whether certain implications hold or whether a counter example exists. In the case of many-valued contexts, attribute dependencies, such as functional or ordinal dependencies, are investigated.

The third chapter describes parts of contexts and lattices. In this and the next two chapters the correspondence between lattices and contexts is essential. An operation or structure of a context is always analyzed with respect to how it can be recognized in the corresponding lattice, and vice versa. Subcontexts are substructures of contexts that are created by deleting rows and columns from a context. The lattice of a compatible subcontext is isomorphic to a factor lattice of the original lattice. The process of finding compatible subcontexts corresponds to finding complete congruence relations in lattices. Complete sublattices are substructures of lattices that correspond to certain subrelations of the object-attribute relation in the context. Tolerance relations in lattices are generalized congruence relations and correspond to block relations in contexts.

The fourth and fifth chapters describe decompositions and constructions of concept lattices, which facilitate splitting a complex lattice into simpler parts and composing a complex lattice from smaller lattices. A sub-direct decomposition represents a lattice as sublattice of a direct product of lattices. Atlas decompositions are constructed in analogy to a geographical atlas: a lattice is decomposed into small lattices (similar to maps in an atlas) whose indices form another lattice (similar to an index map in an atlas). Atlas decompositions use tolerance relations and can be utilized to improve the graphical representation of lattice diagrams. Other forms of decompositions use the substitution product and the tensor product.

The construction methods in chapter five are: the subdirect product of lattices which corresponds to fusion of contexts; gluing of lattices which is similar to atlas composition and composes lattices by gluing them together along common substructures; local doubling which is based on duplicating a convex subset of a lattice; and further tensorial constructions.

Chapter 6 characterizes the mathematical properties of concept lattices, such as distributivity, modularity and dimension. Some of these characteristics are in addition to the ones in traditional lattice theory because the inventory of formal concept analysis includes objects, attributes and relations such as the arrow relations defined in chapter one. At the end of the third section the implications among the mathematical properties are conveniently visualized in a lattice diagram. The discussion of different types of lattice dimensions includes an example of an application of the set dimension. The example shows how the digits of the seven-segment display, which is the display of digits often used by digital watches and old fashioned calculators, can be represented as a union of less than seven parts.

The last, seventh chapter discusses mappings (morphisms) among contexts. Scale measures are morphisms that facilitate a comparison between scales as to whether one scale is finer or coarser than the other. This is relevant for the process of scaling many-valued contexts into single-valued contexts as described in chapter two. The book ends with a discussion of concept-analytic measurement theory which is based on a process inverse to scaling: data given in a single-valued context is explained in terms of a many-valued context with appropriate scaling.

Overall the book is impressive. It demonstrates how an abstract notion of "concept" has been developed into a branch of applied mathematics by the two authors and with the help of numerous master's and Ph.D. theses over the past 20 years. Hopefully, the other two volumes announced in the preface will follow in the future.

Uta Priss

Dr. Uta Priss, School of Library and Information Science, Indiana University Bloomington, 10th & Jordan, Bloomington, IN 47405, e-mail: upriss@indiana.edu

ORTNER, von Erich. **Methodenneutraler Fachentwurf : Zu den Grundlagen einer anwendungsorientierten Informatik** [Method-neutral Engineering requirements : A contribution to the fundamentals of an application oriented computer science]. Teubner-Reihe Wirtschaftsinformatik, herausgegeben von Dieter Ehrenberg, Dietrich Seibt, Wolffried Stucky. Leipzig: B.G. Teubner Verlagsgesellschaft 1997. 196 p. ISBN 3-8154-2602-2.

Ortner's book presents a systematic process for programming application systems in the business environment. The author concentrates on the early phase of identifying and representing the needs of users and of the environment of application, the so-called engineering requirements.

Ortner characterizes the conventional methods of representation as method-specific engineering that should be replaced by a method-neutral one. To do so, he develops a language through a reconstruction of concepts from a domain discourse. In this language, the things, phenomena, activities and characteristics of the application may be expressed. This language will be called *material*, since it consists of a dictionary with standardized terms belonging to a subject field, and so-called structural words to express relationships and characteristics of (subject)-terms relationships.

The problem with engineering requirements is twofold. On the one hand, one has to represent application

situations and processes in such a way that they reflect the aims of the potential users and the needs of the subject domain. On the other hand, the result of the engineering requirements phase must be rigorously logical as they are to be processed by a computer. Usually, natural language is used in the analysis of an application and to express conditions and goals of the planned computer program. Doing so means dealing with ambiguities, incompleteness and inconsistencies.

Therefore, it is essential for the engineering requirements to represent the requirements of a planned software in a consistent and complete manner, showing no ambiguities. This may be done only by using an artificial language. This artificial language should be as close as possible to the natural language as it is used by users, so that there is no barrier of language and understanding. But this language must also meet formal requirements to allow for further processing and transforming into the final computer program.

The results of the requirements engineering are normally represented by diagrams (e.g. flowcharts, structograms, entity-relationship diagrams, etc.) The expressions formed by these diagrams are very limited and should be supported by a developer's workbench. One needs specific training in order to have the ability to model complex applications. Since any of these methods shows specific strength and weaknesses, the chosen tool will influence the process and the results of the planning phase. The newer analysis tools consider an application from different viewpoints, i.e. the data-oriented view, the functional view, the organizational view, etc.

By choosing the title *Methodenneutraler Fachentwurf*, Ortner claims that his method does not influence the results of engineering requirements in an unacceptable way. In addition, he believes that his method leads to a language for concept-construction that shows terms and syntactical rules close to the understanding of people working in the operational departments of a company. Personally, I think it necessary to do additional research and development of this method before a judgment can be made on its strength and weaknesses.

The book consists of five chapters. Chapter 1, „Informationsverarbeitung und Sprachkritik: Ein komplementärer Integrationsbereich für Benutzer, Management und Systeme", introduces the reader to the basics of how to construct concepts, and shows for demonstration purposes how enterprise data-modelling will be done. First, steps are undertaken in order to show how a material language (see above) may be developed. The subheading „Ein komplementärer Integrationsbereich für Benutzer, Management und Systeme" articulates the expected goal of the author. But, regarding the state of the development, it remains open to see if the integration of users, management and systems in a common standardized (material) language could happen.

Chapter 2 describes the research program KASPER (Konstanzer Sprachkritik-Programm für das Software-Engineering). In doing so, the author collects a list of tasks and requirements. The reader is not informed of how these requirements are met. Therefore, the reader will remain unclear as to which problems will be encountered and what the effort needed to solve them will be.

Chapter 3, „Aufbau einer methodenneutralen Konstruktionssprache für Informationssysteme" shows the development of a material language close to the application. Ortner differentiates between events/conditions, occurrences/situations, things, relationships, components, characteristics, etc., and he offers the relationships „kind of" and „part of" to establish a semantic network for representation of the application domain. In addition to these semantic relationships, he needs a dictionary with standardized terms as well as a grammar, which offers suited predicates to combine terms to expressions.

The examples shown here (translated from German) are simple:

„Mueller is a collaborator
--
-- having the PERS.No 4711,
--
-- and acting as 'programmer'
--
-- ...".

These examples do not quite show the reader how far this method reaches. Besides the possibility to assure or to negate properties to subjects, one would be interested in knowing how and to what extent more complex situations could be expressed: for example, the synchronization of two or more tasks (one task before or after the other, three days before end of first task), event-control situations („if the order comes in, then..."), consideration of management goals and preferences.

Chapter 4 is devoted to a special theme. The author deals with the conceptual and linguistic aspects of „abstraction" and „composition". „Abstraction" means generalization of a given set of objects to a new object by not considering a distinguishing characteristic, whereas „composition" is the opposite of the part-of relationship. Different concepts are combined to form a new concept through this process of composition. For example, the concept „order-item" is generated by composition from the concept „article" and the characteristic „quantity", the concept „order" by composition from „customer", „date" and sequence of „order-item".

Chapter 5 shows the relevant literature relating to comparable linguistic-oriented approaches for the construction of information systems. The author classifies the literature as emphasizing the empiric-analytic, empiric-experimental and constructive methods.

The book can be read without great difficulty. It offers interesting elements to those who are looking for language-oriented methods. This work is based on earlier work by Lorenzen, Wedekind and the author himself, and as such it documents well the state of the art. As already mentioned however, the book shows as well that at this time a final conclusion on how far the language-based approach will reach cannot yet be made. If, and to what degree, the proposed method is suited as a „methodenneutraler Fachentwurf" remains open for discussion.

Anybody who is responsible for software development and looking for a new tool to ease the task will be disappointed. Software developers are clearly not the best audience for this book which addresses rather very scientific goals.

Hans Czap

Prof. Dr. Hans Czap, Universitaet Trier, Lehrstuhl fuer B W L/Wirtschaftsinformatik, 54286 Trier, Germany, e-mail: cz@wiinfo.uni-trier.de

PREDIGER, Susanne. **Kontextuelle Urteilslogik mit Begriffsgraphen. : Ein Beitrag zur Restrukturierung der mathematischen Logik** [Contextual Judgment Logic with Concept Graphs : A Contribution to a Restructuring of Mathematical Logic]. Aachen, Germany : Shaker Verlag, 1998. 106 p. ISBN 3-8265-3969-9.

This dissertation contributes convincingly to the foundations of "Contextual Logic" by developing a syntax and semantics of a contextual judgment logic. It is exceptional how comprehensively the theme of the dissertation is treated: from a broad discussion of the philosophical and historical background to a profound elaboration of the mathematical foundations including basic completeness theorems.

The recent development of "Contextual Logic" at Darmstadt University of Technology was brought about by problems which have occurred in using methods and procedures based on predicate logic in computer-aided knowledge processing. A main reason for those problems lies in Frege's conception of logic. G. Frege abandoned the traditional understanding of logic which, by Kant's lectures on logic, is based on the three main functions of human thinking: concepts, judgments, and conclusions. Frege concentrated on the question about the truth of propositions for gaining a certain foundation of mathematics by a mechanistically designed calculus of logic. Although this research program failed in its central aim, Frege's conception of logic still dominates. The traditional understanding of logic as the doctrine of the forms of thinking, oriented to questions concerning knowledge and reason, has only survived in some parts of philosophy.

"Contextual Logic" is based on a language- and reality-oriented approach of mathematizing the traditional philosophical logic. As a source for the mathematization, Formal Concept Analysis is used for formalizing the doctrine of concepts, and Sowa's Theory of Conceptual Graphs for formalizing the doctrine of judgment and conclusion. The foundation on formal contexts, for which the connection of the extensional and the intensional view is constitutive, is the basis for "Contextual Logic".

In Chapter 1 (Part I) of the dissertation, the conception of "Restructuring" mathematical logic is explained as it has been developed in the department of mathematics of Darmstadt University of Technology since 1978. Starting from H. von Hentig's claim to restructure humanities and sciences so that they become better learnable, accessible, and criticizable in public, the role of mathematics in our society is discussed in the scope of basic ideas of pragmatic philosophy. Based on this, purposes and effects of mathematical logic are described for clarifying how far the developments of mathematical logic depend on the aims which they are supposed to fulfil. It is made clear that the aim of supporting human argumentation and, in particular, knowledge processing suggests a mathematization of the traditional philosophical logic. This yields the argument for a restructuring of mathematical logic by mathematizing the philosophical doctrines of concepts, judgements, and conclusions.

Chapter 2 discusses why it happened that the paradigm of logic changed from the understanding of a doctrine concerning the forms of thinking to that of a mechanistic calculus for proving truthness. Surprisingly, this question has only insufficiently been treated up to now by researchers of the history of mathematics and logic. Thus, it is a special achievement of the dissertation to make the process of change understandable by a substantial presentation of the relevant historical developments of mathematical logic. The decisive move was indeed Frege's change to a new aim of logic, namely the goal of establishing a logical foundation for mathematics (which led to the narrow semantics of truthness). In this way, logic became more and more separated from the common language which is one of the main reasons why procedures of predicate logic are of quite limited use in knowledge processing. In making this clear also historically, the turn back to the traditional philosophical logic becomes even more convincing if this leads to a better support of knowledge processing.

In Chapter 3 (Part II), a syntax and semantics for "simple judgments" are developed based on Formal Concept Analysis as a mathematical theory of concepts. Thereby, the simple conceptual graphs (which J. Sowa