

The Oxford Handbook of Innovation

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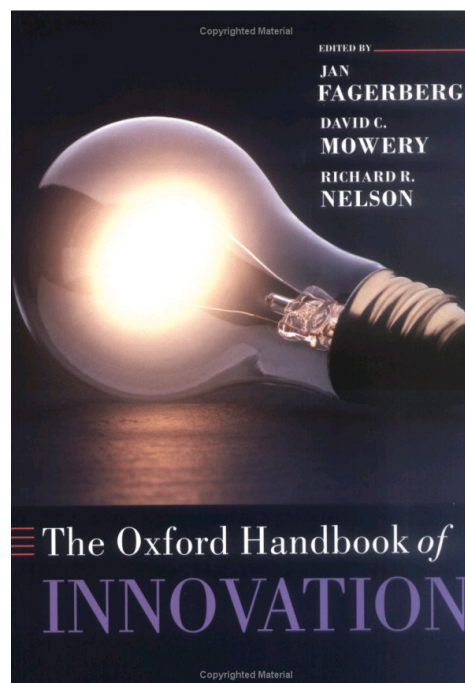
In *The Oxford Handbook of Innovation*, the editors Jan Fagerberg, David Mowery and Richard Nelson present articles from various authors discussing a variety of aspects related to the theme of technological innovation.

The first part of the manual, 'Innovation in the Making,' examines the characteristics of innovating companies and processes, the importance of the formation of innovation networks, and ways of measuring innovative activities.

In the second part, 'The Systemic Nature of Innovation,' innovation is approached from a systemic viewpoint, highlighting the importance of private enterprise in dynamizing the system, the universities as support institutions, and the institutional, legal and regulatory aspects that pervade innovation systems.

The third part, 'How Innovation Differs,' contains articles discussing the specificities of technological innovation in different sectors of the economy: 'low technology' industries, services, and so on.

The fourth and final part, 'Innovation and Performance,' presents articles that examine the importance of technological innovation as a critical factor in the competitiveness of companies and nations, and as an important element in generating employment. The final article of the *Handbook* also discusses the role of science, technology and innovation policies in promoting economic development.



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Presenting a number of ideas that have frequently been used to comprehend innovation in advanced capitalist countries, the *Handbook* combines the didactic structures and elements typical of manuals with analyses from some of the key authors writing on the topic. This is one of the book's strongest points.

Before turning to the positive comments on the work, though, one of its main weaknesses should be highlighted. This limitation is epitomized by its opening phrase where Jan Fagerberg asserts that "Innovation is not a new phenomenon. Arguably, it is as old as mankind itself." This idea illustrates one of the consequences of the close affinity between the concepts of technology and innovation, namely the subsumption of the former to the latter. In other words, the reduction of a generic, ahistorical, asocial and apolitical concept, associated with the production of knowledge for the purpose of making human life easier, to another socially and politically dated concept that signifies the introduction of a new economically viable idea onto the market, guided from its conception by the demand to produce profits.

Taking innovation and technology to be synonyms generates a series of problems, two of which can be emphasized. The first is theoretical-methodological in kind and resides in the fact that the idea of innovation is associated with the capitalist system through the figure of the company, as argued by one of the first non-Marxist authors to analyze specifically the relationship between innovation and 'economic life,' the Austrian Joseph Schumpeter, in *The Theory of Economic Development*, from 1912. The constant search for the extraordinary profits enabled by the "new combinations of materials and forces," the author argues, forms the central process of intercapitalist competition, leading to economic development (or, more precisely, the development of capitalist economies).

Since it comprises an essentially capitalist phenomenon and not something "as old as mankind itself," the concept of innovation, as well the theoretical-methodological framework developed on its basis, cannot be used to understand elements present in pre-capitalist societies. Neither does it seem appropriate to the analysis of technological phenomena occurring in planned economies and located outside the private sphere, though still within capitalist societies (such as Social Technology initiatives and those in the area of the Solidary Economy movement, for example).

Although the *Handbook* refers to the well-known distinction between invention (the first occurrence of a specific idea) and innovation (the first initiative to put this idea into practice, generally through its commercialization), its authors fail to make explicit a distinction between technology and innovation that would avoid the naturalization of the social relations of production entailed by the reduction of the two concepts.

The second problem, associated with the semantic 'mistake' of taking innovation and technology as synonyms, also has an ideological dimension. The Innovation Economy (IE), a current based on the ideas of

Schumpeter and others following in his wake, ignores essential contributions from other approaches found in the wider field of the Social Studies of Science and Technology (SSST). The latter include the Sociology of Work and Marxist studies of technology, which observe what happens inside the factory where profit is actually produced through the private appropriation of the rise in labour productivity enabled by innovation – a profit which, materialized on the market, leads to a 'creative destruction' at the godlike hand of the business entrepreneur. These contributions, which show how innovations – especially new processes – have progressively negative consequences for labour, such as an increase in the exploitation, alienation and control of workers by capital and the hierarchization and segmentation of labour, would undoubtedly augment the explanatory power of the ideas proposed by the IE.

However, the work does provide a good illustration of the rapid growth of the IE within the SSST field, a topic we have covered in other works (Dagnino & Thomas 2001, Dias & Dagnino 2007). Over the last two decades, this process has threatened to undermine one of the most important (and attractive) aspects of this field: its insistence on the idea that any examination of the relations between Science, Technology and the social actors involved, in part because of its very complexity, should adopt a multidisciplinary historical approach that is historically, socially and politically contextualized.

The *Handbook* also illustrates how the approaches to science-technology-society (STS) relations found in other disciplinary fields, such as Sociology, Philosophy, Anthropology, History, Political Science and Psychology, have been ignored by the theoretical and methodological constructions engendered by the IE.

However, the articles making up the *Handbook* share an idea of innovation (such as the concept is presented by the IE) that contains more than an ideological limitation. Contributions from other SSST disciplines that cannot be labelled critiques of capitalism or its technological manifestations (and do not, therefore, represent a frontal attack on this system of accumulation, taken by economists as a given), such as Actor-Network Theory (ANT) and the Social Construction of Technology (SCOT), have also failed to find their way into the IE's theoretical and methodological constructions.

While the IE has ignored the task of exploring the social and political aspects inherent to innovation, its treatment of science is even more lightweight. In fact, despite the valuable reflections of Kline and Rosenberg in the key article 'An Overview of Innovation,' in which the authors critique the mechanistic view of the Linear Model of Innovation, and Rosenberg in *Inside the Black Box*, through the question "how exogenous is science?", the debate on science and its relations with technology and, above all, society have not been explored. Science is taken to be a simple cognitive resource for technological activity, yet its conditioning social factors and its dynamic of development are entirely peripheral questions for the IE.

Returning to the articles collected by the *Handbook* on the factors contributing to innovation, we can highlight the analyses of apprenticeship and the accumulation of innovative capacities by companies, the importance of formal and informal networks of cooperation between companies, the positive and negative consequences of technological specialization, and the technological particularities manifested at distinct sector-based, historical and geographic levels.

This latter line of investigation, perhaps one of the most promising within the IE, is examined in the *Handbook* through contributions such as Asheim and Gertler's article on the relationship between innovations and the local context in which they occur, Malerba's study of the influence of sector-based industrial conditions on the innovative process, von Tunzelmann & Acha's analysis of innovation in 'low technology' industrial sectors, and the study by Miles on innovation in service sectors.

This type of study can also be subjected to another criticism, which, though extensive, seems to us crucial to make given the space in which this review is published. The authors make use of a conceptual and methodological corpus that helps considerably in explaining the context they propose to analyze: that of advanced (or central) capitalist countries. These constructions are undoubtedly well-suited to comprehending phenomena found in this specific context. However, whether because the authors do not specifically address the issue, or because they are unaware of the problem involved, these constructions are used indiscriminately and uncritically to examine innovation in peripheral countries.

A clear example of this practice is the use of the concept of National Innovation System (NIS) – considered one of the key concepts of this literature – to explain innovation in Latin America. This concept seems to be adequate to analyzing what occurs in countries like the USA, England and Japan, as explored in the seminal works of Mowery and Rosenberg and Rosenberg & Nelson. But it has proven less useful in comprehending the Brazilian context, for example.

What we find in Brazil is precisely the relative absence of the organic institutional networks – the result of a long process of co-organization – that characterize such systems in advanced capitalist countries. The concentration of innovative activities in the South-Southeast region (far, therefore, from being national in scope), the low propensity of local companies to innovate (and even less to invest in R&D), the complete dominance of big foreign capital in the most technologically developed sectors, the high flow of technology imports and the low generation of innovations in the narrow sense are examples of systemic (interconnected, interdependent, etc.) elements of Brazil's STS relationship, typical of peripheral capitalism. By failing to 'fit' into the framework proposed by the IE, these aspects can only be examined through the latter at the cost of continually ignoring its systemic character and the quantitative and qualitative distance of its behaviour from that expected by the IE. An understanding of the Brazilian context can be much more effectively obtained

by adopting alternative frameworks, such as the Passive National Learning System proposed by Viotti in his doctoral thesis, 'Passive and Active National Learning Systems,' or the ideas proposed by the Latin American Thought in Science, Technology and Society movement (PLACTS in its Brazilian acronym).

Returning to more specific observations concerning the *Handbook*, we can stress its astute analysis of the poor use of S&T indicators by policy makers and the limitations of the indicators presently utilized. Indeed, as Smith emphasizes, we often find an ambiguous use of concepts and forms of measuring innovative activity, which tend to simply reflect the hypotheses raised by those responsible for formulating science and technology policy. An aspect undoubtedly shared by central and peripheral countries alike.

Other important aspects related to technological innovation are also examined by the *Handbook*, such as the role of universities in technological development. Perhaps because the authors make use of theoretical constructs such as the Mode 2 Knowledge of Gibbons et al., or the Triple Helix of Etzkowitz & Leydesdorff, the book seems to give excessive importance to the joint research conducted by universities and companies. This idea, which contradicts the available evidence on the realities of both central and peripheral countries, has become widely accepted in the Latin American academic world. Companies seem little interested in procuring the disembodied knowledge obtained through university research. Instead, companies appear to envisage the latter as spaces for training professionals who will later develop research within the company's own laboratories. Data presented by Mowery & Rosenberg show that the involvement of university research studies contracted by companies decreased over the period of the Cold War. This kind of research represented 11% of the total in 1953, 5.5% in 1960 and just 2.7% in 1978, though the latter is almost three times higher than the figure observed today.

Another point worth highlighting is the analysis of the relationship between multinational companies (MNCs) and technological development. Examination of recent evidence shows that the most important factor in defining the innovative behaviour of these companies in the context of globalization is their need to respond to the specific demands of each context. Despite the book's careful exploration of these elements, questions such as the 'capture' of technology by MNCs (understood as the monopolization of the production of technology by these companies) in detriment to consumers-users are left examined. The fact that this question is frequently approached by other authors from the SSST field provokes another criticism of the IE. It seems to have accepted the dogma that companies are the only spaces in which innovations can emerge and that no development model can dispense with large private enterprise and oligopolies. By adopting this line, the IE stifles analyses of alternative forms of technological development occurring outside the scope of private companies (ignoring, for example, the

emblematic appropriate technology movement and the more recent Social Technology and Solidary Economy movements).

We conclude our review by underlining those aspects of the *Handbook* that most interested us as researchers in the SSST field, emphasizing that the work represents an important contribution to these studies. It comprises an excellent compilation of works about the IE, offered in a clear and didactic form to those who, whatever their ideological position, study technological innovation and related phenomena.

This is despite some of the limitations emphasized above. The latter mostly arise from the fact that the work is not actually an Innovation Manual, but an Innovation Economy Manual, given the absence of a more pluralistic and multidisciplinary approach to the topic of innovation. Indeed, the work is further limited by the fact that the *Handbook* was inadvertently conceived by its authors – perhaps due to hegemonic thought's limited awareness of whatever is foreign to it – as an Innovation Economy Manual for Advanced Capitalist Countries. This is made patent by the failure to recognize that the analytic model advocated in the book was designed as an explanatory framework for advanced countries: though somewhat fanciful, it would be convenient to include a reminder, like the contra-indications on medicine leaflets, warning that this model can have undesirable side-effects when 'administered' to peripheral countries.

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