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Conceptual Modeling

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Preface

The International Conference on Conceptual Modeling (ER) is the leading global forum for current research on conceptual modeling (CM) and trendsetting CM applications. The topics of interest span the entire spectrum of CM: theoretical and ontological foundation, methods and tools for developing and communicating conceptual models and meta models, techniques for transforming conceptual models into effective implementations, and the impact of CM techniques on databases, business strategies, and information systems development. The ER conference series has been held at a variety of superb locations, rotating in successive years between Europe, the Asia-Pacific region, and the Americas, and attracting an international community of scholars.

This volume contains the research and technical papers comprising the main program of ER 2017 in its 36th conference edition held during November 6–9, 2017, in the beautiful city of Valencia, Spain. More than 450 researchers from all over the world followed our call for papers and submitted 153 papers about their latest research results. Each paper was carefully reviewed by at least three members of the Program Committee, which consisted of renowned scientists from more than 40 nations. Finally, 28 papers, i.e., about 18%, were selected as full papers to be presented at the conference and to be included in this volume. An additional 10 submissions were accepted as short papers. The quality of these 38 papers is a tribute to the authors and also to the reviewers who guided any necessary improvements.

Focal points of these papers are: (1) CM and ontologies in the context of requirements analysis, business processes, and other domains; (2) foundations of CM, for example, regarding multi-level modeling; (3) CM methodology with a broad spectrum of innovative answers to interesting research questions; (4) ontologies; and (5) model efficiency.

This volume would not have materialized without the support of many people. First, we are very grateful to all the authors for their continuous commitment and intensive work. Second, we would like to thank the Program Committee members and additional reviewers for providing timely and in-depth assessments. Furthermore, we thank all the people and sponsors who helped in the organization of ER 2017. Without all that effort there would have been no substance for this volume and no success for ER 2017. Last but not least, we are greatly indebted to the five invited speakers, Prof. Lois Delcambre (USA), Prof. Josef Mitterer (Austria), Prof. Antoni Olivé (Spain), Francisco Garcia-Moran (Spain), and Prof. Yair Wand (Canada), for accepting our invitation to address this conference.

September 2017

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Conceptual Modeling? When We are Awash in Information?

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Abstract. We challenge the traditional who/what/why of conceptual modeling of information in a world where structured data is ubiquitous.

Who (defines conceptual models?) Analysts? Developers? Ontology specialists? All of the above. But non-traditional users such as scientists, journalists, educators, and almost anyone with data to share are being empowered to define their own information with easy to use data storage and web management systems.

What (is being modeled?) A database as part of an information system or software system? Information that supports a business process? Definitely. But some users define their structured information directly – for display and processing.

Why (is a conceptual model defined?) To describe information and processing of an information system or a software system? To promote collaboration and communication? To increase understanding of a domain? To document a system? Certainly. But let's consider the goals of people who define and publish their own structured information directly; perhaps we can use a conceptual model to offer them useful functionality for their information (e.g., for browsing, mapping, calculations).

We suggest that domain users are doing conceptual modeling. And we believe that they can relate their conceptual model to a domain model when they are enticed by sophisticated information widgets that can select, display, and process their information. We also highlight a problem that has been present since conceptual models (or database schemas) were first created: information of interest to a user might be present in the "data" (such as "Oregon" being part of someone's address) or in the "schema" such as "Oregon" or "California" being attribute names (for a sport fishing registry). Finally, we show that users (who understand their own information) can perform schema integration, including complex operations such as pivot and unpivot, when guided with examples (of the widgets) using sample data.

Conceptual Modeling: Philosophical Considerations

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Abstract. The underlying philosophies of Conceptual Modeling vary between Critical Realism and Ontological Constructivism and fit into the philosophical panorama: *There are distinctions and therefore we make them* (Realism) — *We make distinctions and therefore they are* (Idealism/Constructivism).

The presupposition of dichotomies between language and world, description and object, between what we talk and what we talk about, helps to freeze, dogmatize and fundamentalize the *status quo* into a "real" world and "its" representations.

Claims of representing the real world remain irrelevant as long as consensus prevails. When conflicts arise, the world and other potential decision criteria in a beyond of discourse stay mute: the criteria fail and the opposing parties get into a stalemate… In a recent conversation the ontologist Barry Smith said on how he would deal with competing ontologies: "I try to win."

Proposing an alternative philosophy of change requires a shift in the vocabulary and in the direction of discourse: Instead of advocating a dichotomy between a fixed/independent world and privileged representations, a philosophy of change favors relations between *so far* and *from now on*. The object of a description relates to the description of the object like the description *so far* to the description *from now on*. Every description of the object changes the object into a new object of further descriptions.

Philosophical ontologists try to transcend the "here and now" into the past and future. I opt for transparence rather than transcendence. The world, the reality is nothing but the present state of things.

IT Professionals and Conceptual Modeling

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Abstract. IT professionals, explicitly or implicitly, develop conceptual models when trying to produce a high level description of the fundamental principles and the main functionalities of the "systems" (understood in the most general way: Enterprise Architecture, Infrastructure Blueprints, Information Systems, Database Systems, etc.) they want to implement. They do it because they want

1. enhance the understanding of the "users",
2. facilitate the dialogue among system's stakeholders,
3. provide system designers with an input to produce system specifications at different levels, and
4. document the system for future reference and collaboration activities.

There are several relevant questions to IT practitioners about the use of conceptual modelling that the author will try to cover in his presentation on his more than 40 years of professional experience in the public sector as well as his conversations with hundreds of IT professionals in the public and private sectors:

1. Why "conceptual modeling" is considered by many IT professionals as "too theoretical" or "too heavy"?
2. Which are the barriers and facilitators for its more formal adoption?
3. Is there a contradiction between "being agile" (for instance using agile development methodologies like Scrum) and the formal use of conceptual models?
4. What can be done about it?

The author will try to illustrate the answer to some of the above mentioned questions based on the results on an informal survey filled in by many of his contacts in public and private sectors.

Classification and Science

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Abstract. Classifying phenomena is deeply intertwined with cognition and human information processing. Therefore, identifying classes is a central aspect of information technology (IT). Choosing a "good" set of classes is both theoretically and practically important. Two cognitive principles underlie the cognitive approach to classification. First, classes encapsulate inferences about the properties of their instances – in other words, knowing a category can "tell" us more about an instance that required to identify the category it belongs to. Second, collections of classes should provide economy of storage. This leads to a view of classes as carriers of domain knowledge in the form of inferences about situations, which is more than "containers" for information.

We discuss how this view can be used to model scientific theories. We explain how the principles can be used to guide the choice of collections of classes. We show how the approach can be used in scientific discourse by applying it to one of the most well-known areas of physics – the electromagnetic equations as developed originally by Maxwell. The example shows how the classification based approach can be generally applied to scientific problems and that it has two advantages. First, it can provide a simpler and more informative account of the sample phenomena. Second, the classification principles can lead to questions to be asked to help resolve differences between observations and predictions. This means that the resolution of problems can be framed in terms of changes to classification structures, and to principles suggesting how such changes might occur.

Contents

Conceptual Modeling and Requirements

Foundations