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Book review

Principles of Forecasting. A Handbook for Researchers and Practitioners
J. Scott Armstrong. Kluwer Academic Publishers, Norwell, MA, USA, 2001, xii and 849 pages. ISBN 0-7923-7930-6 (Hardbound); US$190.

This book is a welcome and timely addition to the literature of the science of forecasting and, more broadly, to the field of management education and practice. Its value lies not only in the fact that it is a valuable addition to a manager's or decision-maker's library, but that it deals with a hitherto neglected scientific field — that of treating the future as a consequence of human decisions in the present. The following statement, taken from the first chapter (Introduction), reflects the basic idea of the whole book: "The purpose of this book is to summarize knowledge of forecasting as a set of principles. These 'principles' represent *advice, guidelines, prescriptions, condition–action statements, and rules*" (italic added).

The book is the most recent achievement of the International Series in Operations Research and Management Science, a Kluwer series edited by Frederick Hillier of Stanford University. In the Preface, Armstrong tells us that the idea of the handbook arose in the middle of 1996, after a suggestion by Hillier to write a comprehensive book on forecasting to include in this series. To realize this book project, Armstrong called on the contributions of 39 coauthors, the choices based on their prior experience and research in this field. The result is a carefully well-written book, with abundant tables and graphics (*exhibits* in the text), a thorough set of references at the end of each chapter, and a 57-page dictionary, from *Acceleration* to *X-12-ARIMA decomposition*, the first attempt, as far as I know, to compile a Forecasting Dictionary. Moreover, the book is handsomely produced and edited, with a beautiful and durable hardcover, and coherent texts throughout, despite being written by many different authors.

Armstrong's *Principles of Forecasting* is divided into 20 chapters, which represent a collection of 31 articles written by 40 authors, with 10 of them written by Armstrong himself (two as coauthor). Each article was peer reviewed by some of the other authors and by the 123 outside reviewers (a list of these reviewers is presented at the end of the book). As a primer on the attempt of collecting a so broad range of actual expertise in the field of forecasting, Armstrong did an admirable job. Polite applause to Professor Armstrong and his coauthors and editors team.

But there is a very serious drawback. "Technological forecasting" is a term absent in Armstrong's Forecasting Dictionary and not considered in the whole book! As I understand the approach suggested by Armstrong, the set of "principles" to be followed for the practice of forecasting operates at a meta-systemic level, that is, so we do not need to consider the realm of the system to be predicted. In this way, *advice*, *guidelines*, *prescriptions*, *condition–*

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action statements, and *rules* are what a decision-maker or a manager must use in making good decisions and in suggesting better actions and they do not need to consider the technological involvement in the process. The "principles" are of a very broad and general nature: mathematical procedures and judgmental subjectivism are overriding in choosing the methodology. Technology seems to be marginal in this book. At best, we can find some "principles" underlying the diffusion process of innovations. But in the whole book, the only mention to technology is a subchapter of the Chapter 18 (Applications of Principles), a notable exception authored by Nigel Meade and Towidul Islam with the title "Forecasting the Diffusion of Innovations: Implications for Time-Series Extrapolation."

Has Fernand Braudel exaggerated when he wrote that "the whole of the history of mankind is the result of technology"? Were Makridakis and Wheelwright [1] wrong when they classified forecasting methods into three groups — quantitative, judgmental, and technological? Where are the many powerful forecasting tools developed since the 1960s by many hardcore scientists in the field of technological forecasting? Environmental scanning, trend impact, cross-impact analysis, impact assessment, technology sequence, relevance trees, normative forecasting, simulation gaming, futures wheel, Fisher–Pry method, etc.. . .are terms we cannot find either in the Forecasting Dictionary or in the text. A possible argument in response to these concerns is that the book is not on methodology, but on "principles." However, have not these concepts (and his authors) contributed to finding "principles" of forecasting during the last three decades? It has been forgotten that the Delphi technique came into existence in the late 1950s as the result of the questioning of RAND thinkers primarily dealing with the military potential of *future technology* and its influence on potential political issues.

Armstrong, in the Introduction (Chapter 1), informs that the book is supported by the Forecasting Principles website at http://hops.wharton.upenn.edu/forecast, which was originally established to allow for communication among the handbook's authors, but so efficiently designed that it became a source of continuing information and discussion on the science of forecasting. At the heading of this website we read: "The goal of the Forecasting Principles site is to summarize all useful knowledge about forecasting so that it can be used by researchers, practitioners, and educators. This knowledge is provided as principles (guidelines, prescription, rules, conditions, action statements, or advice) about what to do in given situations." The same absence of the technological involvement permeates the entire website. It is curious to observe in this website, for example, in the link to Journals/Articles, Bibliographies for Researchers, an annotated and rated (* to ****) list of 500 references to forecasting literature to 1978. In this list, we can find just four references dealing with Technological Forecasting, two books rated with ** (by Robert Ayres [2] and a seminal book of Erich Jantsch [3]) and two rated with * (marginal). One of these marginal contributions is Joseph Martino's 1972 book [4]. The comments attached to these references speak for themselves: Martino's book is dismissed with the comment "this is a too long (750 pp.) book," and about Ayres' book we are told, "if you want to read something about technological forecasting, this is one of the best." The message is clear: technological forecasting is just a field of application, and if you want to be acquainted with this field go to a reasonable and short text and not to a thick book!

Armstrong says that the principles apply to *management*, *operations research*, and the *social sciences*. But really apply to forecast what? Are econometric or judgmental time-series alive per se, excusing attention on the substratum they come into existence and upon which they evolve? Could meteorology be a science that just establishes principles on how to look to or how to extrapolate temperature and pressure time-series? Where is the role of technology on social and economic development? Can a manager or a decision-maker at a leading position in a company think in the future if he does not consider technology as his most powerful tool and the central factor of productivity of his business? Companies invest in technologies with expectation of financial returns, savings, and profits. National governments become interested in mastering some critical technologies, and subsidize their development, with expectation of gaining international economic and political advantage. Assessments are also made of technology's impact on society under an assumption that technology is essentially an endogenous component of the socioeconomic system and that needs to be controlled by human users. Humans are the agents and technology is the medium. The framework revealed in the *Principles of Forecasting* resembles that of looking for the ether in a Michelson–Morley experiment.

Another caveat must be uttered, and is related to the aspect of uncertainty in forecasting, a topic covered by two articles worth reading included in Chapter 15 (Assessing Uncertainty). One is of a pure mathematical–statistical nature and covers the topic of PIs (prediction intervals) for time-series forecasting, signed by Chris Charfield, and the second deals with overconfidence in judgmental forecasting, signed by Hal Arkes. Armstrong states well in the introductory chapter that "decision makers need forecasts only if there is uncertainty about the future," but reduces significantly the field of application of the principles when stating in the introductory lines of Chapter 15 that "uncertainty arises because assumption about relationships might not hold over the forecast horizon." This is not the only source of uncertainty, and formal procedures are of very little help to people in assessing uncertainty. A touch of modernity could be brought to this discussion including a chapter on chaos and nonlinear modeling, a theme that deserves more interest of economists and social scientists. Some concrete principles already exist for dealing with chaotic systems in the socioeconomic realm, as well as to differentiate pure random systems from chaotic systems.

As a final remark, I would like to point out a paragraph Armstrong wrote in the Preface, commenting on the huge amount of work and energy consumed in editing the book. We read: "Can I thank the Internet? I marvel that edited books appeared before the Internet. It is not feasible to conduct such a joint undertaking without it. It allowed us to see each other's work and enabled me to send thousands of messages to contributors and reviewers. Many thousands. Try to do that without the Internet." It sounds somehow paradoxical to find this emphatic appreciation of a technology enunciated in a book where technology is given such minimal attention.

I guess that all readers of this Journal are very well acquainted with the pervasive aspect of the Internet in our everyday life. The Internet represents undoubtedly the best example of a synergistic cooperation of many different technologies and much technical knowledge converging to a final product that changed dramatically our way of doing things. How could we predict this radical change in the late 1960s when Lawrence Roberts began to develop the

ARPANET? I doubt that the business-biased view emanating from the principles could be of any help here.

References

[1] S. Makridakis, S.C. Wheelwright, Forecasting Methods for Management, Wiley, New York, 1989.
[2] R.U. Ayres, Technological Forecasting and Long Range Planning, McGraw-Hill, New York, 1969.
[3] E. Jantsch, Technological Forecasting in Perspective, OECD, Paris, 1967.
[4] J.P. Martino, Technological Forecasting for Decision Making, Elsevier, New York, 1972 (third and last edition in 1993 by McGraw-Hill, New York).

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