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Economic Sociology and Social Studies of Technology

by

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It is striking how little systematic analysis of technological change can be found in the writings of the main proponents of Economic Sociology. In the *Handbook of Economic Sociology*, edited by Smelser and Swedberg, technology is not accorded a separate treatment. Economic sociologists therefore appear to be somewhat unprepared for discussing what many consider the great issues of the day, such as the role of innovation processes in economic change, and more specifically the impact of information technology, genetic engineering, advances in materials technology and new environmental regulatory regimes on markets, organisations and economic systems.

However, there are sociologists who study technological change, and the purpose of this review is to introduce a small selection to the readers of the *Newsletter*. Most of the contributions mentioned here belong to an field of studies, often labelled 'STS' (Science, Technology, Society) which has been established within three organisation, the *European Association for Social Studies of Science and Technology* (EASSST), the *Society for Social Studies of Science* (4S) and the *Society for History of Technology* (SHOT). As a result, STS is among other things shaped by an ongoing dialogue between historians and social scientists, including sociologists but also anthropologists and business economists. It is also characterised by a pervasive interest in the relation between science and technology, and by a pronounced interdisciplinary orientation.

Social studies of technology are the study of man made artefacts, how they are made, used and disposed of in a social context (Basalla 1988). Artefacts are, to paraphrase Latour (1993), both natural and social, simultaneously and indissolubly. In the empirical work of sociologists or others within 'STS,' this emphasis on physical and tangible artefacts is quite pronounced. Industrial design, electronics, video-recorders and the chemistry of industrial ecosystems attract more attention than say changing tastes, software innovation, the history of cinema and changing concepts of Nature. In bridging the divide between material culture and culture in general, most of those who work within the ambit of social studies of science and technology lean toward the material side of the equation, which is their point of departure, and this in turn helps distinguish them from other adjoining fields of study, such as economic sociology, economic history, business administration and 'cultural studies.' However, analysing the social shaping of artefacts through innovation and adaptation processes invariably develops into a sociology of engineers and machine operators, of engineering networks and of engineering expertise, and hence, of socially constituted knowledge.

It is probably not too far off the mark to see an anthology published in 1987, with papers from a workshop held in 1984, as constitutive of this particular field as a separate focus of research. Its' title is *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, and it was edited by Wiebe E. Bijker, Thomas P. Hughes and Trevor Pinch. In three programmatic essays in the first section of this anthology the editors and Michel Callon laid out the major tenets of the 'new' sociology of technology.

In their essay, Pinch and Bijker emphasise the knowledge component of technological change and the need to bring the sociology of technology to similar levels of sophistication as the sociology of science. The concept of interpretative flexibility is central to their conceptualisation of innovation processes, which are seen as a series of negotiations about the shape and function of artefacts leading to what they call rhetorical closure, which implies that problematic aspects are defined as outside the ambit of potential application, and that other problems are (re)defined in accordance with the interests of prospective users. Thus, for example, bicycle rubber tires, which were originally introduced (by Dunlop) with the argument that they reduced vibration and increased comfort, became redefined as devices to increase speed on the race track, and in this new garb, they became acceptable to the pioneers of bicycling, who saw themselves as *sportsmen*.

In a second essay Thomas B. Hughes developed a theory of technological systems, based on his research in the history of electricity. Such systems, according to Hughes, consist of socially connected physical artefacts. They evolve through distinct stages, invention, development, innovation, growth, competition, and consolidation. A central mechanism in this process is technology transfer, and another central concept is technological style, the former accounting for the tendency of large systems to follow similar paths everywhere, the other accounting for regional, national or continental variation. As systems are consolidated they acquire a momentum of their own due to their technical and social ramifications. Once, for example, 220V becomes a standard, entire systems of devices are adjusted to this fact, but this standard is also typical (for its period) in that it does not apply globally. Eventually, such technological systems can enter a phase of stasis and decline as their momentum is challenged and broken (e.g. as did canal transport), but they can also survive the challenges and adapt to new circumstances more or less effectively, as exemplified by the succession of different modes of electricity generation.

In a third essay Michel Callon argues that engineering work includes a large component of 'engineer-sociology,' in analysing social trends and reading the futures in which innovations are to operate. This aspect is also prominent in Bruno Latour's work *ARAMIS or the Love of Technology* originally published in 1993. According to this approach, problems which in one scenario can be seen as minor technical glitches can in another be seen as heralding a new age, a fundamentally different trajectory (of, say, the automobile), which therefore must be anticipated. Hence, radical inventions are promoted and developed to the extent that they can be constructed as reasonable responses to futures which strongly deviate from the present. This implies reconfiguring and reinterpreting the connections between artefacts (as in electric cars), and this in turn often involves reshaping or inventing from scratch new artefacts which fit the new system or in Callon's and Latour's terms, are appropriate to the relevant *actor-network*. In order to understand this process, therefore, it is essential to see artefacts as social actors, with all the recalcitrant 'stubbornness' and unexpected 'inventiveness' which sociologists such as Bourdieu and Touraine have accorded to the beings who populate their social worlds. The material/physical/technical can, in other words, not be taken as given in sociological analysis, any more than the engineers of today can take as given the social futures in which their innovations will compete for success.

The common theme in these three articles, namely the dialectic between the social shaping of technologies and the social impact of technologies, is developed in varied ways in other contributions in the anthology, which cover empirical objects as disparate as the gyroscopes that guide(d) American intercontinental ballistic missiles (MacKenzie) to the use of magnetic compasses on Portuguese galleys in the twelfth century (Law). The impact of the anthology

probably lay in this, that it demonstrated quite concretely that it made sense in a wide variety of contexts to discuss interactions among physical things and among social things 'in terms of the same analytical vocabulary' (Law in Bijker et al.: 114), at least as long as the attention is focused on technological change.

Since then, a large number of anthologies has been produced by changing constellations of researchers variously located within the field, and some of the more important ones can be found in the bibliography below. The journal *Technology and Culture*, as well as *Science, Technology and Human Values* and *Social Studies of Science* have also become important avenues for publication for the products of this field of studies, although they can be found in many other publications besides. However, the original programme proposed by Callon and Latour, and subscribed to by the other authors mentioned so far in some degree, namely to create a new and alternative approach to society on the basis of technology studies, has not materialised. The heterogeneity of the field in terms of methodological and theoretical frames of reference has, if anything, increased. However, it is now generally recognised that innovation is a major competitive factor that needs to be nurtured and cannot be left to so-called market mechanisms alone. This has in turn led to a growing interest in innovation studies, innovation policy and learning, which, for example, are the main topics for social science studies which are funded by the European Union. Simultaneously, (and funding mechanisms and career opportunities probably have a lot to do with that) one can detect a centrifugal motion within social studies of science and technology itself, particularly among the 'second generation,' that is, a return back to economics, sociology and history. While technology issues become more relevant to policy discussions, disciplinary traditions appear more relevant to technology issues, or, perhaps, to the careers of those involved. The field has in recent years therefore become bifurcated rather than chaotically pluralistic.

On the one side of this divide, we find, for example, Charles Edquist, an economic historian and Bengt-Åke Lundvall, a sociologist turned economist, who have focused on innovation management, research policy and national innovation systems. The label 'political economy of innovation management' would be appropriate for this group and its activities, which is also known as STI studies (science, technology, innovation). The work of this group within social studies of science and technology is closely related, conceptually and otherwise, to a sustained effort to develop an economics of technological change exemplified by the work of Luc Soete and Christopher Freeman. This latter work has been part and parcel of the social studies of science and technology scene while these authors, however, have pursued their own discipline oriented agenda vigorously.

On the other side, we find the STS people (science, technology, society), for example Johan Schot, a central figure in the Greening of Industry Network, and Steven Woolgar, the coordinator of a megaproject funded by the British government on 'Virtual Society,' who continue to develop the multidisciplinary tradition, but with an emphasis on the cultural shaping of science and technology. In this group, of course, also belong various derivatives of the original interpretative sociologies of technology developed by Bijker, Pinch, Latour and Callon, which emphasise detailed description and analysis of negotiations, conflicts and consensus (see for example Law and Hassard 1999). This group has generated a large number of micro studies as well as theoretical work on the relation between science, technology and society, gender issues, consumer concerns and environmentalism, and in particular addressed issues of popular participation, technology and democracy (e.g. Rip et al. 1995, Irvin and Wynne 1996).

The possibility to connect economic sociology and social studies of science and technology is therefore woven of two rather distinct strands. On the one hand, as R&D policy and innovation management studies are mainstreamed, many of the issues analysed by economic sociologists surface as important, and Mark Granovetter, among others, is frequently quoted by people working in this vein. The question how new markets are constructed, maintained and expanded is, for example, relevant for both economic sociology and for science, technology and innovation studies. Another conceivable meeting place is innovation diffusion, which both economic sociologists and innovation economists have discussed without much cross-fertilising occurring as yet, and the same can be said of the construction of networks and alliances around the invention and launching of new technologies.

On the other hand, there is a rich lode to be mined in the intersection between economic sociology and the more interpretative strands of the science technology and society discourse. Many of the science based technologies evolving fast today (genetic engineering, for example) are heavily dependent on the particular constructions we choose to put on their ethical and social aspects (and some of them may therefore end up in the same place as the intercontinental ballistic missiles analysed by MacKenzie, perhaps by an equally winding path). Electronic communications technologies based on the internet are also entering mass markets and leaving the stage where computer experts set the agenda. In acquiring momentum, they are also being transformed from information technologies to the technologies of global mass culture. The cultural elements of innovation processes are therefore essential, not tangential, to understanding what is happening, and a relevant economic sociology must perforce take account of that.

Bibliography

Below a few of the most important titles within social studies of science and technology are listed, but searching on the names of these authors in library, booksellers' or article databases and citation indexes will of course turn up many more titles. First, however, a few useful links:

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