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REVIEWS AND OVERVIEWS

J. Morecroft, Strategic Modelling and Business Dynamics. A Feedback Systems Approach

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Edoardo Mollona

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Before reviewing the book, a few words on the cultural terrain that is in the background of Morecroft's work may help the reader to appropriately position this contribution. John Morecroft is a leading figure in the System Dynamic community. System Dynamic (SD) is a discipline that includes a repertoire of modelling principles and simulation techniques to analyse the behaviour of complex social systems. Originated by the work of John Forrester at MIT, SD is the *science of feedback behaviour in social systems* (Forrester 1968a, p. 400) and, more specifically, *the study of information-feedback characteristics of industrial activity* (Forrester 1961, p. 13). At the gist of the approach is the analysis of how the emerging behaviour of an organisation is produced by the organisation's structure, this latter described by a set of information feedback loops, flows of materials, people and financial resources, and delays in decision-making. At its outset, the approach has generated enthusiasm, critical comments (Ansoff and Slevin 1968) and negative reaction (Nordhaus 1973). Recently, in strategy and organisational studies, which represent the original scene within which SD developed, the discipline has been employed, for example, as a theory testing environment by Sastry (1997), who analysed the Tushman and Romanelli theory of punctuated change (1985), and Gary (2005), who explored theories of corporate diversification. Within the SD field, John Morecroft has elaborated his intellectual production maintaining a firm hold in the strategic management literature. I will here mention at least three of his lines of work, which represent rock-hard bridges between SD and strategic management. A first line of work is connected to the exploration of the intellectual proximity between the studies developed at the Carnegie University on organisational behaviour (Cyert and March, 1963) and SD (Morecroft 1983). The use of simulation models as supports for strategy making (Morecroft 1984) represents a second line of work while the third point of contact between SD and

E. Mollona (✉)
Department of Computer Science, University of Bologna, Bologna, Italy
e-mail: emollona@cs.unibo.it

strategic management is the investigation of the conceptual bonds that link the resource-based view of the firm, (Wernerfelt 1984; Barney 1986; Dierickx and Cool 1989; Peteraf 1993) and SD (Morecroft 1999, 2002).

Coming to the content of the book, in this work, Morecroft associates the focus on business and corporate strategy with problems and models, which can be defined *classics* in the SD literature. As a result of such association, readers are both given tools to cope with dynamic complexity and are introduced to the motives, themes and issues that constitute the cultural *milieu* to which SD modellers refer. The book is organized around the presentation of models that are associated to specific issues and are connected to simulation software contained in a CD attached to the book. Thus, the reader is provided with the possibility to test policies by simulating models to have hands-on experience in problem-solving.

In the first chapter, for example, to stimulate curiosity for SD modelling approach, Morecroft let readers to immediately face the problem of limits of systems' growth and of the management of renewable resources. In particular, the problems of governing sustainable fishery are presented and a flight simulator is illustrated that allows experiencing the difficulties in fine-tuning a community toward efficient fishing policies. The result is that, at the end of the chapter, the reader has been exposed to issues that are at the core of the cultural background of the SD community and has been given the opportunity to experience the use of modelling and simulation for problem solving.

In the second chapter, Morecroft escorts readers in the journey from linear and event-based thinking to system thinking by providing an introduction to the concept of feedback, which is fundamental in the SD approach to the analysis of social systems' behaviour. In the chapter, Morecroft explains how to create and to use a causal loop diagram, that is, a set of symbols to conceptualise problem issues in terms of feedback loops among variables.

The third chapter introduces the reader to the symbolic language and the logic to describe flow and stock variables, being these latter key concepts to explain dynamics of feedback systems. The role of stock in accumulating results of past processes of resource accumulation and erosion is explained with examples such diverse as the growth of faculty size in universities, the activity of a large international radio broadcaster and the policies to control drug-related crimes.

Following, in the fourth chapter, the complex dynamics potentially emerging from the interaction of local decision-making is described. In the chapter, the problems of competition among different areas of an organization in accumulating resources is metaphorically represented, and studied, with a simulation model that reproduces the interaction between two showers. By playing with the available software, a reader is able to experience the quandaries and surprising consequences of integrating local decision-makers that have to share resources.

In the fifth chapter, Morecroft addresses the modelling of cyclical dynamics describing human resource management processes. In the sixth and seventh chapters, the issue of business growth is explored. In particular, in the sixth chapter the focus is on the growth that is pull by the diffusion of a successful product while the seventh chapter depicts dynamics of growth driven by endogenous acceleration of resource accumulation. Both chapters impinge upon the analysis of well known

SD models, the Bass model of diffusion (1969) and the Forrester's growth model driven by capital investment (Forrester 1968b).

In the eighth chapter, the focus shifts from business to industry. The chapter reports an analysis of global oil market. The analysis stems from a project developed with the planning team at Royal Dutch/Shell and aimed at capturing the causes underpinning the puzzling dynamics of oil prices. In the chapter, the author reports the processes of problem articulation and model building. After the description of model structure, Morecroft goes along with the reader navigating such structure and elucidates the logic of scenario analysis by using the simulation model available in the attached CD.

In the ninth chapter, Morecroft presents three simulation models. The first model is Urban Dynamics, a famous model built by Forrester (1969) to address the relationships between housing policies and the path of development of cities. The second model investigates the implications of EU labour policies on working patterns within the National Health Service in Britain. Finally, Morecroft revisits the fishery model, which was introduced in the first chapter, to deepen the exploration of regulatory policies in fishing communities. While presenting these three models, the author takes the opportunity to show how SD modelling and simulation have been used to address issues in public policy and to describe model articulation and development processes.

The tenth chapter, finally, deals with the very subtle issue of SD model validation. The issue is very sensitive since from its beginning, SD approach has often been criticised for lack of rigorous testing of model structure and parameters (Nordhaus 1973). Typically, the reply that SD community gave to such remark is rooted in a pragmatic view of science according to which models are validated to the extent that modellers are able to build confidence around their models' usefulness to address and solve specific problems. Within this tradition, Morecroft describes SD models as models for learning rather than models to forecast future states of the world, and proposes a view of validation as a rigorous process to extract the knowledge hold by decision-makers and to capture this knowledge within a model. Thus, empirical tests of parameters give ways to techniques aimed at eliciting knowledge from people. In this light, a key message that the book conveys is that simulation models play a crucial role in facilitating dialectics and dialogue among actors involved in managerial decision making processes (Morecroft 1984, p. 217).

To conclude, a merit of Morecroft's book is to respond to concerns typically raised by scholars and professionals that approach SD. These concerns deal with the cost-benefits and applicability of SD as a management practice *that requires people well versed in a specific modelling technique* (Ansoff and Slevin 1968). To explain SD modelling practice, Morecroft uses a style that captures the attention of the reader by first introducing at front a specific problem issue and, then, articulating in a friendly and transparent way the modelling process. While keeping the technicalities of language at the bear necessary minimum, Morecroft associates the qualitative presentation of a problem with the description of the reasoning that leads to the formulation of equations suitable to feed a simulation model. In most of the cases, the simulation model is captured in software (which is made available in a CD attached to the book) and the reader is then able to experience the surprise and

unexpected consequences of implementing policies in complex dynamics social systems. In addition, the accuracy with which Morecroft describes the process of problem articulation and representation highlights the importance of the qualitative phase of modelling to trigger learning and create insight by the means of a process that entails eliciting, questioning and eventually modifying mental models of decision-makers. In this respect, the book of Morecroft provides grounds to Ansoff and Slevin notation that SD appears to have *therapeutic effect on the managers, forcing them to crystallize decision making processes and to order their thoughts according to a systematic, information feedback model* (1968, p. 393).

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Author Biography

Edoardo Mollona graduated in Strategic Management at Bocconi University in Milan (Italy) and received a PhD degree in Strategic Management and Decision Sciences at the London Business School. He is currently associate professor in the Faculty of Mathematical, Physical and Natural Sciences at the

University of Bologna where he teaches Business Economics and Dynamics of Complex Organisations. His research interests focus on the application of modeling and simulation techniques to strategic management and organizational theory. In particular, Edoardo Mollona conducts research on the evolution and strategic change in large organizations, and on the changing nature of firms in knowledge-based economic contexts.