

A REVIEW OF THE LITERATURE ON THE DETERMINANTS OF INNOVATION

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ABSTRACT

Innovation research is typically concerned with understanding how innovations emerge, develop, grow and are displaced by other innovations. The present paper explores from a theoretical as well as from a managerial perspective, some of the determinants of innovation: technology, R&D management, leadership, company size, company age, company location, market structure.

Introduction

In today's fast changing world, characterized by rapid technological developments and changing market demands, the success and survival of the organizations depend on creativity, innovation, discovery and inventiveness (Mostafa, 2005; Herbig and Jacobs, 1996).

The term "innovation" can strike fear into the heart of many enterprises that are struggling to stay alive. Faced with challenges like *skills shortages*, lack of training, lack of capital, excessive taxation, fluctuating currency levels, many enterprises feel they can't cope with the added burden of trying to be innovative. On the other side, the role of innovations in achieving higher economic growth has been recognized in the models of economic growth and national competitiveness. Recently, innovations are considered the basic resource for the formation of dynamic and competitive knowledge-based economy (Račić and Aralica, 2005)

Innovation research is typically concerned with understanding how innovations emerge, develop, grow and are displaced by other innovations (Vollenbroek, 2002). In order for an innovation to be effective, or even successful, it must result in a significant change, preferably an improvement in a real product, process or service compared with previous achievements (Harper and Becker, 2004, Riddle, 2000).

Innovation is a complex and multifaceted phenomenon that, to be properly understood, requires in depth examination of a large variety of phenomena spanning from the inception of the original innovative idea, to the research activities to turn this idea into new knowledge that can be potentially applied, to the process of embodiment of this knowledge into a product/service or process to be commercialized (Polt, Vonortas and Fisher, 2008).

In recent years a lot of research has been done to find out which factors contribute to innovation efforts of an organization, to build a more thorough theoretical foundation for the mechanisms behind innovations and to substantiate practical interventions. From the point of view of the set of antecedents of innovation, two major streams of research can be identified (Prajogo and Ahmed, 2006). One stream examines innovation in terms of technological aspects, while the second focuses upon human aspects. Studies covering

technological factors of innovation, such as Napolitano (1991) and Leblanc et al. (1997), emphasize the importance of technology and research and development (R&D) for innovation. This research stream conceives that technology and R&D are the ‘front-edges’ of innovative firms. On the other hand, studies on the human factors of innovation emphasize such factors as organizational structure and culture. This research stream presupposes that people and organizational context are the main determinants of successful innovation (Cooper and Kleinschmidt, 1995; Zien and Buckler, 1997).

Other researchers have been explained the intensity of organizations innovation through analysis of the external and internal factors). External factors refer to opportunities a company can seize from its environment. Internal factors refer to characteristics and policies of a company. From the point of view of the influence of external factors on the innovation, the researchers (Nieto and Quevedo, 2005) have been analyzed how the degree of concentration of an industry, the stimulus of demand, the existence of technological opportunities, suitability for appropriation or the existence of spillovers can shape the innovative behavior of a business. Other works has emphasized the part played by factors that are internal, and thus controllable by the firm. These have included size (Cohen and Klepper, 1996), mechanisms for coordination between departments (Gupta et al., 1985), human resources procedures (Wolfe, 1995), capacity for self-financing (Grabowski, 1968), the type of diversification strategy adopted (Scott and Pascoe, 1987), and the nature of organizations’ competences (Henderson and Cockburn, 1994).

Some determinants of innovation

As previously said, many studies revealed that activities directed to innovation correlate with a considerable number of factors. From a theoretical as well as from a managerial perspective, it seems to be relevant to present some of the factors that contribute most to innovation efforts.

Technology

Technology is an important driver of innovation. Theoretical and empirical studies show that technology not only plays a key role in creating new products or processes, but sometime it changes the fundamentals of industry structure by radically redefining “the rules of competition”. The consequence of these shifts may entirely destroy existing markets and/or create new ones. As such, the term “technological innovation” is very popular in the literature on innovation (Shane and Ulrich, 2004), even though researchers have pointed out that innovation may not always be technologically based (Claver et al., 1998).

R&D Management

Many companies decided to augment their technological capabilities, either through in-house efforts or external sourcing. Traditionally, large firms relied on internal R&D to create new products. In many industries, large internal R&D labs were a strategic asset and represent a considerable barrier to entry for potential entrants. As a result, large firms with extended R&D capabilities and complementary assets could outperform smaller rivals (Teece, 1986). This process in which large firms discover, develop and commercialize technologies internally has been labeled as “closed innovation” (Chesbrough, 2003). For a long time, closed innovation has been a very successful way used by companies to sustain a competitive advantage in their different businesses. However, the innovation landscape has changed considerably. In addition to internal R&D, many companies need to get access to external knowledge, such as startups, universities,

suppliers, or even competitors to stay competitive in the long run. So, a growing number of large companies have been moving from an internally focused innovation process to one that is more “open”. In this new era of “open innovation”, companies use both internal and external pathways to exploit technologies and, concurrently, they scout different external sources of technology that can accelerate their innovation process (Chesbrough, 2003). Companies are engaged in joint R&D because it allows the utilization of external resources for their own purposes directly and systematically. The benefits of R&D cooperation (Becker and Peters, 1998) can be described as follows: joint financing of R&D, reducing uncertainty, realizing cost-savings, realizing economies of scale and scope.

Leadership

Leadership has been suggested to be an important factor affecting innovation (Gumusluoglu and Ilsev, 2009, Jung et al., 2003). Broadly speaking, leaders of organizations perform two main roles in relation to innovation. First, they are motivators – they inspire people to transcend the ordinary and innovate. Second, they are architects in the administrative sense – designing an organizational environment that enables employee to be innovative.

Zaltman et al (1973) mention that innovation is a highly complex social process that requires the effective interaction of a large number of individuals and sub-units within the innovating organization. There is thus a need to provide directive leadership through professional managers.

Company size

Cohen and Klepper (1996) argue that returns of an innovation are positively related with the size of the company and that this relationship is stronger for process innovations than for product innovations. For process innovation, they assume that it cannot be sold in disembodied form; the return of a process innovation that improves the price-cost margin is positively related to the internal applications (that depend on the company's output). Higher volumes of production imply higher gross benefits of an innovation. Hence, larger companies are able to benefit more from a certain innovation than smaller companies because larger companies can spread the benefits over a greater volume.

On the other hand many empirical studies of the relation between innovative output and firm size found that small companies generate more innovations per dollar of R&D. Researchers have puzzled whether this is evidence that small companies are more efficient innovators than large companies. The argument in favor of small companies is that they have flexibility in adjusting employees in innovation related projects and less complex management structures in implementing new projects.

Company location

It is found generally in the international literature (Acs, 2002) that innovation propensity is increased when companies are located in large and diverse cities. Combining this observation with the above observations from the companies' size, suggests that large concentrations of small firms in large cities should promote innovation.

Company age

The research in the field has associated company experience, and implicitly its age, with learning. Learning-by-doing, widely studied in economics, has been associated with decreases in the marginal cost of production as the company accumulate production experience. There is ample evidence that a firm's innovative activities may be subject to learning effects. In other words, firms' innovative abilities may improve with time.

Market structure

Which market conditions are optimal for effective and sustained innovation to occur? This is a question that has preoccupied economists and business academics for many years. The empirical evidence shows that this relationship most likely depends on the characteristics of the industry under consideration (particularly the number of firms in the market and the level and availability of technology). High levels of research and development spending are frequently observed in oligopolistic markets. Geroski (1990) has stated that the role of rivalry in stimulating innovation is considerable but is nowhere near as important as that of technological opportunity. Monopolists are capable of doing this due to higher profits and the ability to feed off past innovations. The benefits are offset by the possible negative effects of social welfare loss to consumers and the squeezing out of competitors; problems that are avoided in a competitive market.

Baumol (2002) also concludes that competition, not market power, encourages firms to innovate. Institutions and government policy are significant. Technological change and productivity growth has been known to occur more freely when the government sets a favorable climate for change (Acemoglu et al., 2002). Also important is the enacting of appropriate antitrust legislation. From a policy perspective, antitrust interventions must examine carefully and individually the cases of companies abusing monopoly power and should not always act to eliminate the incentives for innovation.

Organizational culture

Organizational culture is a set of beliefs and values shared by members of the same organization, which influence their behaviors. This culture reflects a common way of thinking, which drives a common way of developing, manufacturing, and marketing a product. Kenny and Reedy (2007) emphasize that organizational culture affects the extent to which creative solutions are encouraged, supported and implemented. Yeung, Brockbank and Ulrich (1991) refer that organizational culture is important as a vehicle for implementing organizational change. King (1990) points out that though not all organizational change involves innovation, but all organizational innovation involves change. Christensen (1997) suggests that an organization's resources, processes and values (its culture) contribute to its ability to adopt innovations. Kanter (1988) stresses the importance of a "pro-innovation" culture.

Conclusion

From the perspective of innovation policy, there are also other more urgent framework conditions than the flaws in the system itself: for example, fiscal burdens on labor, inflexible education and training system, etc. The sense of urgency to solve these problems is however not always adequate.

References

1. Acemoglu, D., Aghion, P. and Zilibotti F. (2002). "Distance to Frontier", *Selection and Economic Growth*, MIT Economics Working Paper, No. 04-03.
2. Acs, Z.J., 2002, *Innovation and the Growth of Cities*, Edward Elgar, Cheltenham
3. Becker, W., Peters, J., 1998. "R&D-competition between vertical corporate networks: structure, efficiency and R&D-spillovers". *Economics of Innovation and New Technology* 6, pp. 51–71.

4. Baumol, W. J. (2002) *The Free-Market Innovation. Machine: Analyzing the Growth Miracle of Capitalism*. Princeton University Press
5. Chesbrough, H., 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press: Boston, MA.
6. Christensen, Clayton M (1997), *The Innovator's Dilemma*. Boston: Harvard Business School Press
7. Claver, E., Llopis, J., Garcia, D. and Molina, H. (1998) "Organizational culture for innovation and new technological behavior". *Journal of High Technology Management Research*, 9, pp. 55–68
8. Cohen, W.M., Klepper, S. (1996). "A reprise of size and R&D". *The Economic Journal* 106, pp. 925–951.
9. Cooper, R.G. and Kleinschmidt, E.J. (1995) "Benchmarking the firm's critical success factors in new product development". *Journal of Product Innovation Management*, 12, pp. 374–391
10. Geroski, P.A. (1990). "Innovation, Technological Opportunity and Market Structure". *Oxford Economic Papers*, New Series, Vol. 42, No. 3: pp. 586-602.
11. Grabowski, H.G. (1968) "The determinants of industrial research and development: a study of the chemical, drug and petroleum industries". *Journal of Political Economy* 76, pp. 292–306.
12. Gumusluoglu, L., İlsev, A. (2009) "Transformational Leadership and Organizational Innovation: The Roles of Internal and External Support for Innovation". *Journal of Product Innovation Management*, Vol. 26, pp. 264-277, 2009.
13. Gupta, A.K., Raj, S.P., Wilemon, D.L.(1985). "The R&D/marketing interface in high-technology firms". *Journal of Product Innovation Management* 2, pp. 12–24.
14. Hardie, Mary P. and Manley, Karen (2008) "Enabling factors for innovation by small contractors". In *Proceedings Clients Driving Innovation: Benefiting from Innovation*, Gold Coast, Australia
15. Harper SM, Becker SW. (2004) "On the leading edge of innovation: a comparative study of innovation practices". *Southern Business Review* 29:1–15
16. Henderson, R., Cockburn, I. (1996). "Scale, scope and spillover: the determinants of research productivity in drug discovery". *Rand Journal of Economics* 27(11), pp. 32–59.
17. Herbig, P., Jacobs, L. (1996), "Creative problem solving style in the USA and Japan", *International Marketing Review*, Vol. 13 pp.63-71
18. Jung, D. I., Chow, C., and Wu, A. (2003). "The Role of Transformational Leadership in Enhancing Organizational Innovation": *Hypotheses and Some Preliminary Findings*. *Leadership Quarterly*, 14: 525-544
19. Kanter, RM (1988), "When a Thousand Flowers Bloom: Structural, Collective, and Social Conditions for Innovation in Organization", *Research in Organizational Behavior*, Vol. 10, pp. 169-211.
20. Kenny, B., Reedy, E. (2006), "The Impact of Organisational Culture Factors on Innovation Levels in SMEs: An Empirical Investigation", *The Irish Journal of Management*, January 2006, pp 119-42
21. King, N (1990), "Innovation at work: the research literature". in M. West and J. Farr (Eds.) *Innovation and creativity at work*, pp 15-61, New York, John Wiley and Sons.

22. LeBlanc, L.J., Nash, R., Gallagher, D., Gonda, K. and Kakizaki, F. (1997) "A comparison of US and Japanese technology management and innovation". *International Journal of Technology Management*, 13, 601–614.
23. Mostafa, M. (2005), "Factors affecting organizational creativity and innovativeness in Egyptian business organizations: an empirical investigation", *Journal of Management Development*, Vol. 24 pp.7-33.
24. Napolitano, G. (1991) "Industrial research and sources of innovation: a cross-industry analysis of Italian manufacturing firms". *Research Policy*, 20, 171–178
25. Nieto M. and Quevedo P. (2005) "Absorptive capacity, technological opportunity, knowledge spillovers, and innovative effort", *Technovation*, 25, 1141–1157
26. Polt, W., Vonortas, N. and Fisher R. (2008), *Innovation Impact*, Final report to the European Commission, Brussels: DG Research.
27. Prajogo D. I., Ahmed P.K. (2006) "Relationships between innovation stimulus, innovation capacity, and innovation performance". *R&D Management*, 36(5), pp. 499-515
28. Račić, D., Aralica Z. (2005) *Innovation in Croatian Enterprises*. Zagreb: The Institute of Economics
29. Riddle, D. (2000) "Why innovate?". **International Trade Forum** vol. 2000/2, pp. 18-19.
30. Scott, J.T., Pascoe, G. (1987). "Purposive diversification of R&D in manufacturing". *Journal of Industrial Economics* 36, pp. 193–206.
31. Shane, S., Ulrich, K. (2004) "Technological innovation, product development, and entrepreneurship in Management Science", *Management Science*, 50(2): pp. 133-144, 2004
32. Teece, D. (1986) "Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy". *Research Policy* 15, pp. 285-305
33. Vollenbroek, F. (2002) "Sustainable development and the challenge of innovation". *Journal of Cleaner Production*, vol. 10, pp. 215-223
34. Wolfe, R. (1995), "Human resource management innovations: determinants of their adoption and implementation", *Human Resource Management*, 34(2), pp. 313-332
35. Yeung, A, Brockbank, J & Ulrich, D (1991), 'Organizational culture and human resources practices: An empirical assessment'. In Woodman, RW & Pasmore WA (Eds.) *Research in organizational change and development*, pp 59-82), London, JAI Press
36. Zaltman , J., Duncan, R. and Holbek, J. (1973), *Innovations and Organizations*, New York, John Wiley and Sons.
37. Zien, K.A. and Buckler, S.A. (1997) "Dreams to market: crafting a culture of innovation". *Journal of Product Innovation Management*, 14, pp. 274–287.