

# Preface

Computing as a discipline is maturing rapidly. However, with maturity can come a plethora of subdisciplines, which, as time progresses, can become isolationist. Within the broad remit of software engineering have emerged the subdisciplines of modelling, metamodeling, ontologies and modelling languages to support a more disciplined approach to software development. Many of the ideas are argued in words; here, we collect together mathematical ideas that either already do underpin modelling or will do so in the near future. In particular, we seek a mathematical underpinning that will provide a solid link between ideas in these various subdisciplines.

Introducing set theory as a consistent underlying formalism, we show how a coherent framework can be developed that clearly links these four, previously separate, areas of software engineering. In particular, we show how the incorporation of a foundational ontology can be beneficial in resolving a number of controversial issues in conceptual modelling, especially with regard to the perceived differences between linguistic metamodeling and ontological metamodeling. We also suggest that the focus on the model–metamodel ‘instantiation’ linkage, common in the mindset of those using standards produced by the Object Management Group, could be replaced by a model-modelling language linkage. In other words, a shift in thinking from ‘a model is an instance of a metamodel’ or, more accurately, ‘a model conforms to a metamodel’ to one where the metamodel’s role is secondary to that of the modelling language. Ideally, that modelling language should have an ontological basis, which is where the foundational ontology provides concepts such as sortals, rigidity and identity that are typically not present in today’s (object-oriented) modelling languages could provide a next generation of modelling languages that are less easily open to misuse and abuse. Finally, consideration of domain-specific modelling languages is also included in this mathematical analysis of models, metamodels, ontologies and modelling languages.

Although I take responsibility for the contents of this book, I should acknowledge some personal influences on this work from my collaborators, in particular Drs. Cesar Gonzalez-Perez, Giancarlo Guizzardi and Owen Eriksson and Professors Graham Low and Pär Ågerfalk.

Lastly, I wish to thank Cesar Gonzalez-Perez, Stijn Hoppenbrouwers, Owen Eriksson and Graham Low for comments on the first draft of the manuscript for this book. This is contribution 12/05 of the Centre for Object Technology Applications and Research within the Human Centred Technology Design research centre at the University of Technology, Sydney. This research was supported by the Australian Research Council under grant DP0878172.

On the Mathematics of Modelling, Metamodelling,  
Ontologies and Modelling Languages

Henderson-Sellers, B.

2012, IX, 106 p. 98 illus., Softcover

ISBN: 978-3-642-29824-0