

loops coexist simultaneously at all levels of scale. Crisis leads to renewal and there can be no yin without a yang. This realization suggests that the strategic introduction of crisis into an organization may be absolutely essential if the organization is to reach higher levels of organization.

I congratulate David Hurst for a thought-provoking and innovative discourse through a world alien to me. My previous view of business as that monolithic parasite of society has greatly changed, and I now see that nature, whether physical, biological, or socioeconomic, is all the same. Same as it ever was.

JAMES A. DRAKE

## *Knowledge Assets*

*Securing Competitive Advantage in the Information Economy*

*Max Boisot (Oxford University Press, 1998)*

By now, anyone reading this review knows that the Information Age is upon us, and that developing and utilizing knowledge well have become increasingly important to the success of firms. But what are knowledge assets anyway? How should we think about them? And how can firms benefit from a better understanding of the answers to these questions? Max Boisot tackles all of these issues, in a provocative book that ranges from Piaget to dominant designs to complex systems. Boisot devotes much of the book to theoretical, almost philosophical, discussion that is not for the faint of heart. He concludes with two company examples of the way in which the more concrete aspects of his analysis can be used to improve the management of knowledge for competitive advantage. Given the scope of this book, I will not attempt to give a standard sort of book summary that often comprises a large portion of a book review. Instead, I will discuss aspects of the book that I found particularly interesting or thought provoking.

The book contains some significant departures from current thinking, one of the most striking of which occurs in Chapter 2 (following an introductory chapter). Boisot proposes that we completely rethink production functions in economics, as follows. He claims not only that the standard textbook tradeoff between capital and labor is obsolete, but also that

newer formulations that add knowledge as a factor of production are also incorrect. Instead, he proposes a production function that consists of a tradeoff between physical factors and “data,” where data are the inputs on which information and knowledge are based. This is a very different and interesting way of thinking about microeconomics. Boisot also builds on this idea to incorporate ideas about complexity and learning through time, as organizations learn to reduce the needs for both data and physical factors in a production process.

He then moves on in Chapter 3 to distinguish three dimensions of what he calls an information space (I-space): abstract–concrete, undiffused–diffused, and codified–uncodified. Of particular interest to readers here, he then locates complex regimes (as opposed to ordered or chaotic regimes) in this information space. Boisot uses his information space—a cube, diagrammatically—throughout the rest of the book. Although it takes a bit of getting used to, the cube works well to summarize in one picture much of what we know about the various dimensions of knowledge.

In Chapter 7, Boisot provides a very useful set of questions that companies should ask themselves with regard to the development and usage of knowledge assets, along the three information dimensions of the information space. Tables 7.1 through 7.6 articulate these questions for various stages of the knowledge-management process, beginning with scanning of products, technologies, and the organization, and ending with the eventual impact of this process on products, technologies, and the organization.

Then in Chapter 8, Boisot deals with the implications of his analysis for the competences of an organization. He tempts us with a short discussion of core competences as complex adaptive systems, with particular reference to Stewart Kauffman’s NK model, providing food for thought for others interested in these ideas.

For someone who studies firms, one of the most interesting parts of the book is Chapter 10, where Boisot gives two detailed case examples of the way in which companies have applied his information-space framework to strategic analysis of their businesses. Here the book becomes much less theoretical and much more practical. One of the case examples involves British Petroleum, which is well known for its leadership in knowledge management. Using the dimensions of the information space combined with explicit mapping of how the organization links its knowledge assets, British Petroleum learned that its stated knowledge-management strategy in oil exploration was in fact at odds with what the

organization was doing. This led to a reassessment and redrawing of the knowledge-management strategy.

Part of what Boisot's book points out is the difficulty of managing in a complex world—and in complex systems—where data, information, and knowledge are not only critical, but changing. He brings in many factors for us to consider, including the nature and rate of learning, the relationship of people to the physical environment, and the role of information technology. There is more than enough for any reader in this book.

CONSTANCE E. HELFAT

*I*s there a student of management anywhere—practitioner or academic—who is not yet convinced that we live in an information age and are part of a knowledge economy? Or who is not yet intrigued by the power and novelty of some of the conceptual constituents of this new economy: intellectual capital, intangible assets, tacitness, appropriability? Yet is there one who fully appreciates how all these new concepts will yield a single new reality, encompassing a new theory of the firm, strategic imperatives, and management practices?

Max Boisot's *Knowledge Assets* attempts, with some significant success, to provide a single analytic framework that can encompass the economic, strategic and managerial implications of knowledge-based competition. The book opens with a foray into the history of economics and production functions. It ends with specific examples of how Boisot's ideas have been used by firms. In between, it explores typologies of learning (as distinct from knowledge), culture as a knowledge-transmission mechanism, and knowledge itself. Boisot does not put all our knowledge questions to rest, but he ties many of them tidily together. He has set a high standard for what any serious theory of knowledge management will have to cover and what it will have to achieve.

The thoughtful trip that Boisot offers his readers is perhaps as valuable as his model. He is a clear, stimulating writer with an exceptional talent for rich, rigorous examples. He is conversant with a startling breadth of material. The reader comes to appreciate familiar knowledge-related concepts more fully through Boisot's rich exposition and examples: codification as viewed through analogies to paleoanthropology, mammography and tomato grading; culture through the lenses of just-in-time production, Staffordshire porcelains and Chinese subcontractors;

economic lessons drawn across different types of economic system (e.g., socialist vs capitalist) rather than just across firms or industries. Even if you do not accept Boisot's conclusions, you will be glad to have explored his program. He has written an excellent book to think with.

As the backbone of his analytic framework, he offers a three-dimensional "I-space" or information space, on which he maps existing and potential states of knowledge. Those who are not yet familiar with the I-space and its associated "social learning cycle" from Boisot's previous work may be surprised to find them at once theoretically compelling and also practical for thinking about strategy and about how to manage. Boisot first uses the I-space to convey what he calls the paradox of knowledge creation: the more abstract, codified and widely shared a piece of knowledge is, the greater its potential to create value, but the less scarce and private (i.e., appropriable) it is. Conversely, the more concrete, uncoded and undiffused, the greater the chance that the generating firm can keep the value it creates, but the opportunities to create value will be more limited. He argues convincingly that tradeoffs between scarcity and utility will be a significant challenge for knowledge-based strategy and management and so an important arena for complexity inquiry.

Boisot also uses the I-space to address potential organizational arrangements (i.e., bureaucracy, market, clan and fief) for managing particular types of knowledge assets and to explore learning and its relationships with knowledge and management. Learning causes knowledge to move between sectors of the I-space. Through the I-space framework, questions about learning are linked to neoclassical vs Schumpeterian economics and to Kuhnian revolutions in paradigms. For example, if you are operating essentially within a paradigm (i.e., in a neoclassical world), you are likely to have more to gain by hoarding than by sharing knowledge. If your competitive environment lends itself to paradigm shifts and overturning of established advantages (i.e., a Schumpeterian environment), sharing may yield greater potential value. Management theorists and complexity models will also be interested to note that Boisot's model implies multilinear, multifinal learning paths. Since each actor integrates new knowledge into their own frames and systems of sense making, a single piece of knowledge may move actors in any number of different directions.

Lest practitioners dismay that they are on their own with Boisot's theories and frameworks, the book ends with some extended examples that illustrate its practicality and power. Several instances are described in which

firms have used the I-space to assess the appropriability of knowledge assets, to determine which assets to share and which to hoard, and to diagnose mismatches between knowledge assets and management practices.

When Boisot errs, it is in implying a bit too much power for his model. For example, he asserts repeatedly that nonlinear models can be developed to fit his knowledge-based constructs. Since he offers no technical development, however, it is still an assumption that these constructs can indeed be modeled rigorously without compromising constraints or confining assumptions. Also, he makes more than passing claims that information economics will save us all from resource depletion and environmental degradation, though the support he offers is rather superficial, especially in comparison to the careful exposition and sound argument offered in most of the rest of the book. These are small quibbles with an intelligent book.

*Knowledge Assets* is smart and stimulating. It is also clear and systematic. It is a refreshing addition to a literature that has sometimes been too loose, fractured, and anecdotal. The preface and introduction both try to reassure skittish managers that this unconventional book is worth the effort. It is certainly less direct and facile than most books aimed at practitioners. It does not serve up pure application. In this, the style is indeed a bit academic; but I mean academic, as the comedians might say, in the nicest possible way. Boisot enables readers to think deeply and for themselves. In a radically new economy, where the roadmaps are all largely untried, Boisot offers precisely what managers need most: rich, theoretically grounded understanding.

JACQUELINE R. MESZAROS

*Leading at the Edge of Chaos*  
How to create the Nimble Organization

Daryl R. Conner (John Wiley, 1998)

I loved and hated this book. As Daryl Conner makes absolutely clear at the start, it is a book written for leaders. It raises the spectre of “chaos” and then, in a detailed and erudite exposition, provides the “best” way to beat back the frontiers of darkness. It sucks the reader