

# A HOLISTIC CONCEPTUAL MODEL FOR MANAGING INNOVATION

Paraskevi Gkiourka<sup>1</sup>, Apollo Tutesigensi<sup>2</sup> and Krisen Moodley<sup>3</sup>

*Institute for Resilient Infrastructure, School of Civil Engineering, University of Leeds, LS2 9JT, Leeds, UK*

Research has ranked innovation as one of the key sources of organizational competitiveness for many years now. However, deficiencies still remain in the conceptualization of innovation. This paper presents a new and holistic model of innovation. The conceptual model attempts to move from partially capturing innovation to encapsulating its multidimensionality. It takes into account the fact that innovation can be distributed across many actors, has socioeconomic and political influences, and is affected by practices in each organizational discipline. The model is built on heuristic concepts of systems theory, diffusion theory and strategic management. The model is built to facilitate examination of particular contexts within which innovation can flourish by capturing as many contributing factors as the extant literature suggests using grounded theory techniques. The factors included in the model cover the internal organizational context, the strategic resources, and the wider external environment of the organization. This enriched way of conceptualizing innovation can be used in the facilitation of self-audit activities, helping organizations to recognize suboptimal practice as well as continuous transformation towards effective and efficient innovation. The model can be applied in the construction industry that is considered as the lynchpin of development in achieving wealth and quality of life in every economy.

Keywords: holistic approach, innovation.

## INTRODUCTION

The management of innovation has evolved over time and an understanding of innovation models can be achieved through examining the evolutionary stages of research in this area. A holistic approach in conceptualizing innovation provides the opportunity to understand and manage innovation more effectively within specific contexts.

### **Evolution of research on innovation**

Interest in innovation research can be seen to have started in the 1950s when new industries emerged and industrial activity expanded (Niosi 1999 and Rothwell 1994). This new technological intensive era of research known as the “technology push” period was dominated by focusing on Research and Development (R&D) and the continuous production of new products for the market, while paying little attention to the market’s real needs (Tidd 2006). Conceptual models in innovation research during this period have depicted innovation as technologically driven (technology

---

<sup>1</sup> cnp@leeds.ac.uk

<sup>2</sup> a.tutesigensi@leeds.ac.uk

<sup>3</sup> k.moodley @leeds.ac.uk

push models). These models limit innovation management to the organizations' ability to invest in R&D activities that lead to radical changes and disregard incremental changes.

In the mid 1960s, the market revealed the need to approach innovation differently and reallocated the interest from the creation of new products to identifying the market 'need'. Increased competition in the market's environment changed the focus from increasing productivity to strategic marketing. This so-called "marketing pull" period was characterized by marketing pull models that focussed on market driven R&D activity and led to incremental changes in products or processes to meet customer requirements (Tidd 2006).

In the early 1970s, constrained resources enforced minimization of cost (Rothwell 1994) and a radically different way of managing the innovation process was introduced (Niosi 1999 and Rothwell 1994). This so-called "coupling elements" period focused on the interaction of R&D and marketing strategies to yield more commercially successful results. This research period showed that innovation could be better managed by increasing competency on many elements and activities, paying attention to the interaction of the different elements and the feedback loops between them (Rothwell 1994). However, the multidimensional approaches to innovation management tended to consider organizations as independent entities and did not account for the interactions with the external environment and its financial stability that could directly influence the innovation potential of organizations as recently seen after the 2008 global economic crisis.

In the early 1980s until the early 1990s, innovation research was characterized by increased focus on strategic alliances and networking activity between companies (Rothwell 1994). Performance and market share were related with speed in development. The Japanese 'Just In Time' model introduced parallel development and integration of activities and it was seen as enabling a more rapid and efficient innovation process. However, this goal-oriented model has been considered to be restrictive because it minimizes the importance of managing unexpected changes, which could also include other opportunities for exploitation.

The current generation of innovation research is identified to have started in the early 1990s and is dominated by focusing on the elements identified in the previous generations such as strategic networking, time-based strategies, better integration of product design and manufacturing, organizational flexibility and adaptability (Rothwell 1994). Attention now is also given to the linkages with the globalized market environment and the world economy directly affecting innovation in organizations. In this period, some conceptual models of innovation management depict innovation as new product development only – they disregard the linkages with the process of innovation and are therefore considered to be partial models. Other models associate innovation competences with capabilities of human resources in R&D teams only, thereby, reducing the capacity of organizations to benefit from all employees' creativity (Tidd 2006).

### **Research problem**

The exploration of the evolution of research in innovation management and innovation models reveals the tendency of approaching the management of innovation in a limited way as a result of partially encapsulating important factors (Tidd 2006). However, organizations are complex systems of interrelated disciplines and processes and innovation is an improvement process that needs to be facilitated by changes in

other business processes (Askarany and Smith 2008). In the context of the ‘holism’ of the systems approach, organizations as ‘wholes’ need to manage innovation by focusing on all the different disciplines examined in relation with their environments which have direct influence and interdependence (Jackson 1991).

Furthermore any incremental improvements resulting from the innovation process need to be diffused throughout the organization system and challenge other possible elements that interact with the initial incremental improvements. The successful management of innovation is thus supported by the diffusion process. In order to capture the diffusion process and the factors that can impact the acceleration of diffusing any incremental improvements in an organization, it is important to gain understanding on whether organizations are making the most out of what is impacting the innovation process (Hivner, Hopkins, and Hopkins 2003). Diffusion theory suggests that there are contextually-dependent factors such as organizational size, organizational structure, organizational culture, organizational strategy, and other influential factors related to environment that can affect the diffusion of innovations (Askarany, 2005; Askarany and Smith 2008 and Rogers 2003). Therefore, there is an opportunity to encapsulate factors that other models in the literature suggest into one single model that can combine the dynamics of the external ecosystem of organizations with the organizational internal strategic competences in order to deliver innovation.

This paper, presents a new holistic model of innovation that can be used to capture and manage the totality of innovation in a given context. The model is based on the philosophical context of experiential realism.

### The philosophical context

The realist approach in simple terms is described thus: “the outcome of an action follows from the mechanisms acting in particular contexts” (Robson 2002: p. 31). On the basis of the realist approach, innovation can be seen to result from a mechanism powered by factors playing a key role in innovation and the particular conditions that pertain to each factor, acting in specific context. The approach is illustrated in Figure 1. The figure is based on the representation of realists’ explanation proposed by Robson (2002) and adapted for the concept of innovation employed in the research from which this paper emanates.

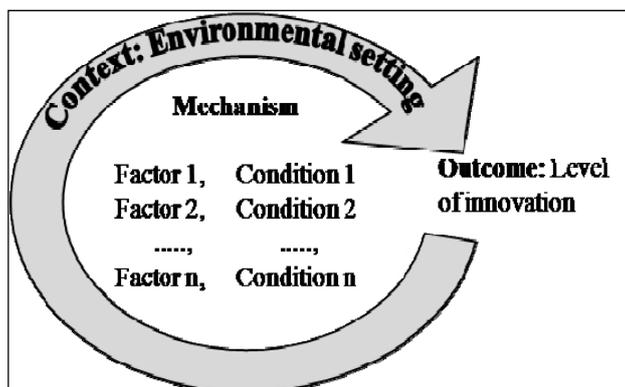


Figure 1: The concept of innovation in a relativist's context

The mechanism is composed of all factors facilitating innovation and the particular conditions that apply to each factor explaining the causality of innovation. Conditions reflect the current practices of the organization with respect to each factor or the specific features of contextually-dependent factors. The context involves the different

environmental settings (e.g. country or sector) within which different innovation levels can be observed. The composition of different factors and the variability on the respective conditions explain that more than one mechanism can have causal changes to the outcome. Realizing the factors and the relevant conditions that have an effect on innovation can increase understanding on how innovation can emerge and be managed. This understanding can be used to manipulate the mechanism and optimize the outcome by applying changes to the factors and/or conditions depending on the context.

### **Aim of the paper**

Building on the realist explanation and in developing such a holistic model, the management of innovation can be said to involve the following stages.

- Stage 1: Identification of the mechanism for the context under study.
- Stage 1.1: Identification of factors explaining the causality of innovation.
- Stage 1.2: Identification of the conditions that pertain to the identified factors.
- Stage 2: Identification of the impact of the mechanism on the level of innovation; and
- Stage 3: Determination of changes to the mechanism required in order to increase efficiency and effectiveness and achieve desired levels of innovation.

The above stages are the subject of an on-going research project. However, the aim of this paper is to present the work done and results realized in Stage 1.1.

## **METHOD OF IDENTIFYING FACTORS CONTRIBUTING TO INNOVATION**

In order to identify the factors that contribute to innovation, extant literature was explored using principles of grounded theory. Grounded theory techniques such as extant texts analysis, coding and category building were used to identify the factors that contribute to innovation (Charmaz 2007). Extant texts identified in the literature related to innovation, innovation theories, and organizational innovation practices were used as a preliminary source of data in order to inform the framework of arguments. The texts were used as objects of analytic scrutiny and not evidence (Charmaz 2007). Coding was used to create the ‘bones’ of the analysis, which integrated with the theoretical constructs and formed the ‘skeleton’ of the research (Charmaz 2007). The coding process included naming segments of data in the extant texts followed by focusing on the most significant and frequent concepts of innovation to sort and synthesize them into theoretical categories emerging from the data. Theoretical sensitivity was addressed by comparing the emerging categories with theoretical notions, definitions and categories from grand theories such as the systems theory (Askarany and Smith 2008), diffusion theory (Askarany 2005; Askarany and Smith 2008; Rogers 2003) and resource-based theory (Kristandl and Bontis 2007). The notions of systems theory and diffusion theory informed the approach of conceptualizing the totality of factors addressing each and every discipline of the organization system. The resource based view (RBV) contributions to organizational performance have been relevant to different fields of study including human resource management (Wright, Dunford, and Snell 2001), economics and finance, entrepreneurship, and marketing and internationalization of business (Barney, Wright, Ketchen, and David 2001). The resource-based approach argument that sustainable

competitive advantage and the ability to change are directly influenced by the strategic resources of the organization has informed the identification of the categories.

Categories emerged from research material rather than concentrating effort on preconceived concepts and terms, which poses the danger of forcing exception of important theoretical knowledge (Bryant and Charmaz 2007). The analysis of the literature has reached a point of saturation, meaning that the research on the factors stopped at the point where the categories revealed, started to repeat and further extant texts examined did not contribute any new factors or reveal any new categories.

## RESULTS

The process of saturation in exploring the literature revealed that other research in the field can be classified in three key areas: research on innovation related to the internal environment of organizations; research on strategic resources that facilitate innovation to occur; and research on innovation related to the external environment in which organizations operate. The main categories that emerged in each key area and the factors within each category that are relevant to innovation are shown in Table 1.

Table 1: Categories and factors that emerged in the key areas of research on innovation

Key Area	Categories	Factors	Source	
Internal environment of organisations	Culture	• Technology	Sexton & Barrett 2004	
		• Leadership style	Day 2001; Carneiro 2008; Oshagbemi & Ocholi 2006	
		• Ownership type	Dainty, Green, & Bagillhole 2007	
	Structural Constructs	• Collaborations	Love, Roper, & Du 2009	
		• Hierarchy	Langford & Male 2001; Keegan & Turner 2002	
		• Number of people reporting to a manager	Finlay 2000; Langford & Male 2001	
Strategy- Policy	• Organisational relationships	• Organisational size	Thompson 2003; Egbu 2004	
		• Strategy	Shefer & Frenkel 2005	
		• Policy	Thompson 2003; Gelderen, Fresco, & Thurik 2000; Faulkner & Campbell 2006; Porter 1985	
	• Organisational learning systems	• Organisational learning systems	Faulkner & Campbell 2006; Koontz & O'Donnell 1968	
		• Promotion of products/services	Thompson 2003; Ortenblad 2004	
Strategic resources of organisations	Marketing strategy	• Intellectual property rights	Smyth 2000; Kotler 2003	
		• Sales management	Andersen 2005	
		• Market information availability	Smyth 2000; Mintzberg 1979; Tang 1998; Vinding 2006; Greco 2008	
		• Capital structure	Acs 2002	
	Finance	• Financial management	Silverstein, Samuel, & DeCarlo 2009	
		• R&D spending	Vinding 2006; Dale 2007	
		• Financiers attitude	Kumaraswamy, Ng, Ugwu, Palanceswaran, & Rahman 2004; O' Sullivan 2005; Kumaraswamy, Ng, Ugwu, Palanceswaran, & Rahman 2004	
	Systems-Processes- Knowledge management	• Process integration	• Process integration	Vallé & Vázquez-Bustelo 2009; Berente, Vandenbosch, & Aubert 2009; Rajagopal 2002
			• Quality control	Brown, Lamming, Bessant, & Jones 2000
		• Knowledge management	Chang & Lee 2008	

<b>Human resources management</b>	• Number of R&D staff	OECD 2002 Nooteboom, Van Haverbeke, Duysters, Gilsing, & van den Oord 2007; Schmidteberg 2008 Gupta 2004; Reid & Barrington 1999; Nijhof Krabbendam & Looisc 2002 Reid & Barrington 1999; Vinding 2006 Kearns 2003 Lau & Ngo 2004	
	• Competence skills of R&D staff		
	• Performance of R&D staff		
	• Age profile of R&D staff		
<b>External environment of organisations</b>	Political and legal framework	• Political freedom	Manseau & Scaden 2001
		• Incentives to foreign investors	
	Economic environment	• Competition framework	Rama 2000; Herrmann & Lipsey 2003 Ahn 2002; Manseau & Scaden 2001; Schumpeter 1942
		• Employment framework	Pierre & Scarpeita 2004
		• Health and safety regulations	Manseau & Shields 2005; Ahn 2002
		• Economic activity	Audretsch & Feldman 1996; Gittleman & Wolff 1995
		• GDP trend	Katz 2006; Gao & Guan 2009; European Commission 2005
		• Rate of inflation	Gillman & Kejak 2005
		• Currency strength	Oppenheimer 2010
		• Tax policy	OECD 2007, OECD 2009
Infrastructures	• Government spending in R&D	OECD 2007	
	• Transport provision	Klein Woolthuis, Lankhuizen, & Gilsing 2005; Ecquist et al. 1998	
	• Energy provision	Klein Woolthuis, Lankhuizen, & Gilsing 2005; Ecquist et al. 1998	

The mechanism is thus explained as the orchestration of the factors in Table 1 and the respective conditions. This can be illustrated by integrating Figure 1 and Table 1 as shown in Figure 2.

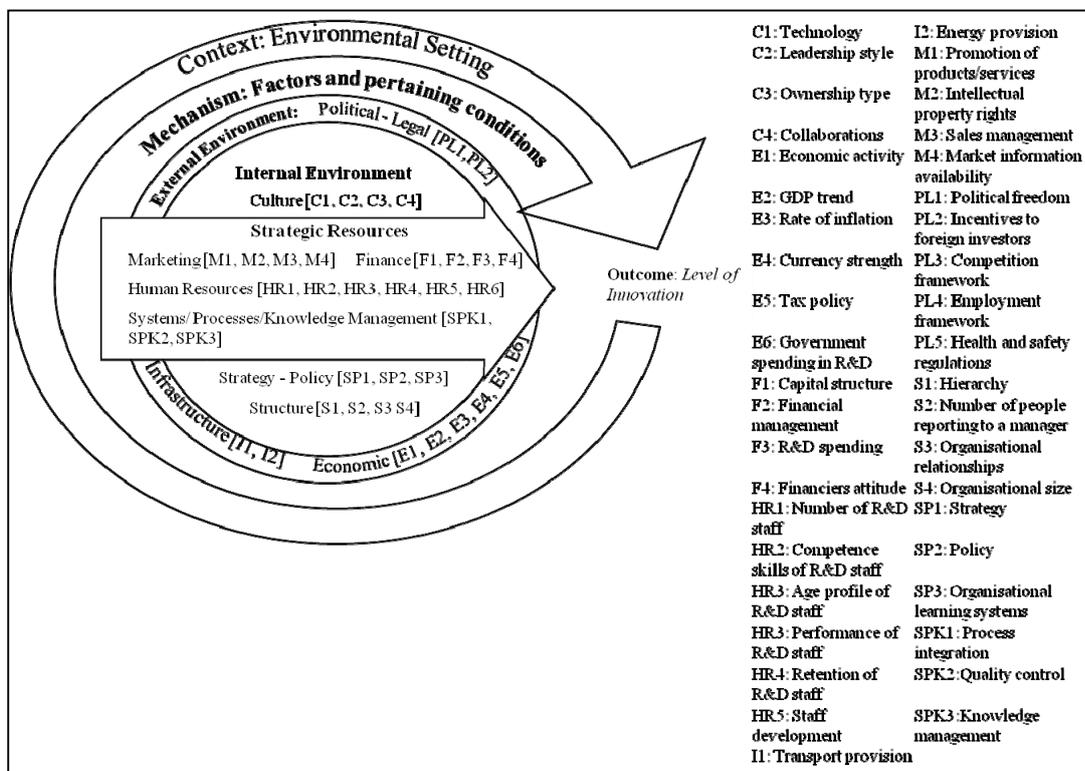


Figure 2: Categories and factors identified integrated in the conceptual model

Figure 2 is a partial depiction of the mechanism, as it does not provide the specific condition on each factor. A mechanism can only be fully described once

measurements have been obtained on each factor for a given context. As indicated previously, consideration of the conditions on each factor is beyond the scope of this paper. However, it is worth noting that the model has successfully been used to identify a full mechanism for the construction industry in the UK.

## CONCLUSIONS

Innovation research over the last six decades has had changing foci; however, it still remains fragmentary. 21<sup>st</sup> century research in innovation requires a holistic and integrated approach in order to better understand the mechanism that facilitates innovation to occur.

The research from which this paper is derived contributes in this effort using grounded theory approaches of extant texts analysis, coding and category building. The categories emerging from the research in innovation-related factors started with heuristic concepts from grand theories and proceeded to the construction of categories and propositions with growing empirical content from innovation practices. The grand theories notions of ‘diffusion’ and ‘systems’ are complementary to the philosophical approach of the realist explanation contributing to identifying the factors that impact on the innovation process.

The conceptual model developed depicts a holistic approach and presents a multidimensionality of factors that can impact innovation in organizations. It introduces a period of innovation research in which contextual issues play a leading role.

The conceptual model can be used in different contexts (e.g. countries, sectors, organizations, etc.), thus, providing customized description and analysis of innovation practice. Such specific description and analysis can facilitate customized self-evaluation of status, and transformation, of innovation practice.

## REFERENCES

- Acs, Z (2002) *Innovation and the growth of cities*. Cheltenham: Edward Elgar.
- Ahn, S (2002) *Competition, Innovation and Productivity Growth: A Review of Theory and Evidence*. OECD, Economics Department.
- Andersen, B (2005) *Intellectual property rights. Innovation, governance, and the institutional environment*. Cheltenham: Edward Elgar.
- Askarany, D (2005) Diffusion of innovations in organizations In Khosrow-Pour, M. (Ed.) *Information Science and Technology*, 5, 853-57. Hershey, PA: IDEA Group.
- Askarany, D, and Smith, M (2008) Diffusion of innovation and business size: a longitudinal study of PACIA. *Managerial Auditing Journal*, 23(9), 900-916.
- Audretsch, D B, and Feldman, M P (1996) R&D Spillovers and the Geography of Innovation and Production. *The American Economic Review*, 86(3), 630-640.
- Barney, J., Wright, M., Ketchen Jr, D J (2001) The resource-based view of the firm: Ten years after 1991. *Journal of Management*, 27, 625-641.
- Berente, N, Vandenbosch, B, and Aubert, B (2009) Information flows and business process integration. *Business Process Management Journal*, 15(1), 119-141.
- Brown, S, Lamming, R, Bessant, J, and Jones, P (2000) *Strategic operations management*. Oxford: Butterworth-Heinemann.
- Bryant, A, and Charmaz, K (2007) *The Sage handbook of grounded theory*. Los Angeles: Sage.

- Carneiro, A (2008) When leadership means more innovation and development. *Business Strategy*, 9(4), 176-184.
- Chang, S-C, and Lee, M-S (2008) The linkage between knowledge accumulation capability and organizational innovation. *Journal of knowledge management*, 12(1), 3-20.
- Charmaz, K (2007) *Constructing grounded theory a practical guide through qualitative analysis*. Los Angeles, Calif.: Sage.
- Dainty, A, Green, S, and Bagilhole, B (2007) *People and Culture in Construction*. Oxon: Taylor and Francis.
- Dale, J (2007) *Innovation in Construction: Ideas are the currency of the future*. Ascot: CIOB.
- Day, J D, Mang, P, Richter, A and Roberts, J (2001) The innovative organization: why new ventures need more than a room of their own. *The McKinsey Quarterly*, 2, 21-31.
- Edquist, C, Hommen, L, Johnson, B, Lemola, T, Malerba, F, Reiss, T, *et al.* (Eds.) (1998) The ISE Policy Statement—the previous termInnovationnext term Policy Implications of the ‘previous termInnovationsnext term Systems and European Integration. Linköping: Linköping University.
- Egbu, C O (2004) Managing knowledge and intellectual capital for improved organizational innovations in the construction industry: an examination of critical success factors. *Engineering, Construction and Architectural Management*, 11(5), 301-315.
- European Commission (2005) Towards a European research area science, technology and innovation. Retrieved 7 January, 2006, from [ftp://ftp.cordis.lu/pub/indicators/docs/2004\\_1857\\_en\\_web.pdf](ftp://ftp.cordis.lu/pub/indicators/docs/2004_1857_en_web.pdf).
- Faulkner, D O, and Campbell, A (2006) *The Oxford Handbook of Strategy: A Strategy Overview and Competitive Strategy*. Oxford: Oxford University Press.
- Finlay, P (2000) *Strategic management*: Pearson Education, Financial Times, Prentice Hall.
- Gao, X, and Guan, J (2009) A scale-independent analysis of the performance of the Chinese innovation system. *Journal of Informetrics*, 3(4), 321-331.
- Gelderen, M, Frese, M, and Thurik, R (2000) Strategies, Uncertainty and Performance of Small Business Startups. *Small Business Economics*, 15, 165-181.
- Gillen, T (2005) *Winning new business in construction*. Aldershot: Gower.
- Gillman, M, and Kejak, M (2005) Inflation and Balanced-Path Growth with Alternative Payment Mechanisms. *The Economic Journal*, 115(1), 247-270.
- Gittleman, M, and Wolff, E N (1995) R&D activity and cross-country growth comparisons. *Camb. J. Econ.*, 19(1), 189-207.
- Greco, J (2008) *Successful direct marketing methods. Interactive, Database, and Customer marketing for the multichannel communication age (8th edition ed.)*. U.S.: McGraw Hill.
- Gupta, P (2004) *Six Sigma Business Scorecard*. U.S.: McGraw Hill.
- Hendriks, P H J, and Vriens, D J (1999) Knowledge-based systems and knowledge management: Friends or foes? *Information and Management*, 35(2), 113-125.
- Herrmann, H, and Lipsey, R E (2003) *Foreign and direct investment of the real and financial sector of industrial countries*. Germany: Springer.
- Hivner, W, Hopkins, W E, and Hopkins, S A (2003) Facilitating, accelerating, and sustaining the innovation diffusion process: an epidemic modelling approach *European Journal of Innovation Management*, 6(2), 80-89.

- Jackson, M C (1991) *Systems Methodology for the Management Sciences*. Contemporary Systems Thinking. New York: Plenum Press.
- Katz, J S (2006) Indicators for complex innovation systems. *Research Policy*, 35(7), 893-909.
- Kearns, P (2003) *HR strategy. Business focused, individually centered*. Oxford: Paul Kerns.
- Keegan, A, and Turner, J R (2002) The Management of Innovation in Project-Based Firms. *Long Range Planning*, 35(4), 367-388.
- Klein Woolthuis, R, Lankhuizen, M, and Gilsing, V (2005) A system failure framework for innovation policy design. *Technovation*, 25(6), 609-619.
- Koontz, H, and O'Donnell, C (1968) *Principles of management (4th ed.)*: McGraw-Hill.
- Kotler, P (2003) *Marketing management*: Pearson Education, Prentice Hall.
- Kristandl, G, and Bontis, N (2007) Constructing a definition for intangibles using the resource based view of the firm. *Management Decision*, 45(9), 1510-1524.
- Kumaraswamy, M M, Ng, S T, Ugwu, O O, Palaneeswaran, E, and Rahman, M M (2004) Empowering collaborative decisions in complex construction project scenarios. *Engineering, Construction and Architectural Management*, 11(2), 133-142.
- Langford, D, and Male, S (2001) *Strategic management in construction (2nd ed.)*: Wiley Blackwell.
- Lau, C, and Ngo, H (2004) The HR system, organizational culture, and product innovation. *International Business Review*, 13(6), 685-703.
- Love, J H, Roper, S, and Du, J (2009) Innovation, ownership and profitability. *International Journal of Industrial Organization*, 27(3), 424-434.
- Manseau, A, and Seaden, G (2001) *Innovation in construction. An international review of public policies*. London: Spon Press.
- Manseau, A, and Shields, R (2005) *Building tomorrow: Innovation in Construction and Engineering*: Ashgate.
- Mintzberg, H (1979) *The structuring of organizations (International ed.)*: Prentice Hall.
- Niosi, J (1999) Fourth-Generation R&D: From Linear Models to Flexible Innovation. *Journal of Business Research*, 45(2), 111-117.
- Nooteboom, B, Van Haverbeke, W, Duysters, G, Gilsing, V, and van den Oord, A (2007) Optimal cognitive distance and absorptive capacity. *Research Policy*, 36(7), 1016-1034.
- O' Sullivan, M (2005) Finance and innovation. In J. Fagerberg, D. Mowery and R. Nelson (Eds.), *The Oxford handbook of innovation*. Oxford: Oxford University Press.
- OECD (2002) *Frascati Manual. Proposed Standard Practice for Surveys on Research and Experimental Development*. Paris: OECD.
- OECD (2007) *Science, technology and innovation indicators in a changing world*. Responding to policy needs, Available from <http://213.253.134.43/oecd/pdfs/browseit/9207121E.PDF>.
- OECD Science Technology and Industry Scoreboard (2009) *Tax treatment of R&D*, Available from [http://dx.doi.org/10.1787/sti\\_scoreboard-2009-31-en](http://dx.doi.org/10.1787/sti_scoreboard-2009-31-en).
- Oppenheimer, A (2010) *Commentary: Latin America's strong currency may hinder its growth*. Retrieved from <http://www.mcclatchydc.com/2010/03/19/90469/>.
- Ortenblad, A (2004) The learning organization: towards an integrated model. *The Learning Organization*, 11(2), 129-144.

- Oshagbemi, T, and Ocholi, S A (2006) Leadership styles and behaviour profiles of managers. *Journal of Management Development*, **25**(8), 748-762.
- Pavitt, K, Robson, M, and Townsend, J (1987) The size distribution of innovating firms in the UK: 1945- 1983. *Journal of Industrial Economics*, **35**(297-316).
- Pierre, G, and Scarpetta, S (2004) *Employment Regulations through the Eyes of Employers: Do They Matter and How Do Firms Respond to Them?* Washington: World Bank.
- Porter, M. (1985). *Competitive advantage: Creating and sustaining superior performance*. Free Press.
- Rajagopal, P (2002) An innovation-diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model. *Information and Management*, **40**(2), 87-114.
- Rama, R (2008) Foreign investment innovation: a review of selected policies. *The Journal of Technology Transfer*, **33**(4), 353-363.
- Reid, M A, and Barrington, H (1999) Training Interventions. Promoting learning opportunities. Trowbridge: Chartered Institute of Personnel and Development.
- Robson, C (2002) Real world research: a resource for social scientists and practitioner-researchers (2nd ed.). Oxford: Blackwell.
- Rogers, E M (2003) Diffusion of Innovations. New York, NY,: The Free Press.
- Rothwell, R (1994) Towards the Fifth-generation Innovation Process. *International Marketing Review*, **11**(1), 7-31.
- Schmiedeberg, C (2008) Complementarities of innovation activities: An empirical analysis of the German manufacturing sector. *Research Policy*, **37**(9), 1492-1503.
- Schumpeter, J A (1942) *Capitalism, Socialism and Democracy*. New York: Harper and Row.
- Sexton, M, and Barrett, P (2004) The role of technology transfer in innovation within small construction firms. *Engineering, Construction and Architectural Management*, **11**(5), 342-348.
- Shefer, D, and Frenkel, A (2005) R&D, firm size and innovation: an empirical analysis. *Technovation*, **25**(1), 25-32.
- Silverstein, D, Samuel, P, and DeCarlo, N (2009) *The innovators Toolkit: 50+ techniques for predictable and sustainable organic growth*. United States: John Wiley.
- Smyth, H (2000) *Marketing and selling construction services*. London: Blackwell.
- Tang, H K (1998) An integrative model of innovation in organizations. *Technovation*, **18**(5), 297-309.
- Thompson, J L (2003) *Strategic management* (4th ed.). Italy: Gray Publishing.
- Tidd, J (2006) *Innovation Models, A review of Innovation Models*. Imperial College, London: Pfizer Inc.
- Valle, S, and Vazquez-Bustelo, D (2009) Concurrent engineering performance: Incremental versus radical innovation. *International Journal of Production Economics*, **119**(1), 136-148.
- Vinding, A L (2006) Absorptive capacity and innovative performance: A human capital approach. *Economics of Innovation and New Technology*, **15**(4), 507-517.
- Wright, P M, Dunford, B B, and Snell, S A (2001) Human resources and the resource based view of the firm. *Journal of Management*, **27**(6).