Another chapter deals with the principles of database structuring, as well as with the embedment of an information system into its technical environment. A selection of the features of Hypertext and Internet is presented, as well as those of a few well known commercial databases.

Besides skill in searching, complete knowledge of the indexing policies in past and present is required in search (which can therefore hardly be accomplished in perfection by only casual database users).

The necessity of a well balanced division of the tasks between information science and informatics is emphasized. In particular, judgements and decisions must not be seen exclusively from the perspective of informatics. Much importance is also attached to close cooperation between the user and the information expert.

The book presents a promising philosophy and technology of database construction. It reflects the large practical experience of its author in handling operational databases, in particular of one with an integrated thesaurus. It offers a realistic impression of the complexity of the task of information supply.

The index provides sufficient access to the contents of the book and also to the terminology of information technology. The literature references could be a little more precise and include more citations.

In the outlook the expectation is expressed that in future the user might be able to solve all his information problems himself. This surprises because this would largely result in searching merely for the words assumed to occur in the texts of documents, an approach the deficiencies of which had convincingly been set forth earlier in the book.

A book of this size cannot constitute a genuine textbook on subject analysis and search. The topics of classification and indexing and of thesaurus construction would claim comprehensive books of their own if these subjects are to be dealt with exhaustively. But the book offers the basic knowledge necessary in evaluating databases in terms of their subscription, abandonment, continuation or establishment for operational use. The three or four hours necessary for the perusal of the book are a great gain for the less experienced in the field or those with a largely technological perspective of the field included. In its conciseness and clearness the book is highly recommended also for those who are responsible for management affairs in the information field.

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Galinski, Christian and Schmitz, Klaus-Dirk, Ed. (1996) **TKE 1996 - Terminology and Knowledge Engineering : Proceedings : Fourth International Congress on Terminology and Knowledge Engineering, Vienna, 26-28 August 1996.** Frankfurt: Indeks Verlag. viii, 464p. ISBN 3-88672-207-4.

The 51 papers contained in this volume provide a consolidation of the theme of the conference "Terminology and knowledge engineering". They are organized according to nine sub-themes.

The first of these sub-themes, "Terminology and philosophy of science" includes seven papers, each exploring different aspects of the sub-theme. Ahmad's paper presents an analysis of texts in nuclear physics and in the philosophy of science, arguing that the intext deconstruction and reconstruction of scientific reality, mainly through manipulating the terminology of a given specialty, plays an important role both in the genesis of science and in the genesis of the philosophy of science. The author also indicates that a study of 'terminology dynamic' can provide useful insight into the work of the scientists. De Beaugrande, in a paper on 'language for special purposes and terminology', presents some terse demonstrations of the fact that access to knowledge can be properly assessed only by exploring the whole discourse domain and not just a few of its well-behaved lexical, morphological, syntactic and semantic features and structures. Evolution of scientific terminology is very often determined by conscious human efforts to create new concepts, new terms and new conceptual relationships, eliminate existing concepts, reorganize concept systems etc. Budin includes terminology standardization and harmonization as an integral part of the overall process of terminological evolution in "Evolution of scientific terminologies". Benking discusses "concept and context mapping" as a means of achieving common frames of reference like the Information Coding and Classification System. An abstract of Mark Burgin's paper "Terminological and teleological systems" indicates that there can be terminological algebra and calculus providing deductive means for inference of relations between concepts in terminological systems. Alemasov et al., in their paper "On conceptions set of reacting systems thermodynamics" realize conceptions set by classes and objects of C+ + language from definitions and structure of conceptions set of reacting system thermodynamics. Shelov and others describe studies in terminology knowledge representation being undertaken at the Committee for Scientific Terminology in Fundamental Research, Russian Academy of Sciences (CST).

The second sub-theme, "Terminology on the information superhighway", is developed in five papers discussing the role of terminology in navigating

knowledge space in the world wide web (WWW). Schweighofer and Scheithauer, in "Legal terminology research in an Internet/WWW environment" describe KONTERM, the Terminology Research Internet Site that houses HTML pages representing the various meanings of important legal terms with links to matching descriptions in different languages aiding the users in translating phrases. The input to the system is a set of legal documents for each language, a thesaurus of important legal descriptors created by legal experts and a set of language specific context sensitive rules for finding typical phrases in order to get the various connotational meanings of these descriptors. Wallmannsberger's paper "From the infonauts' logbooks : participant observation models of navigating knowledge space" stresses the need for the study of and development of models of human computer interaction to guide the design of comprehensive information processing strategies. In "Terminology extraction from texts corpora : application to document keeping via Internet", Jacquin and Liscouet describe a prototype terminological extraction tool which sends requests (keywords) to an Internet retrieval text tool, retrieves the texts of interest, and processes them to give to the user the principal terms of the concerned texts. Cornelis van der Laan and others discuss "Accessing the terminology database of the Parliament of the European Community" using web browsers and suggest a 16-bit Unicode to represent characters to solve all problems of multilingual documents. Anita Nuopponen discusses terminological information and activities found on the Internet, citing about thirty important sites. She indicates that the web is an ideal platform for various kinds of terminological activities, playing the important role of an interactive collaborative communication tool in terminological research and terminographical projects.

The next section, "Terminology and language engineering", includes ten papers which discuss computer-based methods for terminology engineering and terminology management. Jorg Schutz describes the application of web technology in combination with AI to overcome the language barriers of an online multilingual technical information service in the automotive industry. Naulleau et al. describe the method used to assign semantic tags to term components of a nominal phrase in their paper "Tagging term components with semantic information". Mustafa-Elhadi and Jouis survey the capacity of natural language processing (NLP) systems to identify terms related to a specific field of knowledge and the logico-semantic relations they entertain. They also suggest some possibilities of evaluating NLP systems for terminology extraction and building as well as their application in information retrieval. Kageura et al. consider the validity of some quantitative characterizations of terminological elements in Japanese technical abstracts used in existing automatic term recognition and automatic indexing work, and argue for the necessity of a clearer and more integrated approach to the statistical modelling of terminology. Ulrich Heid et al. in "Term extraction with standard tools for corpus exploration - experience from German", describe tools that support the extraction of term candidates from German text in the field of automobile engineering, provide contextual information and build terminological glossaries. Nelson Verastegui presents a computational method for spelling error detection in terminological databases. Andre Le Meur and Loic Depecker describe BALNEO, an Internet-based French language terminological network database that can help make judicious choices particularly in the case of terminological normalization (term settling), harmonization (relating designations to concepts) and term translation. In "Engineering terminology : a case for a linguistically informed terminology database", Kurshid Ahmad et al. describe the tool box used in the TRANSTERM project which has corpus management tools and morpho-syntactic analysis tools, through the use of which it is possible to enrich and re-use terminology resources in a number of applications ranging from terminology management to information retrieval. Magner Brekke et al. describe how a computer-based corpus of texts can be of assistance to the terminology community, particularly for terminologists working in lesser-used living languages like Catalan, Danish, Dutch, Norwegian, Welsh etc., based on their experiments with Norwegian texts in both general and special languages. Tsuji and Kageura present an "Analysis of word structure of medical synonyms", concluding that the term which contains the cause of the disease is likely to dominate over other synonymous names.

The fourth sub-theme, "Terminology and knowledge data management", is developed in eight papers, the first of which, by Melby and Hardman, discusses inspection, adjustment and adoption, three important phases in importing terminology from multiple sources. They propose a blind version of MARTIF (Machine Readable Terminology Interchange Format, a SGML application) as an intermediary format for import. Gillam and Ahmad, in "Knowledge-engineered terminology databases", discuss issues related to representation of data associated with terms as frames and as semantic networks. Holmes-Higgin and Ahmad discuss data analysis and data modelling with reference to terminological data, and point out that simply using a relational database may not be enough; the authors show that an object-oriented term bank can be implemented as a layer on top of a relational database to provide all the benefits of object-oriented as well as knowledge-based databases in their paper "Is

your terminology in safe hands? : data analysis, data modelling and term banks". Felix Mayer's "The representation of inconsistent relationships in term banks" discusses clear and fuzzy equivalence, fuzzy synonymy and their representation. In "Concept structure of terminology and knowledge representation procedure", Shelov points out that the conceptual hierarchy established through the definitional system of the corresponding terms and concepts gives a very accurate and concise concept picture of the subject field and can be very easily made into a standard database. Aguilar-Amat et al. describe the structure of BACO, a terminological knowledge base built for translators in "Logical organization of information at BACO : a knowledge multilingual database for translation purposes". Fischer et al. describe "A modular, object-oriented and generic approach for building terminology maintenance systems" called Terminology Framework (TFw). TFw comprises an executable specification language for an object-oriented model of terminological dictionaries and thesauri. Wright discusses "Mapping local data categories to categories defined in ISO 12620" and presents examples of such mapping. Anzaldi et al. propose an interactive, semi-automatic approach to building up a thesaurus in their paper "Construction of a terminological interdisciplinary thesaurus"; their approach is based on the automatic extraction of terms from selected documents using grammatical and semantic text analysis and clustering via interactive analysis with the aid of an expert in the domain. Akemi Haruyama et al. describe the "Development of a multilingual indexing vocabulary based on a faceted thesaurus" in the field of occupational health. Ahmad and Salway discuss terminological issues in a para-disciplinary language, namely the "Language of Safety". They have identified elements that, although they appear denominative in their nominal syntactic form, have a dynamic aspect in that a part of their meaning is only determined by the domain in which they are applied. This is identified as one of the unique features of para-disciplinary languages. Patricia Plath discusses the "Links between terminology and documentation", both explicit and implicit. She suggests that the thesaurus represents a highway while alphabetical lists constitute side roads in the network of terminology and documentation.

Five papers dealing with terminological tools and knowledge representation for translation appear in the section "Terminology and translation". Walther von Hahn and Galja Angelova discuss the needs of translators, explain the formalisms and techniques applied for the representation of linguistic, conceptual and domain knowledge, and give details about the interaction of the internal system resources, the lexicon and the main user interface of the German- Bulgarian project DB-MAT. Masumi Narita et al., in a paper titled "Building a dictionary for word translation by digital copiers", describe "Tanyakuman", a language assistant that can provide Japanese equivalents for English words in a text. It consists of OCR, a language processor and layout controller; the language processor has a speech analyser, a dictionary look-up engine and an English-Japanese dictionary. The authors also discuss the effects of word translation on reading comprehension. Danielsson and Ridings describe "Terminology in parallel texts", a tool for students of translation, which includes sentences in a database. The corpus is accessible through MS Access. After their training, the students will be provided with a version of the term bank they have built up for further improvement. Terminological relativity issues emanating from changes in conceptual structures and structures of terminological systems at subject field level, doctrine level, culture level and language level are discussed by Faina Citkina. Principles of term formation are explained by Valentina Skujina who enunciates ten principles followed in preparing Informatics and Computer Sciences terminology in Latvian.

"Terminology and knowledge transfer", the next section, includes seven papers. The first one, by Peter Sandrini, discusses "Comparative analysis of legal terms" with special reference to the concept of equivalence, more specifically, relative equivalence. Eisek deals with "the ownership of words and knowledge" and explores the difference between user and owner. Galinsky and Picht discuss "graphic and other semiotic forms of knowledge representation in terminology management", indicating that non-verbal forms of representation are complementary to verbal forms of representation. Jordan-Weiss exposes the "problems, solutions and challenges of practical terminology work in South Africa" where, in addition to Afrikaans and English, nine languages have been bestowed official status. Parliamentary law and procedure has been described as a complex mosaic. Antia describes an on-going project on a terminological resource on the language of parliamentary discourse, presenting the need for the resource, the search nodes of the resource, the data architecture and the implementation. In her paper "Teaching terminology to economics students", Pozzi observes that teaching the language of macroeconomics to students who were not familiar with the subject helped them understand the underlying concepts better; these students obtained better results when they eventually took macroeconomics one semester later, suggesting that knowledge transfer was more efficient and perhaps more permanent with prior understanding of the terminology. An Iranian experiment in terminology work is presented by Reza Mansouri who explains

key items of the strategy adopted for the project; some of these key items are: (1) Never start terminological work in alphabetical order; (2) Terms to be considered should be for use in scientific and technical writing; (3) For a term under consideration, try first to find all other terms related to it; (4) The root of a word family could be borrowed from any language but it had to be used under the regulations of the Persian grammar; and so on. The project aims at producing a standardized bilingual dictionary of scientific terms.

The eighth sub-theme, "Terminology and knowledge in multimedia applications", is developed in three papers. Winiwarter et al., in "Multimodal natural language interfaces for hypermedia distance education", present a 'Japanese natural language interface' that includes search using context information. New questions by students are collected and grouped for each context on the basis of their semantic representation. After the question is answered by the teacher, it is added to the Frequently Asked Questions knowledge base so that future questions can be answered automatically. Frequency data about answered FAQ is also available and can be used for improvement of the teaching material. Cabre and Rojo, the authors of "Specialized knowledge representation toward a new hypertextual/multimedia proposal", discuss representation of the polyhedral nature of terminological data and indicate how hypertextual links would be more appropriate for such representation. They propose a 'Hyper Media Decision Net Terminology Model' which could be used to produce hypertextual terminology data bases and dictionaries. A "hypermedia project on the design of a telematic hypertextual dictionary" is described by Cabre et al. The procedural steps involved in the compilation of a LSP hypertextual dictionary of 'alternative renewable energies' in four languages (Catalan/Spanish/French/English) are presented. The dictionary is organized on the basis of conceptual maps and it would be made available on the WWW.

The last section, "Demonstration models for terminological knowledge engineering", includes two papers. In "The construction of English terminology on the semantic field of plastics", Pueyo and Solans show that, though much technical taxonomy work is a process of renaming an existing vernacular word, there is also a process of reordering the words into technical hierarchical taxonomies. The data are processed through an expert system which allows the user to choose a semantic field among the options presented and the system shows the possible languages (English, Spanish, German, French and Italian) the term can be translated into, as well as the definition of the chosen term. In the final paper, "Structure of an indexed multilingual on-line system for industrial use", Wingartz discusses the need, design and available standards for a system for use in industries. The author also stresses the need for a reference hierarchy as specified in ISO 13584 part 42 to be used across industries to structure the information.

This volume of proceedings is well organized, with a separate list of all the authors' names, addresses, and e-mail addresses. A three-column index provides easy access to specific topics, concepts and names. The physical get up and quality of the materials used are good. This will be a valuable document for all those interested in terminology and knowledge engineering work (terminologists, information professionals, librarians, classificationists, term bank designers, etc. It will constitute a useful addition to libraries and information centres.

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POLLANDT, Silke. **Fuzzy-Begriffe: Formale Begriffsanalyse unscharfer Daten** (Fuzzy concepts: Formal concept analysis of imprecise data). Berlin: Springer-Verlag, 1997. 146 p. ISBN 3-540-61335-8.

Silke Pollandt has written the first book combining two apparently totally different theories, namely Fuzzy Theory (introduced by L.A. Zadeh (1965)) and Formal Concept Analysis (introduced by R. Wille (1982)). This mathematically very precise treatment of imprecise data with sharp concepts is based on her doctoral thesis (Silke Umbreit: Formale Begriffsanalyse mit unscharfen Begriffen, Halle-Wittenberg 1995). The purpose is to develop a theory of fuzzy concepts based on the theory of L-Fuzzy sets and many-valued predicate logic. It is shown by several examples how to apply this theory in practice.

The first chapter contains basic notions in Formal Concept Analysis and L-Fuzzy sets. Here "L" denotes an arbitrary *L-Fuzzy algebra* in the sense of W. Wechler (The Concept of Fuzziness in Automata and Language Theory (1978)). The set of *L-Fuzzy sets on a set X* is as usual identified with L^X the set of all *(membership)* functions from X into L.

The second chapter on *(L-) Fuzzy contexts* generalizes the notion of a *formal context* (G,M,I) as defined in Formal Concept Analysis by replacing the incidence relation I by a Fuzzy relation R defined by its membership function $m_R : G'M \to L$. The value $m_R(g,m)$ is interpreted as the quasi truth value of the proposition "g has the attribute m". Using many-valued predicate logic these quasi truth values are used to introduce *fuzzy concepts* analogously to Formal