

SPECIAL ISSUE

Toward an ecosystem for innovation – implications for management, policy and higher education

Introduction

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This special issue of *Industry and Higher Education* found its origin in the Fifth International Conference of the Triple Helix of University–Industry–Government Relations held in Turin on 18–21 May 2005. Those who have been developing the Triple Helix thesis over the past ten years see university–business/industry–government relations as constituting a complex system which, under certain conditions, can supply both the impetus and means for innovation to flourish in an economy (Etzkowitz and Leydesdorff, 2000), but in which in other instances, because of size effects (Klepper, 1996) or failing institutions (Nelson, 1993; Cooke and Leydesdorff, 2006), innovation may be caused to lag.

The role of universities in this system has been of particular interest to Triple Helix analysts. The old linear model, which assumes that ‘science invents and business absorbs’, has been replaced

with an appreciation of both the various means (R&D, technology transfer and incubation) by which universities may directly serve an innovation economy and their particular responsibility for higher education (Etzkowitz *et al.*, 2000). To these considerations we now add a set of elements *within* business organizations that contribute to what we call in this special issue an ‘innovation ecosystem’. These include ways of cultivating and rewarding innovation as a process and a culture within an enterprise and the need to identify the skills sets required to maintain it.

In compiling this special issue we have had two intentions. First, we wished to highlight the growing significance of innovation to the future of business worldwide and, by extension, to the future of the economy. Second, we wanted to examine ways in which business, higher education and government can contribute to the strength and effectiveness

of an innovation economy. To do this requires an understanding of the forces that influence innovation and how each participant in the Triple Helix can influence those forces.

Growth has always been a top priority for business – but in the 21st century this is no longer the 1980s and 1990s version of growth, driven by mergers and acquisitions. Global businesses now expect innovation to be their primary source of new revenue. Indeed, according to a recent survey of 650 US and European businesses, revenues from new products introduced in the past three years were expected to represent 34% of total revenues in 2007, up from 21% in 1998 (Deloitte & Touche, 2005). The converse also holds: by 2010, products representing more than 70% of today's sales will, typically, be obsolete.

It is not only business practice and organization that must be readjusted. Universities also will have to adjust, forging links and collaborations with government and business and adding new or modifying existing graduate programmes (Tobias and Birrer, 1998). University graduates will, after all, have to succeed in a world in which the appearance of whole new products, whole new ways of doing business and whole new industries will be the norm.

We see in this issue how the National University of Singapore has been refashioned to incubate a new economic sector (applied biotechnology), and how the University of Auckland (in New Zealand) and its Business School are developing a 'whole of institution' approach to transforming knowledge into wealth. In Colombia, where it is still uncommon for a firm to engage in alliances with universities or scientific institutions, a national network of CDTs (technological development centres) has been introduced to mediate between industries and universities. In Ireland, the transformation of universities has been even more dramatic than elsewhere. Beginning in 2002, combined funding from two new bodies – the new Science Foundation Ireland and the Higher Education Authorities Programme for Research in Third Level Institutions – has freed up significant resources for university research and research infrastructure, particularly in the areas of biotechnology and information technology (IT).

The Indian Institute of Science (IISc), founded in Bangalore in 1909 (with the participation of a private industrialist), seems to have anticipated the role of technology incubator, at least in terms of IT. In 1984, the first overseas IT company to start operations in Bangalore in 1984, Texas Instruments, operated through a Texas Instruments employee who was an IISc alumnus (which may be why Texas Instruments selected Bangalore). Since then, the Institute has created an autonomous agency within itself called the Society for

Innovation and Development (SID), which now has joint research and development projects with almost all major companies in Bangalore and holds several patents jointly with them.

How far administrators and faculties of most universities are willing (or able) to become as 'entrepreneurial' as IISc, MIT and Stanford, of course, remains to be seen (Saxenian, 1996; Etzkowitz, 2002; Cooke and Leydesdorff, 2006).

Some new teaching programmes and curricula have already appeared and are described in the pages that follow. What they have in common is attention to the development of an entrepreneurial mindset, along with cross-disciplinary (eventually translating into cross-functional) habits of thought. Graduates of these new programmes are provided with in-depth knowledge of a given field and the ability to connect that field to other disciplines. More importantly, their education will have made them comfortable with what Alan Gibb described in 1993 as 'dichotomous learning modes' – namely, knowledge-based and skills-oriented learning (Gibb, 1993; Tobias *et al.*, 1995).

To address all these themes, we begin in Part 1 with an overview paper that explores the process, culture and competencies which together constitute an innovation ecosystem. We then call on our national correspondents, writing in Part 2, to detail how creative transformations in national economies have taken place when the planning process (whether at the level of firm, region or nation) has factored in innovation. And in Part 3 we have asked selected educators to describe new programmes that impart the specific skills sets and competencies which participants in an innovation ecosystem will be expected to have mastered. Our Leiden colleague, Frans Birrer, closes the issue with reflections on the entire collection.

Throughout, we employ a definition of 'innovation' that allows us to analyse an innovative ecosystem. Innovation involves more than raw invention or discovery (Schumpeter, 1912). Rather, it is present *only* when new ideas or inventions are successfully brought to market. With this definition in view, we proceed to the analysis.

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