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2 It's entrepreneurship, stupid!

A fresh look at innovation policy and the role of the university

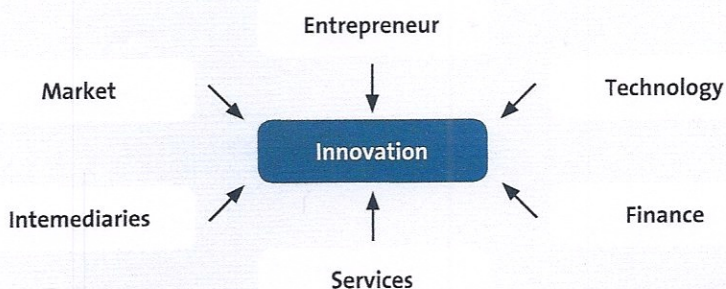
National Innovation System

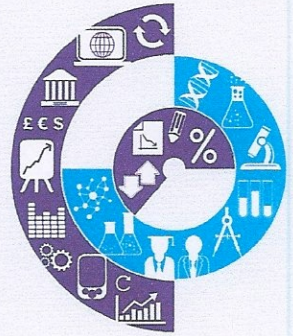
"Innovation is today's equivalent of the Holy Grail. Rich-world governments see it as a way of staving off stagnation. Poor governments see it as a way of speeding up growth. And businesspeople everywhere see it as the key to survival"¹. The question: "What does it take to innovate, that is, to bring an invention to the market or to use?" has become topical in economic thinking. In the 19th century it was the great inventors/entrepreneurs who brought technology to the market: James Watt, Samuel Morse, Daniel Bell, Thomas Edison and so many others. Today, innovation has become a complex process that requires the collaboration of many actors. This has led to the concept of the National Innovation System (NIS), proposed by Freeman². His definition of an NIS is: "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies."³ The work of Freeman is still the basis of innovation policy in many countries and we shall also use it in this article. However, we would like to emphasise the role of the entrepreneur and we propose a slightly different picture of the model⁴ (Figure 9).

First of all, this model identifies six core factors (the interactions among these factors are not shown on the graph):

- The entrepreneur, the crucial factor in innovation. It is the entrepreneur, whether employed in an existing firm or whether in his/her own company, who brings a product to the market or puts a process, marketing or organisational innovation to use. Entrepreneurs are 'dreamers who do'⁵. They are often obsessed by their idea or invention and they are willing to take personal risks in bringing it to the market or into use. Entrepreneurship flourishes in an entrepreneurial culture (as in California, the Boston area and the areas around the universities of Cambridge,

Figure 9: Core elements of the National Innovation System





- Technology: technical knowledge has become a commodity that companies buy and sell from and to each other and from and to research institutes. This is known as open innovation⁸. Open innovation can be extended to 'crowdsourcing' in which challenges are simply put on the internet and solutions come forward⁹.
- Market: When Japanese companies want to test new high-tech devices on the market, they do so in the Shinjuku district of Tokyo, one of the most innovative markets in the world. 'Innovative market' means a market in which people are eager to buy and test new inventions, taking a certain risk that it turns out not to be what they sought.
- Intermediaries: transfer agents who act as intermediaries between the knowledge sector and business. In the agricultural sector, the so-called extension services, which advise farmers on the use of genetic material, fertilisers, pesticides, equipment and other tools, have been most instrumental in the increase of agricultural production as well as the protection of the environment¹⁰.
- Finance: risk capital in the form of business angels and capital venture funds. Silicon Valley, the Boston area and the Cambridge region in the UK owe their success as much to an elaborate and varied business angel/VC fund structure as to technological prowess.
- Services, made up of two components: professional services and infrastructure. Infrastructure support consists of incubators and science or technology parks. Incubators and technoparks often come with administrative services; some offer the use of high-tech equipment¹¹.

Looking at the German situation, one is inclined to conclude that there is plenty of technology, plenty of finance¹² (although few business angels), plenty of intermediaries and plenty of services. The rapid diffusion of new products and services suggests that the market is reasonably innovation-minded. Existing corporations are in general quite innovative (compare the German car industry with the US sector), which suggests that there is an entrepreneurial climate within these industries. However, it is striking that Germany's vast science & technology sector with its many top universities, research Gesellschaften and Gemeinschaften and impressive private R&D institutions, produces relatively few Googles, Skypes and Facebooks. Strictly speaking, this is not a German but a European problem. In a recent article, *The Economist* complained that: "Britain has produced too few world-class technology firms."¹³ Germany invented the research university, the Humboldt University, so that is not the problem. Or is it?

Third Generation Universities

In the past decades, we have seen the emergence of international technology hubs, consisting of a wide range of innovative activities around a prominent university, a Third Generation University (3GU)¹⁴. Stanford University, Harvard, MIT and in Europe Cambridge, Leuven, TU Munich and Wageningen UR are examples of such 3GUs. The hubs are characterised by the combination of fundamental science, collaborative programmes of the university and high-tech corporations, the presence of corporate research institutions, efforts to train and support technostarters (students or academics who start their own, technology-based firm), incubators, technoparks, clubs of business angels¹⁵, support firms and much more. Third Generation Universities can create much value and employment of which Silicon Valley with its roots in Stanford University is the ultimate example. If the companies founded by MIT graduates and faculty were to form an independent nation, the revenues of these companies would make that nation the 24th largest economy in the world. The 4000 MIT-related companies (located worldwide) that existed in 1997 employed 1.1 million people and had annual world sales of \$232 billion. That is roughly equal to a GDP of \$116 billion, which is comparable to the 1996 GDP of South Africa or Thailand¹⁶. 3GUs are not degenerated, commercial versions of the Humboldt universities: they win most Nobel prizes on the one hand while creating immense value for the economy on the other.

The role of 3GUs in realising innovation makes them Innovation Systems in their own right and, as such, the seventh element of a modern NIS. Unfortunately, it is doubtful whether they can be planned. The examples quoted all emerged spontaneously, driven by student- and alumni-entrepreneurs, business angels and visionary university managers. Still, one can create the conditions for the emergence of a 3GU and if all the conditions are present, it is likely that a true know-how hub, that nobody can ignore, will develop.

Although the expression '3GU' has not yet been generally adopted in Germany, the concept is by no means new as RWTH, TUM and many other such hubs are already impressive while the *Gesellschaften* and *Gemeinschaften* combine government-sponsored fundamental research with work for industry, in the words of Jürgen Leohold of Volkswagen: "We do research together"¹⁷. Despite the virtues of these practices, systematic support for technostarters – students or researchers who start their own technology-based firm – is lacking. New technology is brought to the market by either existing firms or start-ups. We would postulate that without technology-based start-ups, innovation stumbles along on one leg. In the words of Theun Baller of Philips Research in his presentation to the Enterprising Knowledge Conference: "Business start-ups are more effective than technical solutions."

Perspective

The unprecedented rate at which new discoveries are announced makes one feel as if scientific discovery has only just started. The first cell with a synthetic genome – "As close to God as it gets" read the cover of *The Economist* at the time – was created in 2010 by Craig Venter. By the way, this research was financed by a \$ 600 million grant from Exxon Mobile, which is pursuing modified algae as an alternative source of energy. Japanese robots can dance, play football, do all kinds of packaging, write their own name with a felt pen and play Elgar's *Pomp and Circumstance*

on the violin. We teach children that the moon rotates around the earth because of gravity, but 'gravity' is just a word: how does the moon know the earth is there in the first place? It seems that CERN is close to confirming the existence of the Higgs boson (proposed as early as 1964), which is the hypothetical manifestation of the Higgs field, which may throw light on such very fundamental physical questions and perhaps even some metaphysical ones. Remember that IBM's Deep Blue computer beat Garry Kasparov in 1997? It showed that computers are superior in making linear calculations but we would say: computers will never do associative thinking. Well, forget it. On Feb 16, 2011, after a three-night tournament, IBM's supercomputer Watson (so named after its founder, Thomas J. Watson) defeated champions Ken Jennings and Brad Rutter in the American Jeopardy TV show. Jeopardy is an American quiz show featuring topics such as history, literature, the arts, pop culture, science and sports. A major investment, this computer? No, the software runs on a standard supercomputer with 2,880 IBM Power750 cores (computing brains); it takes 15 terabytes of memory. This sounds like a lot of memory but 15 TB is just ten times more memory as my grandson got in the game computer he recently bought for \$ 1500. So, in say five years, 'Watson' will be in a cell phone near you. Imagine the Japanese putting 'Watson' in one of their robots, you would get something like R2D2 of the Star War series, or better. Imagine how such robots would revolutionise the way we do research.

The gap between adoption and discovery and innovation

Equally striking as the rate of scientific discovery is the speed of diffusion: only eleven years after the first sequencing of the human genome, is this analysis routine in a number of hospitals. It took just-in-time logistics about as much time to be adopted globally.

Still, the gap between what we know and what we use seems to get larger all the time. If that is true, it would mean that the realisation of the knowledge economy depends more on the rate of adoption than that of discovery and this brings us back to innovation. In part, we still live in the 19th century. We train our children to become good scientists and engineers; we forget to train them in addition to become good entrepreneurs. There are several reasons for this. The idea that private entrepreneurship means enriching yourself at the expense of others is still widely engrained in Europe. Perhaps a more important reason is that, until now, we did not need high-tech start-ups, as the corporations would take care of innovation. This is no longer valid: we need "two-leg" innovation. This can only be accomplished if entrepreneurship – the weak element in the European Innovation Systems – becomes as much a part of our cultural inheritance as the values of the Enlightenment. This means: playful introductions into entrepreneurship at kindergarten, working papers at Lyceum, obligatory courses at university and Hochschule – in any university and Hochschule curriculum. It also means putting entrepreneurship high on the political agenda; there is some, albeit shallow, evidence that entrepreneurship policies can be effective¹⁸. Finally, it means we deliberately 'massage' our beloved Humboldt universities to adopt the 3GU model.

Footnotes

- 1 "Think different", Schumpeter column, *The Economist*, August 6th, 2011, p. 53. See also the presentation of Jonathan Haskel of Imperial College to the Conference Enterprising Knowledge on www.stifterverband.de/enterprising-knowledge.
- 2 Ch. Freeman and L. Soete, *The Economics of Industrial Innovation*, 3rd edn, Pinter, London, 1997.
- 3 C. Freeman, *Technology Policy and Economic Performance – Lessons from Japan*, Frances Pinter Publishers, London, 1987.
- 4 See: J.G. Wissema, "It's entrepreneurship stupid! – A new look at Innovation Policy", Edward Elgar Publishers, forthcoming.
- 5 Pinchot, G., *Intrapreneuring: why you don't have to leave the corporation to become an entrepreneur*, Harper & Row, New York, 1985.
- 6 C. Chirstensen et al, *The Innovator's DNA*, Harvard Business School Press (1 July 2011).
- 7 J. Lerner, *Boulevard of broken dreams – Why public efforts to boost entrepreneurship and venture capital have failed, and what to do about it*, Princeton University Press, 2009.
- 8 H.W. Chesbrough, *Open innovation – the new imperative for creating and profiting from technology*, Harvard Business School Press, 2003. See also the presentation of Roland Harwood at the Conference Enterprising Knowledge on www.stifterverband.de/enterprising-knowledge.
- 9 See the presentations of Monika Lessl of Bayer HealthCare and Helen Neville of Proctor & Gamble to the Conference on www.stifterverband.de/enterprising-knowledge.
- 10 E. M. Rogers, "The diffusion of innovations", Simon & Schuster International; 5th Revised edition, 2003.
- 11 The Technopark of TU Wroslaw in Poland offers its tenants the use of high-tech analytical equipment, obtained with a grant from the EU.
- 12 See the presentation of Frank Kalkbrenner of Boehringer Ingelheim Venture Fund to the Conference Enterprising Knowledge on www.stifterverband.de/enterprising-knowledge.
- 13 "Start me up", *The Economist*, August 6th, 2011, pp. 26-28.
- 14 J.G. Wissema, "Towards the Third Generation University", Edward Elgar Publishers, London, 2009 (translated into Turkish, Polish, Macedonian; Russian translation to be published end 2011 by St Petersburg State University).
- 15 See the presentation of Bradley Hardiman of Cambridge Enterprise, University of Cambridge UK, to the Conference Enterprising Knowledge on www.stifterverband.de/enterprising-knowledge.
- 16 Economics Department of BankBoston (now Bank of America), MIT: The impact of Innovation, Publication of BankBoston, Boston, March 1997 (web.mit.edu/newsoffice/founders/ - 3k).
- 17 His presentation to the Conference Enterprising Knowledge on www.stifterverband.de/enterprising-knowledge.
- 18 F. Welter et al (eds), *Handbook of research in entrepreneurship policies in Central and Eastern Europe*, Edwin Edgar Publishing, July 2011.

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