but collectively do not quite come to grips with the question of whether the described reworking of the world is part of a continuum, or a transformation unique to our own particular present.

Rather, the volume consistently raises these key questions: is there a paradigmatic shift, embedded in new technologies, toward a new world organisational trajectory; and, what are the shaping forces and cultural imperatives for organisational outcomes? These questions have a decided Bourdieuian ring to them and by their sheer complexity, present a daunting challenge. As Marceau points out:

The shapes of productive organisations will continue to be influenced and constrained by cultural factors, by greater or lesser degrees of technological advancement, lag or superiority, by differing local, national and international inter-organisational patterns in the distribution of power, including the relative power of capital and labour, and by the activities of public instances, including states, regional and local governments (p. 465).

Ultimately these questions remain to be answered, but *Reworking the World*, provides plenty of food for thought.

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Management of Technological Change: Context and Case Studies *edited by Gerhard Rosegger* (Elsevier Advanced Technology, Oxford, 1991) pp. 190, ISBN 1856170764.

The complexity of the innovation process suggests that inter-disciplinary approaches could be a fruitful track towards its potential understanding. This excellent collection of representatives interdisciplinary papers from the journal *Technovation* is illustrative. The book is presented in three sections - the first deals with some broad aspects of the process of technological change; the second covers issues in the management of technology, primarily at the firm level; while the third section provides some interestng case studies.

Papers in Section I illustrate and support the view that technology is endogenous within the socio-economic system. Rothwell and Wissema explicity examine the role of socio-cultural and institutional factors in the innovation process, and draw some conclusions for the role of government in shaping institutions conducive to innovation. In their view, the phenoma of technological discontinuities are said to arise because mutually reinforcing technological clusters take time to mesh. Ayres' paper takes up the theme of technological life cycles and discontinuities from a different angle. He argues that technological discontinuities arise from discontinuities in the laws of nature which in turn create barriers to technical progress as well as opportunities for major breakthroughs. These two papers thus present an interesting contrast between social and physical scientists' perspectives on the same phenomenon.

De Gregori's paper attacks the limits to growth hypotheses based on natural resource constraints by arguing that resources are defined by the existing state of knowledge. This paper was written in 1985. Since then, global concerns over resource constraints may be fading, to be replaced by growing concern over the capacity of the planetary ecosystem to cope with the massive changes wrought by 20th century industrialisation such as large in-

creases in the carbon dioxide content of the atmosphere, depletion of oxygen generating forests, explosion of the human population at the expense of other species, and damage to the ozone layer.

In contrast to the broad and global issues tackled in Section I, Section II of the book focuses on management aspects of innovation within the firm. Souder contrasts classical and modern management philosophies in his investigation of the role of organisational design in innovation. He concludes, one would suggest rightly, that successful innovation requires appropriate organisational forms. Gold investigates the evaluation of a new technology's economic potential, while Fischmeister, who like Ayres, is another physical scientist, explores how the organisation can break out of a routine approach to engineering design. Holt looks at the important role of the user in the innovation process and explores useful ways to forge links between users and producers of new innovations. Alic provides an overview of inter-firm cooperation in R&D in the US, Japan and Europe and concludes that participating firms need to keep a clear eye on their own internal R&D efforts as well as their proprietary rights. Written in 1990, this paper downplays the importance of technological cooperation in the US context. However, with the recent explosion of technology-based strategic alliances among firms in the information technology and rapidly converging digital video communication areas, perhaps the author's view on this issue would now be somewhat different.

Section II reveals a traditional view of innovation as uniquely something involving R&D that happens in the manufacturing sector. This ignores innovation in the service sector which often occurs via the adoption of information technology and its subsequent adaptation to produce new products and services. To be fair, this critiism cannot be applied to this book as a whole. The case studies in Section III include two examples of service sector innovations. Voss looks at a particular software development to illustrate the issue of simultaneous invention, while Mayne illustrates how information technology has affected the competitive structure of the US banking and finance sector.

Rothwell and Gardiner's paper in Section III looks at the case of the development of the hovercraft to demonstrate: the changing role of the user in innovation, the gap that often exists between technical and commercial feasibility, and the role of public institutions in facilitating development and diffusion. Innovations rarely emerge in static, crystalline form. Instead the process is one of evolutionary development. Rosegger illustrated this with the case of a new steel making technique. Finally, Schwartz investigates bottlenecks to economic development in less developed countries.

Although this book is about information – technology being defined as knowledge applied in production – it is regrettable that none of the papers take an explicit information theoretic (or information economics) view of the innovation process. Such a view could enhance understanding, as well as have implications for the management of technological change.

Proofreading errors are confined to a few in the reference section of some of the papers. Overall, a collection to be recommended for the growing number of technology management programs in business and engineering schools, as well as for courses in the economics of technological change.

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