Radical and incremental innovation

A radical or disruptive innovation is one that has a significant impact on a market and on the economic activity of firms in that market, while incremental innovation concerns an existing product, service, process, organization or method whose performance has been significantly enhanced or upgraded. Incremental innovation is the dominant form of innovation. The nature of innovation and the rate of technological change greatly differ from sector to sector and across countries and time periods.

What are radical innovation and incremental innovation?

A radical or disruptive innovation is an innovation that has a significant impact on a market and on the economic activity of firms in that market. This concept focuses on the impact of innovations as opposed to their novelty. The innovation could, for example, change the structure of the market, create new markets or render existing products obsolete. However, it might not be apparent that an innovation is disruptive until long after it has been introduced, and the cut-off point between incremental and radical innovation might be set at different levels. This makes it difficult to collect data on disruptive innovations within the period reviewed in an innovation survey, typically two years. In Schumpeter's view "radical" innovations create major disruptive changes, whereas "incremental" innovations continuously advance the process of change (Schumpeter, 1942).

Incremental innovation concerns an existing product, service, process, organization or method whose performance has been significantly enhanced or upgraded. This can take two forms: For example, a simple product may be improved (in terms of improved performance or lower cost) through use of higher performance components or materials, or a complex product comprising a number of integrated technical subsystems may be improved by partial changes to one of the subsystems.

How important are radical and incremental innovations?

Incremental innovation most prevalent. Incremental innovation is the dominant form of innovation. Radical innovation is generally a complex process, rather than a discrete event, and generally implies a difficult, lengthy and risky process. Smaller firms, or new market entrants, can play important roles in introducing radical innovations. The diffusion of radical innovations nearly always depends on incremental improvements, refinements and modifications, the development of complementary technologies, and organisational change and social learning. The contributions of incremental innovations to address socioeconomic challenges are substantial and may be even more important in a development context. For instance, Puga and Trefler (2010) provide evidence of the rise of incremental innovation in low-wage countries and show how it has been contributing to increasing exports of high-quality and sophisticated manufactured goods.

Innovation differs by sector. Yet, the nature of innovation and the rate of technological change greatly differ from sector to sector. Some sectors are characterised by rapid change and radical innovations, others by smaller, incremental changes. In high-technology sectors, R&D plays a central role in innovation activities, while other sectors rely to a greater degree on the adoption of existing knowledge and technology. Low- and medium-technology industries (LMTs) are often generally characterised by incremental innovation and adoption. As such, innovation activities are often focused on production efficiency, product differentiation and marketing (Von Tunzelmann and Acha, 2005). Innovation activity in services also tends to be a continuous process, comprising a series of incremental changes in products and processes. This may occasionally complicate the identification of innovations in services in terms of single events, i.e. as the implementation of a significant change in products, processes or other methods.

What are the policy implications of the distinction between radical and incremental innovations?

Because innovations are of different types, occur in many different ways, and have varying effects, they call for different policy responses. For example, research has found that policies that address the tail-end of the product innovation cycle and encourage demand for innovation are more likely to stimulate incremental innovation than to foster radical innovation (Nemet, 2009). By contrast, publicly funded research has often been found to be critical prior to the introduction of many of the radical innovations of the past. The latter is better induced through technology- (or supply)- push policies (OECD, 2009).

References

- Nemet, G. F. (2009), “Demand pull, technology push, and government-led incentives for non-incremental technical change”, Research Policy, Vol. 38/5, pp. 700–709.
- OECD (2012), OECD Science, Technology and Industry Outlook 2012, OECD Publishing. doi: 10.1787/sti_outlook-2012-en
- OECD (2010), “Fostering innovation: The policy challenge”, in The OECD Innovation Strategy: Getting a Head Start on Tomorrow, OECD Publishing. doi: 10.1787/9789264083479-en
- OECD (2009), “Policies for Demand-led Innovation: Interim Report”, internal working document.
- OECD/Eurostat (2005), The Measurement of Scientific and Technological Activities—Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd ed., OECD Publishing. doi: 10.1787/9789264013100-en
- Puga, D. and D. Trefler (2010), “Wake up and smell the ginseng: International trade and the rise of incremental innovation in low-wage countries”, Journal of Development Economics, Vol. 91/1, January 2010, pp. 64–76. http://dx.doi.org/10.1016/j.jdeveco.2009.01.011 [1]
- Schumpeter J. (1942), “Capitalism, Socialism, and Democracy”, Harper, New York
- Smith, K. (2009), “Climate change and radical energy innovation: The policy issues”, TIK Working Papers on Innovation Studies No. 20090101, University of Oslo, Centre for Technology, Innovation and Culture, Oslo.
- Von Tunzelmann, N. and V. Acha (2005), “Innovation in “low tech’ industries”, Chapter 15 in J. Fagerberg, D. Mowery and R.R. Nelson (eds), The Oxford Handbook of Innovation, Oxford University Press, Oxford, UK.

Links
[1] http://dx.doi.org/10.1016/j.jdeveco.2009.01.011