policy but in the name of truth. They are symptoms of that scientific and technological ***hubris*** which threatens to subvert the meaning of human purpose in the post-industrial world.

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Information Economics and Policy in the United States *by Michael R. Rubin* (Libraries Unlimited, Littleton, Colorado, USA, 1983), pp. xiv + 335, $US35.00. ISBN: 0-87287-378-1

Information economics might appear to be of recent origin because it was officially recognised by the American Economic Association in 1976 by award of a category in the Association's Classification System for Articles and Abstracts. Such an interpretation of its history fits the popular but erroneous view that information economics is simply a reflection of the spectacular advent of intelligent electronics with its greatly enhanced capacities for communication, computation, and control. The view is erroneous because all societies have been information societies and have employed information technologies. What has been changing in response not only to computers and satellites but also to recognition of the deficiencies of economic theory and failures of government and business policies, is the role assigned to information in economic analysis. Greater concern with the present and its problems rather than long-run equilibrium has led to information activities being seen as cause of disequilibrium and means to equilibrium; as endogenous rather than exogenous. This shift of emphasis has been most obvious in the case of technology, which is perhaps the most important and potentially beneficial kind of information.

A decade ago those interested in information matters still emphasised the need to incorporate a role for information in economic models because of its bearing upon market performance. Pioneers like Jacob Marschak and Fritz Machlup had already done much to shape the pattern of development of information economics. Marschak had initiated true theoretical work and established a link with the study of organisation as an information-handling decision system. Machlup had provided a detailed statistical account of information activities. The radical thought that is only now emerging with increasing clarity is that organisational change as well as technological change is fundamentally important and can be analysed in economic terms.

Information and the information-handling mechanisms we call organisations are now to be treated as resources. But it seems that generations will have passed before the full implications are understood. Put in the simplest terms possible, organisation is now to be a variable, as the product was made a variable in the exciting days of imperfect and monopolistic competition theory. There can be great advantages in co-operating with others in information-handling, i.e. forming an organisation. This calls for creation of information channels, the building up of a stock of information, and the

creation of an 'organisation' language that may limit access to non-members. The technical characteristics of these resources have two major implications: first, random events can have considerable importance; and, secondly, the more successful the pursuit of efficiency, the more rigid and unresponsive the organisation may become. This line of thought leads to an understanding that decision-makers may become locked into their information systems just as easily as into stocks of other kinds of capital, such as buildings and machines. Organisational obsolescence is in this way given an economic rationale.

The subject matter of information economics is, of course, neither more nor less than that of economics itself, because all decision-makers, except those in microeconomic textbooks, are involved in choosing which information to acquire and use. Even rational expectations theory must recognise that there is a wide range of procedures that economic actors use to cope with uncertainty. When circumstances dictate that reliance upon those procedures is important, as in dynamic conditions, the theorist is once more in need of a theory of the decision-making process and obliged to address the role of information.

Michael Rubin's book, which was selected as a publication by the US Council for World Communication Year 1983, emphasises the convergence of computer and telecommunications technology and brings together a number of studies which examine, in terms of the recently developed approaches to information economics and information policy, the effects and implications of the accelerating development and diffusion of information technology. Information technology is considered initially in a broad context of technological innovation and social change. The second chapter entitled 'The economics of information' sets the pattern. A short introduction is followed by excerpts from significant publication, relating, in this case, to measuring the information sector, telematics and new growth, and selected roles of information goods and services in the US economy, e.g., international trade in such goods and services, employment trends, and the relative price changes for information and other goods and services. Subsequent chapters deal with transborder data flows, government participation in the market place, managing scientific and technical information, technological innovation as a source of market power, personal privacy and national information policy.

Rubin is an attorney currently with the US Department of Commerce and has served as Special Assistant for Information Policy to the Deputy Assistant Secretary of Commerce for Science and Technology. He was co-author with Mark Porat of *The Information Economy* published by the US Government Printing Office in 1977. As the title of his book indicates, he looks at the US experience and problems and therefore selected the great majority of the excerpts from US sources. His other interest is policy and this is the strength of the volume. He recognises the diversity of governmental functions, ranging from licensing of radio stations to the resolution of international tensions on matters like transborder data flows, that fall under the broad category of information policy. The excerpts are intended to illustrate several viewpoints that span "a spectrum of governmental philosophies from complete centralization to the suggestion that government structure is, if not irrelevant, at least secondary to the need for informed policymakers" (p. 313).

It is to be hoped that this very useful book will prompt other authors to bring together such material on other countries and to embark on comparative studies. Those who feel the need for more comprehensive treatment of the

theoretical aspects can now turn to Fritz Machlup, *Knowledge: Its Creation, Distribution, and Economic Significance, Vol. III, The Economics of Information and Human Capital* published in 1984 by Princeton University Press.

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The Trouble with Technology — Explorations in the Process of Technological Change *edited by Stuart Macdonald, D. McL. Lamberton and Thomas Mandeville*
(Frances Pinter, London and St. Martins Press, New York, 1983) pp. xii + 224, $40.50. ISBN: 0-86187-285-1.

One of the great contrasts within the discipline of economics is that between the awareness of the central importance of technological change to the evolution of economic systems and the difficulty with which theoretical structures struggle with the evolutionary forces of knowledge and its application.

The contributions to this volume certainly highlight this tension and, taken together, they suggest promising lines of investigation. What is clearly needed is a good base camp, from which scholarly enquiry can set forth along promising routes. To the establishment of such a starting point this set of essays may justly be said to contribute. The work is arranged around four themes — conceptual problems, theoretical dilemmas, diffusion and technology transfer, and employment and policy, but these headings do not do full justice to the subtlety of the ensuing arguments. In the space of a brief review it is impossible and inappropriate to comment in detail on each paper so it is best to identify central themes and relate them to specific contributions.

It is useful to begin with the theme of technology as knowledge, as distinct from technology as artefact and machine, for here we recognise the difficulties of treating the production and dissemination of ideas on a footing with the production and distribution of material goods. Lamberton's essay skilfully highlights this issue, and Macdonald takes this as his starting point for a critique of the linear innovation and diffusion model. The problem he identifies is that innovation and diffusion are not separable, sequential phenomena. The innovation which is diffused is rarely a fixed package of ideas, but rather a developing body of technological principle, evolving under the pressure of the diffusion environment and the rivalry from competing technologies. Stoneman's paper is a valuable review of existing diffusion literature, which is beginning to come to terms with the evolutionary viewpoint, while Gold provides a strongly argued case for extending the scope of diffusion research. He argues that the population of potential adopters is not static, that it develops with the advance of technology, and that a key to diffusion research is how different organisations come to hold divergent views