


quo in the face of uncertainty'. This tendency results in an unbalanced assessment of risks and benefits of new technologies, of which incumbents often take advantage. Thirdly, regulations can serve as a stimulus for innovation, especially when new technologies have large room for improvement in terms of efficiency and effectiveness.

In Part III—Chapter 11—the book synthesizes the findings from the previous chapters and discusses their implications for current debates. According to the author, technological innovation will play 'an even greater role in the search for solutions to the global grand challenges' that dominate our world. Given the pivotal role of technological innovation in the face of grand challenges, we have to build deeper understanding of the tensions between innovation and incumbency and strive towards an inclusion economy. In essence, an inclusion economy should include both mature technologies that create jobs and profits at the moment and new technologies that provide opportunities for future jobs and profits. To take a long-term view of technological innovation and societal development is recommended for all the groups, but in reality, this remains a challenging task. Finally, the author has suggested that new technologies themselves also have to be inclusive to succeed; in particular, the product, its retailing and support, the micro-enterprises that provide these demand-side services, and the wider context must be effective.

On the critical side, I would argue that although the book presents detailed and useful case studies throughout

the past few centuries, it falls short at outlining a comprehensive theoretical framework, which could be built upon by future studies. In my point of view, the author's idea for developing this field as a distinctive area of scholarly endeavour would have been more hopeful if the book provides a more thorough analysis of the similarities and differences between the cases examined. As it stands, we seem to learn more about the adoption of technologies in the history than about what to do in the future. Of course, more case studies on specific technologies in specific contexts are of importance, but without an analytical framework the collective strength of the work might be weakened. Overall, the book focuses on an important but underexplored topic, provides detailed and interesting historical case studies, and offers insightful lessons for many academic subjects. More studies will surely follow its suggestions to further broaden the field, namely the adoption of new technologies.

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Models of innovation: The history of an idea

By Benoît Godin, The MIT Press, Cambridge, MA and London, 2017, 344 pages, \$37.00 (hard cover) ISBN 978-0-262-03589-7

The book under review investigates the history of thinking about innovation throughout the 20th century. Innovation has been a long research interest of the author of the book under scrutiny, Benoît Godin, professor at the *Institut national de la recherche scientifique* in Montreal, Canada. Thus, it comes as no surprise that Godin masters the bumpy territories of thought with ease and guides the reader to those places that offer a clear view on the core features of each approach he discusses. Most thinking about innovation, Godin argues, has taken the form of constructing models—indeed, models of innovation gave 'social existence to a theoretical construct' (p. 2) and contributed to making this construct visible within a field.

The book sets out to achieve two objectives. The first objective was to write a history that helps to understand

why specific models of innovation came into existence and, after some time, occasionally disappeared. The second objective was to challenge some of the standard genealogical narratives put forth by proponents of specific models. Some pioneers were neglected or ignored, some 'mythic fathers' invented, Godin claims (p. 3). While the second objective is certainly of concern for scholars working in science, technology, and innovation studies, the first objective appears to be of more general interest—even more so since Godin interweaves the history of models of innovation with a reflection on the nature and capacities of models.

The narrative structure that Godin uses consists of a succession of three types of models—although, as Godin repeatedly stresses (p. 51), it was not until the 1960s that these schematic forms were called models. The earliest

models of innovation were formulated by anthropologists around the turn of the 20th century, among who were Adolf Bastian, Edward Tylor, Lewis Morgan, and Franz Boas. These authors formulated stage models (Chapters 1 and 2). Such models differentiated between two or more stages, one of which is typically an invention stage, during which a new social object or practice took shape in a specific place. In the ensuing diffusion stage, the invention travelled and became used in other places around the known world. In this first type of models, the concept of innovation thus was central to anthropological discourses about social transformation and modernization.

During the 1920s and 1930s, an alternative approach to thinking about innovation emerged and partly superseded the previous approach. The models now proposed were linear models, usually drawing a unilinear path by linking boxes with arrows (Chapters 3–6). This approach to thinking about innovation became popular within a discourse about the function of science for economy and society. Godin describes at some length the first formulation of such a linear model, which he found in a text written in 1928 by Maurice Holland, director of the Division of Engineering and Industrial Research of the US National Research Council. During that time, the council was engaged in promoting industrial research, which means that it attempted to convince industry leaders that if they wanted to accelerate the development in their branches, they had to establish their own research departments. The ‘research cycle’ formulated by Holland comprised seven steps: pure science research, applied research, invention, industrial research (development), industrial application, standardization, and mass production. Similar models were developed in the following decades, among others by Rupert Maclaurin, an economic historian from the MIT, whom Godin credits to have carried out the first systematic studies on technological innovation. (Schumpeter, Godin claims, had put forth the notion of innovation, but had carried out few, if any, systematic analysis of the process of innovation; cf. p. 61.)

The shift to the third type of models of innovation came with a parallel shift of the place of debate from science policy to business management. Beginning in the 1960s, both stage and linear models were heavily criticized for allegedly overstating the sequentiality of steps and producing an inadequately artificial image of the real processes involved. Quite in line with the major lines of thought in the social sciences, researchers (and industrialists) began to develop system models of innovation (Chapters 7–9). The focus now was on the elements of a system and their interrelations; the sequence in which information passed from

one element to the other became secondary. This view later got adopted by science policy and formed the basis of what became, in the 1980s, the notion of national systems of innovation, ‘a set of institutions whose interactions determine the innovative performance of national firms’ (Richard Nelson, cited on p. 157). This notion informed most of the studies and reports on science and technology in the last decades of the 20th century, especially those by the Organization for Economic Co-operation and Development (OECD), and became a core concept in national and international statistics.

In an epilogue, Godin explores what can be learned from this history for assessing what models are. In consecutive sections, he discusses that models are available in a variety of forms and used in a variety of ways: as (1) conceptualizations, (2) narratives, (3) figures, (4) tools, and (5) paradigmatic perspectives. He concludes that while the semantic content of the term is highly variable, the purpose of talking of model is rhetorical. First, ‘a model is a symbol of scientificity’ (p. 213). And secondly, a model easily crosses the boundaries between disciplines or between science and policy. Without the semantic flexibility, the term model would presumably not be able to achieve this.

Models of innovation makes for an interesting read and achieves the aim it sets out to achieve. The typology (stage, linear, and system models) is convincing, as is the relation of the various types to specific discourses and audiences (anthropology, science policy, and business management). All in all, however, the reader interested in the history of the social sciences is left a bit disappointed. The story written by Godin develops in a space that hardly knows anything apart from science. Political power, social inequalities, conflicting interests, or international differences are only discussed if they concern the intra-scientific debates. The political dimension of models, and more specifically of models of innovation in an era of globalization, is not investigated. However, without this dimension, the history of models of innovation is incomplete.

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