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Book reviews

Kumiko Miyazaki, *Building Competencies in the Firm: Lessons from Japanese and European Optoelectronics* (Macmillan, Basingstoke, 1995), 205 pp., £42.50, ISBN: 0333 616731.

In the 1970s and early 1980s, there was considerable interest in the process of accumulation of technological capabilities in the newly industrializing countries. Among the most influential scholars we can mention Alice Amsden, Jorge Katz, Sanjaya Lall and Larry Westphal who were all working in the field of development economics.

Oddly enough, we had to wait until the end of the 1980s before we found an equally strong interest among scholars in the fields of economics of innovation and management of technology/business strategy to unravel the mysteries of that process. The emergence of evolutionary economics and the related resource-based school in business strategy created the analytical base for exploring the process of building competencies in firms.

These two schools constitute the base for Kumiko Miyazaki's exciting and useful study of that process in a set of Japanese and European firms. The study focuses on optoelectronics, a new generic technology with an extremely broad range of applications, with the main purpose of providing an empirical analysis of the dynamics of technological competence building at the level of the firm. The firms are large actors in the area of communications, computers, defence electronics and consumer electronics and include NEC, Hitachi, Sony, Siemens, GEC and Philips.

The focus on an empirical analysis is very useful as scholars from all three traditions mentioned above have grappled with how to measure competence, including the evolution of competence in firms. It is also the empirical part which most catches the attention of the reader. It is very carefully done, using bibliometrics, patents and self-evaluation as indicators of competence. Miyazaki reveals an unusual sensitivity to methodological issues relating to many facets of her empirical work. In particular, one is struck by her insistence on the danger of using only one method for assessing the competence of firms and that there is no simple procedure available. Herein lies one of the main strengths of the book.

Another clear source of strength of the work is Miyazaki's detailed knowledge of optoelectronics. The mapping of the competence base of the 11 firms is done at a very detailed level, dividing the field into 11 subfields, such as semiconductor lasers and liquid crystal displays. Indeed, the whole design of the study presupposes a prior heavy investment in learning the specifics of the technology and this, I would argue, needs to be done much more frequently if we are to see a substantial progress in understanding the process of competence building.

This is perhaps of special importance to the literature in business strategy which for some obscure reason is conceptually and empirically underdeveloped in the area of technological entry barriers. Miyazaki's work demonstrates, although this is not made explicit, a useful method for specifying the precise knowledge areas in which a firm needs to develop its competence if it is to join a particular group of firms.

The book is rich and touches on many themes, only a few of which can be mentioned here. First, firms view and exploit a new technology differently depending on their accumulated technological bases and product specialization. Second, in the long term, firms are malleable but a prerequisite is that they invest in competence. Competence building is, however, a very time-consuming process where we need

to think in terms of decades rather than years. It is a far cry from selecting technologies 'off the shelf'. Third, by investing in competence in generic technologies and in components (as distinct from systems), firms are able to diversify into related areas in ways which were extremely difficult to perceive ex ante. Thus, competence has an option value which should not be neglected. Other themes include the organization of R&D and state policy.

I can recommend Miyazaki's book to anybody interested in the process of competence building and in the measurement of competence, be they in development economics, business strategy or the economics of innovation.

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Wiebe Bijker, *Bicycles, Bakelites and Bulbs: Toward a Theory of Sociotechnical Change* (MIT Press, Cambridge, MA, 1995). £26.50, 290 + pp., ISBN 0 262 02376 8.

This is a fascinating and important book. Its empirical core is provided by three detailed interesting case studies, presented from the viewpoint of the social construction of technology. Several earlier books, mostly multi-authored, have laid out the philosophy shared by those who do research within the paradigm of the social construction of technology. However, perhaps because this book is single-authored, and perhaps because some of the thinking has matured with experience, I find this work by Bijker by far the broadest, and most coherent, statement of the intellectual position.

The three core case studies are of bicycles, bakelites, and fluorescent bulbs. Bijker started out as a student of engineering, and his technical background and sophistication show through clearly in these studies, which are quite detailed and illuminating on the technical side. But Bijker is committed to the proposition that technology is shaped by, indeed defined by, social groups, forces, and power, and his case studies are at least as much, or even more, about that than they are about the evolution of the technology per se.

Those that work within the framework of the social construction of technology clearly feel a strong intellectual kinship to those who work within the framework of the social construction of science, and this certainly is so of Bijker.

Indeed Bijker seems to propose that there is not much difference between these two paradigms, or their claims to illumination and validity. Personally, I wonder about that. I confess finding much of the writing on the social construction of science, for example the various articles and books of Bruno Latour, forced and unconvincing. Those that claim that science is socially constructed never have persuaded me that there isn't a hard natural universe out there that, to a considerable extent, science is about. I confess being quite amused by the hoax recently played by Allan Sokal in his article published in Social Text. On the other hand, technology, while constrained by physical laws, clearly is something created and constructed by humans. It also is true that whether a technology, or a variant of one, achieves widespread use within a society is a matter of human, cultural, and social choice. The interesting questions relate to the actual processes involved in the creation and development, and the rejection and selection, of technology.

Bijker states explicitly that he views technological advance as an evolutionary process. So do many other scholars of technical advance, many of whom (most?) do not adhere to a social constructionist viewpoint. It would seem illuminating, therefore, to identify just what differentiates a social constructionist evolutionary theory of technology, from other evolutionary theories.

Certainly there is a striking difference between Bijker's accounts of what drives and selects on technological developments, and the expressly evolutionary viewpoint on technological development put forth by Walter Vincente, in his work on the development of aircraft. For Vincente, the technological variant that ultimately wins out is that which provides the 'best technical solution'. While it is not always clear just how that is defined, Vincente places heavy weight on the judgments of the relevant tech-