differentiated in the following direction: while working towards the solution of global problems, act locally by using locally accepted people, measures and technologies, etc. Theoretical first-best solutions from the outside are not necessarily the best ones.

However, the development of technology tends to define leading nations which have a larger influence on a global scale. This is shown by Buttsworth taking account of historical examples. Countries which are running at the forefront of technology development (be it in gunpowder in the middle ages, in the steam machine in the 18th century or information technology and data processing today) tend to take a dominant position also for economic and social development worldwide.

Altogether, 'Local Matters' is a very interesting collection of papers which contains a number of different focal points surrounding the topic of globalisation. However, it would have been preferable not to limit the authors to such short length of 2–6 pages. Some of them do not get the chance to outline their research properly and completely and in some cases there is a lack of clarity about the topics remaining with the reader. Thus, there should either be a limited number of papers or (rather) a larger book.

Notes and References

1. Bruce Kogut & Udo Zander, 'Knowledge of the firm and the evolutionary theory of the multinational corporation', *Journal of International Business Studies*, 24, 4, 1993, pp. 625–645.

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The Shaping of Automation: A Historical Analysis of the Interaction Between Technology and Organization 1950–1985

Dirk de Wit

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As its title indicates, this book traces the history of automation in the office, or 'automated data processing' as it was commonly called in the 1950s and 1960s, over the period from 1950 to 1985—specifically within three Dutch business organizations: the postal and telephone authority, the Giro bank (until 1986 a part of the former organization), and an insurance company. Under a central theme of 'organization and technology intertwined', it focuses on the dynamic interaction between technological development and organisational change: 'computer systems development is a result of the process of interaction between manufacturers and customers. This work focuses on the dual roles of organization and technology, mutually shaping and being shaped by each other' (p. 39). In order to investigate this interaction, de Wit uses an explicit 'heuristic framework' which serves multiple functions: '... as an aid to structure the search and order of the historical material; as a tool to compare the actions and reactions of the various organizations; and to provide description and explanation' (p. 41). It is an approach which is avowedly historical and interdisciplinary.

De Wit's framework derives from the social shaping, or constructionist, approaches to the study of technology which emerged in the 1980s[1] and which were inspired by

1970s developments in the sociology of scientific knowledge.[2] A central tenet of these approaches is that:

> ... no knowledge possesses absolute warrant, whether from logic, experiment, or practice. There are always grounds for challenging any knowledge claim. But not all knowledge is challenged, nor is all challenge successful or even credible. Why some knowledge claims are challenged, and why some challenges succeed and some fail, thus become interesting empirical questions. Central to the answers are matters of interests, goals, traditions, and experiences of the social groups (technological and other) involved; of the conventions surrounding technological testing; and of the relative prestige and credibility of different links in the network of knowledge.... *Technological knowledge, in other words, is social through and through* (my italics).[3]

De Wit pursues this theme by drawing on and synthesising the three main streams that have formed the core of the constructionist perspective: the actor-network approach, the systems approach, and the social construction of technology ('Scot') model. Taking the organization as the primary unit of analysis, de Wit's analytical model (adapted largely from that of Constant[4]) has three main elements, each consisting of changing constellations of social groups: the technological community, the technological system, and the organization. His analysis depicts computer system development as a process of interaction among these elements. By focusing on the intersection between these elements, as they dynamically interact over time, he is able to gain a greater understanding of the relationships through which the development and application of the technology is socially shaped:

> Historical analysis enables the dynamic relationship between organization and the social shaping of technology to be captured. By combining the Scot model and the notions of technological community, technological system and organization one can trace how economic, social and cultural aspects are intertwined in the introduction and development of computer systems. (p. 62)

This is a dynamic model which elucidates how, in different eras, different combinations of social groups and their interrelationships shape the technology. For example, in the period 1950 to 1965 the technological community consisted of only two main actors, a small number of university researchers and a newly born computer industry, both of which engaged in R&D contributing to the body of knowledge on this new technology. By the final time period traversed by the book, 1975–1985, this community had expanded through specialization to include the electronics industry, software companies, and a dedicated group of academics in computer science departments. As this community changed, so also did the actors in the other two elements of the model, including the emergence of a new heterogeneous social group within the client organizations, the 'user'. De Wit uses this framework to show how, through the interactions between the different social groups involved, the organization in each of the case studies shaped the technological system.

This is a detailed account of what has been a major 'technological revolution' in virtually all economies. Similar such studies would be Donald Mackenzie's historical sociology of nuclear missile guidance systems[5] and Stuart Blume's analysis of technological change within medicine.[6] By providing rich case study data on what goes on inside the 'black box' of technology development, it is a useful antidote to any persistent notions of technological determinism. Although as 'end users' we often experience the development of computers as something of a Juggernaut which seems to be only slightly influenced by 'user needs'!

This book should be of interest to anyone engaged in research on technology (from

whatever perspective). It is a model for research methodology within the social sciences, and it is a source of valuable teaching material for those delivering courses on the social studies of science and technology. However, I do have some reservations about the book's appeal to a wider audience. Its origins appear to be in de Wit's PhD dissertation (submitted at Erasmus University, Rotterdam), and as in nearly all such texts the language is used to construct an academically credible argument—one that is credible to a community of scholars from which the external examiners are drawn—and not to engage an interested reader. This leads to a dense and somewhat stilted formal style, lacking in the rhetorical flourishes which leaven the prose. The sprinkling of well-reproduced archival photographs helps, but is not enough. So, while the book has considerable academic interest, I did not find it to be much fun to read.

Notes and References

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3. Donald Mackenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, MIT Press, Cambridge, MA, 1990.
4. Edward A. Constant II, 'The social locus of technological practice, community, system or organization?' in Bijker, Hughes & Pinch *op. cit.*, Ref. 1, pp. 223–242.
5. Mackenzie, *op. cit.*, Ref. 3.
6. Stuart S. Blume, *Insight and Industry: On the Dynamics of Technological Change in Medicine*, MIT Press, Cambridge, MA, 1992.

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Managers and Innovation: Strategies for a Biotechnology

John Howells

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The aim of this book is to examine the management of technical innovation. The issue is tackled through a case study of a specific biotechnology, single cell protein (SCP) innovation, within companies in Western Europe: a process that Howells believes is probably the first manifestation of biotechnology. The data were collected from interviews with managers of 18 Western European companies, all of which were investigating the technology and developing products for market from the 1960s.

Case studies of this type provide a qualitative view of innovation, detailing the underlying processes in a way that is not possible with aggregated, quantitative data.[1] In the past this approach has been used, for example, to analyse the relative strengths of 'science push' and 'market pull' in innovative companies. Howells, however, concentrates on the impact of individuals in this process: intra-firm technological choices, company politics and interpersonal relationships, versus the external firm environment of consumer acceptance and the economics of competing products. This allows him to extend the discussion beyond the one-dimensional push-pull framework to develop a more