

# Different kinds of modelling – illustrated

**Jordaan, G.D. & Lategan, L.O.K. 2010. Modelling as research methodology.** Bloemfontein: Sun Press. 159 p. Price: R150,00.  
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In the preface of this book, the editors state the purpose of their book as follows: “This book is a modest attempt at introducing the basic principles of modelling and its associated practices, as well as illustrating this research technique by means of a few practical examples of use in a variety of disciplines”. This is further explained by the first editor in Chapter 1:

Even though modelling inevitably facilitates a better understanding of the expected functional characteristics of a real-life system, many researchers still do not use these research techniques optimally in the study of phenomena that could be modelled successfully. For a long period there was a tendency to use mathematical modelling predominantly for the study of engineering-related problems. Fortunately, this is no longer the

case, and it is increasingly being used to model phenomena that occur in other natural sciences disciplines, as well as in the human and economic sciences.

In carrying out their implied intention of introducing and illustrating the ideas of modelling over the spectrum of the sciences and humanities, the editors brought together thirteen authors who contributed to the writing of twelve different chapters. In the end, the book covers topics mainly from engineering and the natural sciences, except for one chapter concerning human and economic sciences.

One gathers that the intended readership for the book are those who are interested in modelling as a research tool, but then only at a very general level. This is not intended to be a systematic text on the construction and manipulation of models. The chapters are quite independent and there does not seem to be a step by step progression from chapter to chapter. The absence of an alphabetical index is a pity, because an index could help draw together the different chapters.

The book is divided into two sections. The first is titled "General principles of modelling" and contains seven chapters, while the second contains five chapters under the heading "Examples of the uses of modelling". Each chapter contains a short list of references to the relevant literature.

Chapter 1 is introductory and is titled "Principles of modelling in research and design". It introduces mathematical modelling, physical modelling and the advantages of modelling. There are three more general chapters on models for science (chapter 2), mathematical modelling in human and economic sciences (chapter 3), and mathematical modelling as a research methodology (chapter 5). As can be expected from the overlap in the titles of these chapters, there is indeed considerable overlap in their content with respect to definitions and use of the different kinds of modelling, but each chapter has a different flavour corresponding to the specific interest of the author(s) of the chapter. Chapters 4 and 6 are more directed toward engineering, referring to a so-called mega-tronic design process and also to physical modelling of terrains and structures. Chapter 7 is on acquisition of data and the accompanying role of computers.

Each chapter in section 2 discusses an example of modelling. The following topics are covered: design of rubber tires, performance of industrial freezers, human-environment dynamics, neural network modelling, and lastly, modelling in research.

As stated above, the reader should not expect to find a thorough step by step development of modelling in this book. Rather, it contains a broad overview of different kinds of modelling and illustrative examples. Unfortunately the mathematical equations presented in several of the chapters seem to appear from nowhere and there is no explanation of the meaning of the different mathematical symbols and the significance of the expressions. To learn more about these, the reader will presumably need to go back to the literature listed. A similar comment applies to several of the diagrams presented, some of them very complicated, with little or no explanation of their meaning and their coherence. This also applies to some of the written material, which is often presented in a very condensed way, such as the discussion of the types of models in chapter 2, paragraph 3, which merely provides lists of terms with little or no explanation of their meaning. There are unfortunate repetitions from chapter to chapter, for example the often repeated definition of what is meant by a mathematical model. Although one can understand that, in a book with a limited scope, many topics will have to be omitted; one misses a better treatment of statistical and probabilistic models.

On a more philosophical level, one feels that a discussion of what is meant by scientific methodology and the related role of models is lacking, although operational aspects are referred to here and there. The important question of the relationship between models and theories gets no attention, although there is substantial literature about this. Even in a more practically oriented book such as we have here, this could provide a valuable contextual perspective.

In conclusion, the book may be recommended to those who have a broad interest in modelling in research, who would like to get acquainted with some of the main related concepts and encounter some examples of applications. This is in line with the intention of the editors to provide a “modest” introduction to the area. Readers who require a more thorough and step by step guide will have to look elsewhere.