an organisation. Consequently, it is crucial to have a specific focus on processes for the management of terminological instruments once they are established because they will obviously not contribute benefits if detached from reality. This view is also supported by (McDavid 1996), who states that "a repository of business terms ...

can be maintained dynamically as the models evolve. It is important to establish a data administration function to make sure that updates, backups, and data consistency matters are attended to".

The process of developing a taxonomy and a glossary is illustrated in Figure 3. It is important to design this process as a bottom-up analysis (McDavid 1996). The first step is to define the valid domain of the taxonomy/glossary (i.e. a certain company, work group or community). Secondly, all the terms of this domain are collected and their definitions have to be reconstructed by domain experts. In order to maximize efficiency, it is useful to concentrate on the most important terms in the beginning. Possible sources for terms can be dictionaries, interviews/workshops, existing systems or the analysis of processes.

| Determine domain | Collect terms | Summarize sources | Create equivalent classes and determination of predifined terms | Resolve term defects | Develop classification logic | Check and revise | Publish |
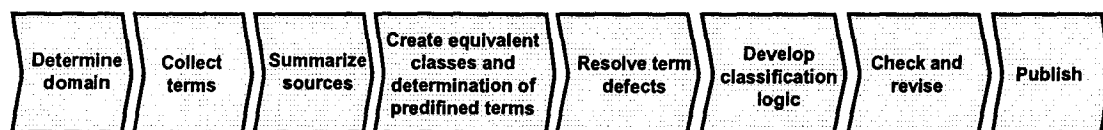
Figure 3. Development of classification schema and glossary

To avoid having the same term show up in multiple sources, the sources are summarized. Terms that are synonyms are clustered in equivalent classes and a preferred term is determined for each class. In a further step, term defects such as homonyms (one term has several definitions) or vagueness of a term need to be eliminated or dealt with. The goal is to have one term at the end (Buchan 1994). A major issue is the development of the classification logic, which means that now the hierarchy or relationship among the terms needs to be established to form the taxonomy. Check and revision is necessary to make sure that all requirements are met by the new taxonomy/glossary. Possible techniques are the questioning of users, the analysis of search queries and terminological checks. The final step is to make the results available for use in the operational systems.

4. Application of the Procedure model in real-life cases

In this chapter we will show the successful usage of the procedure model introduced in the previous chapter. First, two short cases will illustrate the isolated adoption of either a glossary or a taxonomy and highlight the key learnings. The last case shows the combination and synergetic effects of both realized with a corresponding IT solution.

4.1 Glossary for Swiss insurance company

The first case shows an insurance company in Switzerland and deals with glossaries. This insurance company has several terminological challenges. For example, a lot of departments have employees spread out in Switzerland who sometimes have to work in four different languages: German, French, Italian and English. Translation is therefore the primary concern of Terminology Management in this case. Working together with our institute in several workshops and projects, the company was supported in reducing their definition framework from 45 attributes in the beginning to 8 in the end. This will cut down the user's effort drastically. Furthermore the company was able to define the 150 most important terms in four languages within a period of three months. In addition, a tool evaluation for electronically supported glossaries was conducted. The company now uses TermStar of the

MultiLing Corporation, which allows users to create and maintain multilingual terminology databases by supporting major processes like "term creation" or "term approval".
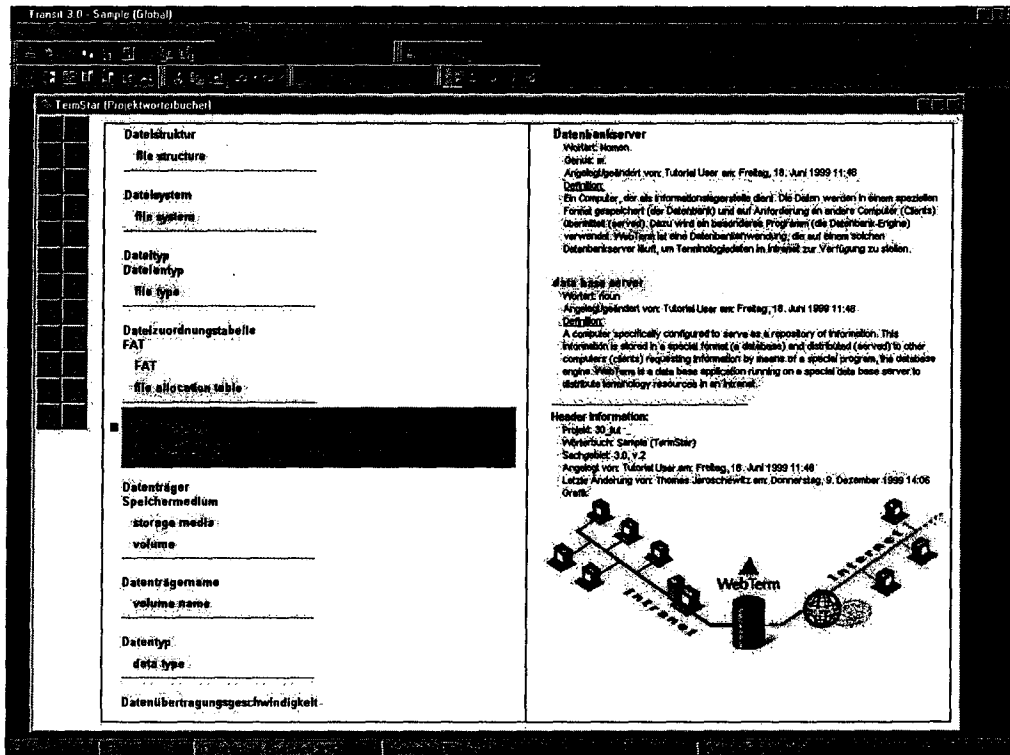

Figure 4. TermStar

We learned from this implementation that

- a structured procedure model facilitates in collecting and defining terms,
- a "lean" definition framework reduces time for term definitions,
- and that an adequate tool support ensures user acceptance.

4.2 Taxonomy for international professional services firm

The second case is derived from an international professional services firm and mainly concentrates on taxonomies. Working with 150,000 employees in over 150 countries worldwide, this company generates an enormous amount of electronic documents. During the set-up phase for the initial intranet solution implementation, the question arose how to categorize electronic documents in a way that storage and retrieval would be easy enough to find relevant documents when needed in the future. A project team was set up to create a corporate taxonomy. Performing a lot of workshops with domain experts and end users, finally seven taxonomical dimensions were found.
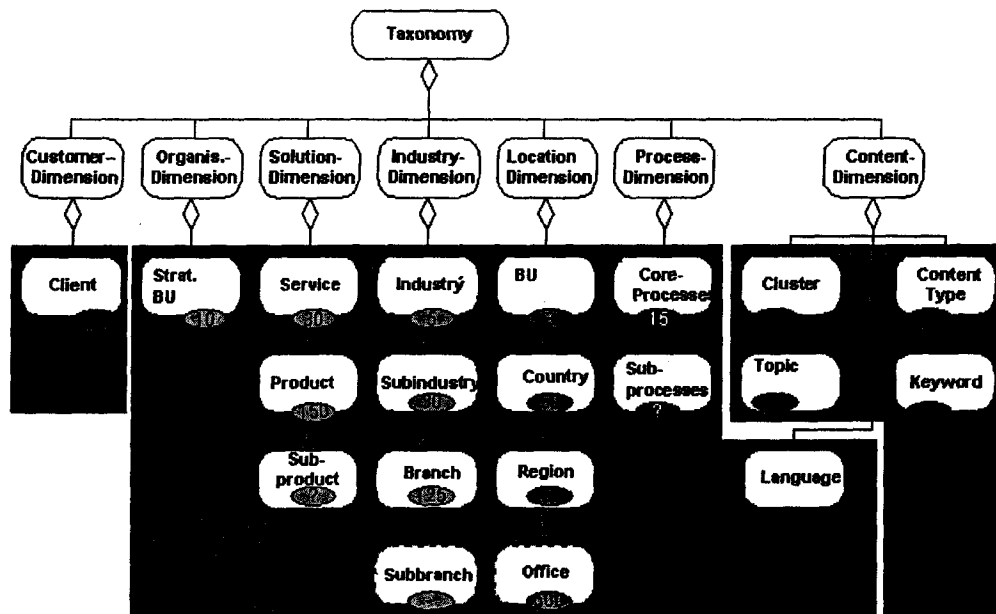
Figure 5. Taxonomical dimensions

Figure 5 illustrates how these taxonomical dimensions allow users to classify their own documents or find documents from other authors with an attribution by customer, organizational unit, product, location, process, or content. The fact that the collection of terms within the seven dimensions occurred at the level of the individual departments can be considered to be critical for the success of the project. Another critical success factor is that the resulting taxonomy was used throughout the entire company with a single keyword database for navigation in the portal, for classification of all documents and for employing search queries. Also important was that update processes were defined from the beginning with the notion of a taxonomy having constant dimensions but variable terms. The duration of the project from the presentation of the idea to the implementation of a key word database was nine months.

Overall, we observed that

- a lot of attributes and values could be derived from existing systems, e.g. HR,

- the content dimension was the most difficult part because the agreement on terms took a long time of discussion with different teams,

- and that sometimes the hierarchy of topics was in opposition to the organizational hierarchy.

4.3 Combination of taxonomy and glossary at our institute

The two previous cases focused on single aspects of Terminology Management, either glossary or taxonomy, whereas the concluding case shows the combination of both.

At our institute we have four chairs, each with two or more competence centers. Each competence center is led by a project manager who is responsible for the results. A lot of electronic documents are produced by each competence center, e.g. lecture materials, presentations, publications, etc. stored in different systems, e.g. file server, lotus notes databases, web content management systems, etc.

From a terminological point of view all electronic documents have one thing in common: they all deal with certain topics, e.g. Knowledge Management, Enterprise Application Integration, Business Networking etc.

Within an internal project we declared "Topic" to be the most important attribute to characterize the content of an electronic document for storage and further retrieval. Relevant topics have been collected decentrally from all competence centers and stored in a single parameter database (Figure 6). On the first level the chairs are listed (1). The competence center IWI4 / CKM (2) with its topics is shown below. Regarding a concrete topic, e.g. Portal, (3), the following structured information is embodied in our definition framework:

- Item: preferred term for topic

- Assigned to: responsible competence center

- Status: draft, active or frozen

- Synonyms: similar terms or different languages

- Description: description of the term (4)

A document history (5) supports the traceability of modifications.

Figure 6. Taxonomy and parameter database

These topics are used to classify documents, e.g. within our team databases or literature- and publication applications. Currently there are about 350 topics overall, owned by 30 competence centers. About 11,000 documents are classified with theses topics for further retrieval, e.g. via our public web site or within team databases of our competence centers. Additionally, the parameter database serves as a glossary for our most important terms.

Changing topics do not result in a re-classification of already classified documents but aggregation and synonym handling will occur on a higher level by exporting this controlled vocabulary and using it as a search engine thesaurus.

From our own implementation we learned that

- a „lean" taxonomy with only few dimensions reduces work load for document classification,

- a few simple (centralized) „rules" for topic definition are helpful, e.g. naming conventions,

- and that the decentralized definition of terms ensures acceptance and usage.

4.4 Lessons learned

Summarizing the lessons learned from the three cases we conclude that usage and maintenance processes play a central role in the management of terms and should be well defined.

In the beginning most Terminology Management projects are too complex. Reduction of the definition framework entries for glossaries and simplification of taxonomy dimensions helps implementing both instruments in a fast and efficient way.

Furthermore, definition framework and taxonomical dimensions work best, if they are constructed by a top-down approach (centralized). But filling glossaries and taxonomies should be done from bottom-up (decentralized).

Last, existing standards for both should be identified inside and outside an organisation for usage or further adoption.

5. Conclusion

As this article shows, glossary and taxonomy, which are important instruments of Terminology Management, are suitable for solving a wide range of terminological defects. By the illustration of three cases the article suggests that the issues that Terminology Management deals with are widespread, therefore the relevance of these instruments can be extended to all companies that share certain needs. The article proposes a procedure model for the introduction of these concepts and the cultivation of a corporate terminology.

Clearly-defined processes are an important aspect of overcoming typical problems when introducing Terminology Management in general. Yet, other means have to be defined to completely eliminate problems like the aspect of missing awareness and cost assignment. Furthermore, the question is whether certain types of companies in certain industry branches can achieve a greater benefit than others through Terminology Management.

There are at least three important aspects for further research. On one hand, it is important to determine how information technology can be enhanced and optimized in order to better support Terminology Management. On the other hand, the effect of a controlled vocabulary

on the creativity and innovation of employees needs to be explored, as it is not clear whether the regulation of terms used in corporate communication has any effect on these characteristics. Finally, the proof of performance, i.e. ROI considerations, of Terminology Management within the corporate setting is a challenge for future projects. Our future research will focus on how this can be accomplished with existing and future partners.

References

Ahmad, K., Davies, A., Fulford, H., Rogers, M. (1994). What is a term? The semi-automatic extraction of terms from text. In *Proceedings of the Translation Studies: An Interdiscipline (Selected Proceedings of the Vienna Conference)* (John Benjamins), p. 267-278, Amsterdam.

Alt, R., Puschmann, T., Reichmayr, C. (2000). Strategies for Business Networking, in: Österle, H., Fleisch, E., Alt, R. (2000). Business Networking: Shaping Enterprise Relationships on the Internet. Springer, Berlin etc., p. 95-116.

Bach, V., Österle, H., Vogler, P. (2000). Business Knowledge Management in der Praxis. Springer, Berlin.

Bailey, K.D. (1994). Typologies and taxonomies : an introduction to classification techniques. 3rd pr. Sage, Thousand Oaks.

BMWA, Bundesministerium für Wirtschaft und Arbeit (2002). Das internationale Aussenhandels-ABC. iXPOS - Das Aussenwirtschaftsportal. http://www.ixpos.de/frameset.htm?content=http://www.ixpos.de/kooperationen_und_gescha eftsformen/ausschreibungen/abc/abc.html?prevHome=1, 31.11.2002.

Brenner, W., Österle, H. (1986). Integration durch Synonymerkennung. Information Management, (1986), p. 9.

Buchan, R.L. (1994). Distinguishing between Terms and Meanings of Terms, in: Materials, A.S.f.T.a. (1994). Standardizing and Harmonizing Terminology: Theory and Practice. Philadelphia, p. 77-82.

Champe, T. (1996). The link between terminology management and document management in technical writing and translation, in: Wright, S.E., Budin, G. (1996). Handbook of Terminology Management. John Benjamins, Amsterdam/Philadelphia.

Dale, A. (2001). Designing Taxonomies at Unilever. Knowledge Management Review, Vol. 3 (2001) Issue 6, p. 30-34.

Davenport, T.H., Harris, J.G., Kohli, A.K. (2001). How Do They Know Their Customers So Well? MIT Sloan Management Review, Vol. 42 (2001) Issue 2, p. 63-73.

Davenport, T.H., Marchand, D. (2001). Is KM just good information management? Financial Times Limited, (2001) 04/25, p. 2.

DelphiGroup (1999). Corporate Portals: Portal Architecture, Delphi Group, Boston.

DMOZ (2002). The Open Directory Project, in: (2002). DMOZ.ORG, http://www.dmoz.org, 23.11.2002.

Felber, H., Budin, G. (1989). Terminologie in Theorie und Praxis. Gunter Narr Verlag, Tübingen.

Gaus, W., Leiner, F. (2000). Dokumentations- und Ordnungslehre. Springer, Heidelberg.

Gebert, H., Geib, M., Kolbe, L.M., Riempp, G. (2002). Towards Customer Knowledge Management – Integrating Customer Relationship Management and Knowledge Management concepts. In *Proceedings of the ICEB2002 conference proceedings*.

Gilchrist, A. (2001). Corporate taxonomies: report on a survey of current practice. Online Information Review, 25 (2001) 2, p. 94-103.

Gummesson, E. (2000). Qualitative methods in management research. Sage Publications India, London.

Gutzwiller, T. (1994). Das CC RIM-Referenzmodell für den Entwurf von betrieblichen, transaktionsorientierten Informationssystemen. Physica, Heidelberg.

Hagen, P. (2000). Must Search stink?, Forrester, http://www.forrester.com/ER/Research/Report/Excerpt/0,1338,9412,FF.html

Hoffmann, C.P., Gerbode, A., Hunziker, A., Klose, M., Pötzl, J. (1999). Logistics and Electronic Commerce - Potentiale für einen Logistics Service Provider im Bereich der Business Media, Institut für Medien und Kommunikationsmanagement, Universität St. Gallen, St. Gallen., http://www.informationobjects.ch/NetAcademy/naservice/publications.nsf/all_pk/1367

Koch, T. (2002). Controlled vocabularies, thesauri and classification systems available in the WWW. Lund University Libraries. http://www.lub.lu.se/metadata/subject-help.html

Kremer, S., Riempp, G. (2001). Babels Türme - Terminologiemanagement in B2E-Portalen. Computerwoche, 26 (2001) 30.06.2001, p. 59-60.

Latham, L. (2001). Web Content Management and Portals: Who's Doing What?, GartnerGroup, Stamford.

Logan, D. (2001). Understanding and Using Taxonomies, GartnerGroup, Stamford.

McDavid, D.W. (1996). Business language analysis for object-oriented information systems. IBM Systems Journal, Vol. 35 (1996) Issue 2, p. 128-150.

Moriarty, T. (1990). Are you ready for a Repository. Database Programming & Design, Vol. 3 (1990) Issue 3, p. 61-71.

Ortner, E. (1997). Methodenneutraler Fachentwurf: zu den Grundlagen anwendungsorientierter Informatik. B. G. Teubner Verlagsgesellschaft, Stuttgart, Leipzig.

Österle, H. (1995). Business in the Information Age: Heading for new Processes. Springer, Berlin et al.

Österle, H., Heym, M. (1993). Computer-aided Methodology Engineering. Information and Software Technology, 35 (1993) 6, p. 345-354.

Ottmann, B., West, M. (1995). Managing Shared Data. In *Proceedings of the Proceedings of the European Product Data Technology Days '95.*

Probst, G. (2001). Die Wissensbasierte Unternehmung, in: Thom, N., Zaugg, R.J. (2001). Excellence durch Personal- und Organisationsmanagement. Haupt, Bern et al., p. 251-268.

Rich, P. (1992). The Organizational Taxonomy: Definition and Design. Academy of Management Review, Vol. 17 (1992) Issue 4, p. 758-781.

SAP (2002). SAP Library. SAP. http://help.sap.com/saphelp_webas610/helpdata/en/35/2cd77bd7705394e10000009b387c12/frameset.htm

Symons, C.R., Tijsma, P. (1982). A Systematic and Practical Approach to the Definition of Data. The Computer Journal, Vol. 25 (1982) No. 4, p. 410-421.

Varian, H.R., Lyman, P. (2000). How much information?, http://www.sims.berkeley.edu/research/projects/how-much-info/index.html

Warzecha, A. (2001). B2E Best Practices: Picking the low-hanging fruit, Meta Group.

Wayne, E. (1991). Terminology Update: Words versus Terms: Is there a Difference? Standardization News, (1991) November 1991, p. 17.

Web/CKS (1999). Web Portals: Present & Future Positioning in the European Marketplace.

Whyte, W.F. (1991). Participatory Action Research. Sage Publications, Newbury Park etc.

YankeeGroup (2000). MyCorporatePortal: A New User Interface for the Extended Enterprise, Internet Computing Strategies, YankeeGroup.