

**National Innovation System:
A Note on the Origins of a Concept**

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**Project on the Intellectual History of Innovation
2010**

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It is commonplace to look at science and technology as a research or innovation system. This system is said to be composed of four main elements or sectors – universities, governments, industry and non-profit – their interrelationships and the context of which they are a part. Recently, the concept of National Innovation System has become a popular framework in the literature for discussing a system approach to technological innovation (Freeman, 1982b; 1987; Nelson, 1993; Lundvall, 1992).

Where does the concept come from? B.-A. Lundvall, a prolific writer on National Innovation System, has suggested that F. List (*Das Nationale System des Politischen Okonomie*, 1841) was the “ancestor” of the concept: “the basic ideas behind the concept national systems of innovation go back to Friedrich List” (Lundvall, 2004: 533). To others, “List anticipated (...) contemporary theories of national systems of innovation” and his book could even have been titled *The National Innovation System* (Soete et al., 2009: 6) – the latter statement was first made by Freeman (1987: 99). Despite these claims, one would have difficulty documenting a tradition of theoretical research on innovation system arising out of List’s work. It is one thing to resuscitate a forgotten author who held “similar” ideas over 150 years ago, and another to document the rise of a research tradition from that author.

I suggest looking more seriously at one of the researchers responsible for the concept: Christopher Freeman. With *The Economics of Industrial Innovation* (1974), Freeman launched the study of technological innovation in what I have called above the second tradition (Godin, 2010). Freeman’s conceptual construction of an innovation system really begins with this book. Freeman’s system approach builds on two authors. The first is F. Machlup and his “wide definition of knowledge industries” (Freeman, 1974: 18), as covering the “generating, disseminating, and applying advances in technology” (Freeman, 1974: 20). This definition allows Freeman to suggest the idea of an “R&D

system” (first suggested in a paper he has produced for UNESCO in 1969). There is no explicit definition of what a system is, but one understands that it means a complex whole responsible for “the ultimate source of economic advance” (Freeman, 1974: 20): production of new products and processes, management and marketing, diffusion (including education and training) and interaction with scientific research (Freeman, 1974: 20-21). Above all, Freeman’s system refers to a “professionalized system” whose “growth is perhaps the most important social and economic change in twentieth-century industry” (Freeman, 1974: 21).

Machlup’s vision is a broad one, looking at invention, its use and diffusion, and science as a system of input and output. Such a “systemic” vision is quite original compared to what was written on technological innovation (broadly defined) at the time. However, it is another author who suggested to Freeman the idea of an “*innovation system*”. A careful reading of Chapter 9 suggests an adaptation of J.K. Galbraith’s “military-industrial complex”. In fact, to Freeman Galbraith’s work on the emergence of a techno-structure is “consistent” with his own argument (Freeman, 1974: 217; 282). To Freeman, the “military-industrial complex is a reality” (Freeman, 1974: 287). It corresponds to a stage (1950s and 1960s) when R&D investments were devoted to big science, and industrial and government R&D expenditures to “national security and prestige types”: nuclear, military and space (Freeman, 1974: 288). This complex Freeman relabeled as the “military innovation system” (Freeman, 1974: 296).

To Freeman, this innovation system was followed by a second and different one. Certainly, “the achievements of the military innovation system are undoubted”, stated Freeman (Freeman, 1974: 296). Yet, it was founded on the assumption of producer sovereignty. To Freeman, the 1970s was a new stage in R&D. It was witness to changing values (reduction in tensions between the superpowers, changes in public opinion, emergence of new problems) and new priorities. Freeman anticipated a shift from a “military-innovation system” to a “social innovation system”, whose challenge is “more complex than that facing purely technical innovators” (Freeman, 1974: 301). Freeman’s prospective is based on the analysis of the then-recent OECD statistics on trends in R&D

expenditures in industrialized countries. The new innovation system would be a shift from military to customer R&D, from producer sovereignty to customer sovereignty.

To complete the picture and reach the subsequent concept of “National Innovation System”, one more element has to be added to the story. To Freeman, the later stage (consumer sovereignty) will become a reality only if supported by *national* policies. The “social innovation system” is (should be) characterized by national policy designed to orient R&D decisions toward social welfare. “The problem for policy is to articulate [the new] demands in such a way that the system can respond effectively” (Freeman, 1974: 296). Policy has to be made explicit (deliberate) rather than implicit (the affairs of a “lobby”) or worse *laissez-innover*. A “political mechanism must restore the lost consumer sovereignty” (Freeman, 1974: 303), and “a social mechanism [must be developed] for stimulating, monitoring and regulating innovation, which does not yet exist in any country” (Freeman, 1974: 308). Users should have a role to play in designing appropriate technologies and government should define (national) priorities. Coupling mechanisms and policies have to be invented to this end:

Military industrial complex (Military innovation system) → Social
innovation system → National System of Innovation

At the time, “innovation system” was definitively not a fully crystallized concept. The term appeared under many other guises in Freeman’s book: “monopolist or socialist system of innovation” (Freeman, 1974: 223), “innovation system” (Freeman, 1974: 253) and “world research innovation system” (Freeman, 1974: 279), with no theoretical development. Freeman was not theorizing on innovation systems as such, but discussing “aspects of public policy for innovation”. Freeman’s purpose (one of his purposes) is clearly policy-oriented and normative. In fact, the changing values Freeman identified were only in the making. Freeman made himself a “prospectivist” here and consequently called for changing priorities in government policy (in order to make a reality of then-

changing values). He suggested *orienting* the innovation system towards national (and explicit) priorities. It is only later that the idea of innovation system got “objectivity”: in the late 1980s and after National Innovation System became a “fact” to be studied. From that time on, authors have forgotten the origins of the concept.

Freeman’s book is no longer read. Students turn rather to the 1982 edition. One would have difficulty finding a genealogy as described above in this edition. Most of the terms and variants on innovation system still appear, but split as they are over two chapters (rather than one as in 1974) the argument on innovation system is less apparent. But it is there, the vocabulary is similar and List is still absent: Galbraith’s “military-industrial complex” (Freeman, 1982a: 190), “military innovation system” (Freeman, 1982a: 202), “technological system” (Freeman, 1982a: 218), “social innovation” (Freeman, 1982a: 201, 205, 216) plus a three-page discussion on “institutional, organizational, legal and social changes”, also called innovations (Freeman, 1982a: 216-18).

From reading Freeman’s first thoughts on technological innovation and his preliminary thoughts on an innovation system, one notices that the concept has nothing to do with List’s. The latter is a resurrected “ancestor” whose value in the recent literature is to give legitimacy and credibility to the concept of a National Innovation System. There is nothing wrong with resurrecting a dead author to develop an argument, as Freeman did with Schumpeter (Godin, 2010). However, it is quite another thing to use this author as a pioneer, as others do. List would have said what modern authors say, perhaps. However, there has been no tradition of research between List and the late twentieth century literature on a National Innovation System. Positioning List as a spiritual forefather is rather like looking for a symbolic figure as a father figure after the fact. List is really an isolated case. The development of the National Innovation System concept owes its existence to something else.

In a recent paper, Godin documented what a ‘system approach’ in science studies owes to national policy and the discussions conducted on this matter in industrialized countries beginning in the early 1960s, above all at the OECD. Over the same period, the system

approach found its way into official statistics, which helped solidify the approach (Godin, 2009a). However, we can go further back in time. And here national science policy is really at the heart of the matter again. The experience of World War I led to mobilization of scientific resources on a nationwide basis, what the American historian A. H. Dupree called the “great estates” of science in the country (Dupree, 1957), and to the demand to link universities (science) with industry (applications). Industrialists have been influential here. From the 1910s onward, US industrialists discussed research in terms of a national system – without using the term – and the relations between the elements of the system (Godin, 2009b). The contribution of industrialists, although not theoretical, is certainly one step toward the development of a system approach to innovation.

‘Men of action’ have been far more influential on the organization of science and the development of theories than is usually imagined. The system approach was first discussed systematically (I mean regularly) among men of action: industrialists beginning in the 1910s, then policy-makers in the 1960s and subsequently. Then, and only then, the National Innovation System tradition developed among academics, adding new dimensions and theorization to the discussions and analyses.

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