
Introduction

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1 Open innovation, globalisation and technological learning

Since the concept was first introduced by Chesbrough in 2003, open innovation has caught the attention of companies around the world. The frequently referred definition of open innovation is “the use of purposive inflows and outflows of knowledge to accelerate internal innovation and to expand the markets for the external use of innovation, respectively” [Chesbrough et al., (2006), p.1]. As far as the organisational modes are concerned, the open innovation paradigm is classified as two dimensions of the,

namely 'inbound' and 'outbound' open innovation (Chesbrough and Crowther, 2006; Lichtenthaler and Ernst, 2009; Bianchi et al., 2011). Recently, more and more research has been conducted to illustrate that the open innovation existing in emerging countries (e.g., Chen et al., 2011).

Many famous case studies on open innovation, such as OLAY Regenerative cream care, Pringles Print Crisps, and iPhone, have shown the value creating effects by integrating a various of external partners, such as universities, suppliers, users, competitors, research institutes, into the innovation process (Bianchi et al., 2011; Boscherini et al., 2010; Chiaroni et al., 2011; Chesbrough, 2003; Van de Vrande et al., 2009). The cooperative modes and the cooperative purpose that a firm selects and the partners change substantially along the process of innovation, from the R&D in lab to commercialisation of R&D results, because they are characterised by very different requirements in terms of level of investments, risk, uncertainty and need for exploring new knowledge rather than exploiting existing one (Chiesa, 2001; Bianchi et al., 2011).

When the external partners during the implementation process of open are across the border of the home country of a firm, the open innovation has overlapped with the globalisation of innovation, particularly R&D globalisation. With the development of trade internalisation, overseas R&D investment of the multinational corporations (MNCs) has growing fast since 1980s (Gassmann and von Zedtwitz, 1998, 1999). R&D globalisation implies the growing R&D and technology interdependence of locations and organisations across countries and regions to tap into knowledge and technology sources in centers of scientific excellence around the world with the aim to either improve their existing assets, or to acquire completely new technological assets (Gerybadze and Reger, 1999; Kuemmerle, 1999; Narula and Zanfei, 2003; Doz et al., 2006).

There are wide discussions about inter-firm cooperation in the R&D globalisation (Hagedoorn, 1993, 2002), decentralised R&D governance versus centralised R&D activities in MNCs (Florida, 1997), a network-based notion of R&D and knowledge-based activities (Narula and Hagedoorn, 1999), and so on. A comprehensive framework that collects these dispersed organisational modes is defined as a double network method by Narula and Zanfei (2005). MNCs deploy both internal networks, interconnecting the innovation activities of a growing number of overseas R&D subsidiaries located in different countries, as well as external networks, through which these R&D affiliates set up linkages with foreign firms and institutions to further exploit their innovation assets and gain access to local innovation systems (Patel and Vega, 1999; Pearce, 1999).

Thus, they should be intertwined as open innovation shows how firms can profit from sourcing external knowledge while globalisation describes a specific way to source external knowledge. The trend towards global R&D should be related to open innovation which focuses on the benefits of tapping into external technology sources (Chesbrough, 2003, 2006). On the one hand, the R&D globalisation will benefit from the insights about collaborative and open innovation and how a firm can tap into local epochs of tacit and contextual knowledge (Chesbrough, 2003, 2006; Bamford et al., 2003). On the other hand, introducing the international dimension in open innovation will increase the relevance of the latter for the management of large multinational companies.

The relationship between the open innovation and R&D globalisation could be explained from the different aspects. The cross-border open innovation could be seen as one kind of R&D globalisation, although perhaps no overseas R&D centers are set up. From this aspect, R&D globalisation is one kind of open innovation. In addition, when a MNC does R&D globalisation, his subsidiaries should implement open innovation in

order to access local R&D sources in the host country. From this aspect, the open innovation could be recognised as one kind of innovation strategies during the globalisation process. Most important, cooperation and alliance are key issues in both open innovation and globalisation (e.g., Bogers, 2011). In short, it is not easy to separate the open innovation and globalisation.

Because most valuable knowledge is tacit (Doz et al., 2001) and firms face a considerable task to be locally embedded during the globalisation process and have sufficient absorptive capacity to learn effectively from local pools of technology (Cohen and Levinthal, 1990; Singh, 2008). In addition, Teece (2009) has mentioned the importance of capabilities in the open innovation. Hence we assume that technological learning is a critical process to absorb and develop the technology from external partners. Thus, it is important to improve the effectiveness of technological learning when a firm operates open innovation and globalisation. The relationships among the open innovation, technological learning and globalisation are still needed more research.

With the dissemination of the 'open innovation' approach (Chesbrough, 2003), an increasing number of companies are adopting open innovation strategies in both developed and emerging economies to access external innovation sources. However, it seems that the latter design and implement their open innovation strategies in a manner that is somewhat different from those adopted in companies from highly industrialised countries.

With the trend of globalisation and more often collaboration, the organisation learning is more and more important for firms in emerging countries during the process of globalisation and open innovation. There are many issues on open innovation in emerging economies that should be examined and discussed. In addition, the empirical observation suggests that there are interactions as well as differences between open innovation and R&D globalisation. Thus what is the current state of open innovation, technological learning and R&D globalisation in emerging economies? How to implement the open innovation strategies for firms in emerging countries? How do firms in emerging countries learn in the collaboration when they do open innovation?

This special issue seeks to explore these crucial questions across a number of dimensions. Before we proceed to a summary of articles, we would like to bring our thanks to reviewers of this special issue, thanks for their review and comments to authors.

2 An overview of the articles in this special issue

In the opening article of this special issue, Professor Margaret Dalziel identifies the explore-exploit continuum as a dimension along which the strategies of high-growth firms from emerging economies will vary, and identifies two specialist strategies for challenger firms from emerging countries, the exploration specialist strategy, and the exploitation specialist strategy, both of which involve early internationalisation, drawing on the distinction between exploration and exploitation. Dalziel develops three propositions on challenger firm strategies and incumbent firm responses. She proposes that in the open innovation era, exploration specialists are highly innovative firms that leverage unique capabilities to internationalise early. Exploitation specialists leverage low cost inputs to participate in international supply chains on the basis of superior efficiencies. The risk to exploration specialists is that they become acquisition targets; the risk to exploitation specialists is low profitability. The institutional context will influence

the range of strategies that are likely to be successfully deployed, and policy makers need to ensure that regulations and business support programmes support a range of firm strategies.

In the second article, by Tomohiro Machikita and Yasushi Ueki, we turn from the general strategies to analysis of the key issue in face-to-face communication and mutual learning in upstream-downstream relations: the learning-driven innovation. Noting the importance of learning in the innovation process, particularly in the manufacturing industries, Machikita and Ueki propose a framework to investigate the impact of mutual knowledge exchanges on product and process innovation based on survey data about product creation and quality upgrading with relationships between connected firms in manufacturing firms in five megacities in Indonesia, Philippines, Thailand and Vietnam. Their research findings from the interconnected firms in developing economies suggests that firms with mutual exchanges between engineers and customers achieved product innovations with new technologies and new markets. However, this is not true for simple improvement of products or process innovation. Mutual exchanges with engineers between producers and suppliers within a chain can be expected to play an important role in the case of costly innovation and in situations unknown situation to the firms. Mutual knowledge exchanges with a customer play an important role in product innovation with new technologies and a new market. On the other hand, mutual knowledge exchanges with a customer do not have any significant impact on production process innovation, except for changing cost controls which are affected by the customer's requirements more than other types of organisational improvements.

Machikita and Ueki thus provide an illuminating survey study in manufacturing industries into learning-driven innovation in four Asian countries. In the third paper, Fabiano Armellini, Paulo Carlos Kaminski, and Catherine Beaudry explore the open innovation strategy in the process of new product development that focuses on one traditional and conservative high-tech sector, the aerospace industry in Brazil. Armellini et al. identify the implications of the openness paradigm to product development in the Brazilian aerospace industry based on information gathered from interviews with Brazilian and Canadian aerospace firms. The finding of the comparative research between Brazilian and Canadian firms is that the higher trend of openness in Brazil in relation to Quebec, except for licensing and coupled activities. Based on this result, Armellini et al. propose that companies from emerging economies tend to be more prone to open innovation than companies in developed countries, since they are often heavily dependent on foreign knowledge and expertise.

The fourth paper moves the research focus from Brazil to China. The forth paper is focusing on the balance of explorative and exploitative learning, a different aspect of learning from the research of Machikita and Ueki. In the fourth paper, based on March's balance theory of explorative and exploitative learning and survey in Chinese firms, Zhaohui Zhu and Jin Chen use factor analysis, path analysis, multiple comparison analysis and structural equation model to test nine hypotheses on the synergy effect between these two kinds of learning and their effect on innovation performance. Their findings suggest that both explorative and exploitative learning can promote innovation. Either kind of learning increases innovation performance. Continuous innovation relies on a constant influx of technologies and knowledge from multiple fields, ideally gained through both exploration and exploitation if firms can balance explorative and exploitative learning.

As all kinds of firms can improve their technological capability through collaboration and in the last paper, by S.S. Prabhakara and N.V. Raghavendra, we turn to the comparative research between the small and large firms during the process of acquisition of technological capability. They focus on the small and large scale firms of Bangalore Machine tool cluster. Prabhakara and Raghavendra identify three collaborative means through which technological information flow happened among firms in industrial clusters: horizontal collaboration, vertical collaboration, and external collaboration. And they investigate the influence of these three collaborative means on the technological learning of small scale and large scale firms of Bangalore machine tool cluster in south India, using a technological capability index and suitable proxies to measure technological learning variables. Prabhakara and Raghavendra argue that firms, whether large or small, are benefited by such collaborative arrangements. While vertical and external collaborations significantly influence technological capability, horizontal collaboration among peer firms is rather weak.

It is not our intention to try to synthesise these findings here into what can only be a prematurely, and so falsely, coherent body of knowledge about technological learning, open innovation strategies, and technological capability in the globalisation of firms in emerging countries, particularly firms in China, India, Brazil, Indonesia, Philippines, Thailand and Vietnam. But as the wide range of these papers, in both subject matters and disciplinary perspectives, illustrates, there is a need for concerted and internationally collaborative research and discussion of these issues to expedite and facilitate technological learning and capability development through open innovation in the global era. It is hoped this Special Issue contributes to construction and expansion of open innovation and globalisation in emerging countries.

References

- Bamford, J., Gomes-Casseres, B. and Robinson, M. (2003) *Mastering Alliance Strategy: A Comprehensive Guide to Design, Management, and Organization*, Jossey-Bass, San Francisco.
- Bianchi, M., Cavaliere, A., Chiaroni, D., Frattini, F. and Chiesa, V. (2011) 'Organisational modes for open innovation in the bio-pharmaceutical industry: an exploratory analysis', *Technovation*, Vol. 31, No. 1, pp.22–33.
- Bogers, M. (2011) 'The open innovation paradox: knowledge sharing and protection in R&D collaborations', *European Journal of Innovation Management*, Vol. 14, No. 1, pp.93–117.
- Boscherini, L., Chiaroni, D., Chiesa, V. and Frattini, F. (2010) 'How to use pilot projects to implement open innovation', *International Journal of Innovation Management*, Vol. 14, No. 6, pp.1065–1097.
- Chen, J., Chen, Y.F. and Vanhaverbeke, W. (2011) 'The influence of scope, depth, and orientation of external technology sources on the innovative performance of Chinese firms', *Technovation*, Vol. 31, No. 8, pp.362–373
- Chesbrough, H. (2003) *Open Innovation; The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Harvard, Boston.
- Chesbrough, H. (2006) *Open Innovation Business Models; How to Thrive in the New Innovation Landscape*, Harvard Business School Press, Harvard, Boston.
- Chesbrough, H. and Crowther, A.K. (2006) 'Beyond high-tech: early adopters of open innovation in other industries', *R&D Management*, Vol. 36, No. 3, pp.229–236.
- Chesbrough, H., Vanhaverbeke, W. and West, J. (Eds.) (2006) *Open Innovation: Researching a New Paradigm*, Oxford University Press, Oxford.

- Chiaroni, D., Chiesa, V. and Frattini, F. (2011) 'The open innovation journey: how firms dynamically implement the emerging innovation management paradigm', *Technovation*, Vol. 31, No. 1, pp.34–43.
- Chiesa, V. (2001) *R&D Strategy and Organisation: Managing Technical Change in Dynamic Contexts*, Imperial College Press, London, UK.
- Cohen, W.M. and Levinthal, D.A. (1990) 'Absorptive capacity: a new perspective on learning and innovation', *Administrative Science Quarterly*, Vol. 35, No. 1, pp.128–152.
- Doz, Y., Santos, J. and Williamson, P. (2001) *From Global to Metanational: How Companies Win in the Knowledge Economy*, Harvard Business School Press, Boston, MA.
- Doz, Y., Wilson, K., Veldhoen, S., Goldbrunner, T. and Altman, G. (2006) *Innovation: Is Global the Way Forward?*, INSEAD, Fontainebleau, France.
- Florida, R. (1997) 'The globalisation of R&D: results of a survey of foreign affiliated R&D laboratories in the USA', *Research Policy*, Vol. 26, No. 1, pp.85–103.
- Gassmann, O. and von Zedtwitz, M. (1998) 'Organization of industrial R&D on a global scale', *R&D Management*, Vol. 28, No. 3, pp.147–161.
- Gassmann, O. and von Zedtwitz, M. (1999) 'New concepts and trends in international R&D organization', *Research Policy*, Vol. 28, Nos. 2–3, pp.231–250.
- Gerybadze, A. and Reger, G. (1999) 'Globalisation of R&D: recent changes in the management of innovation in transnational corporations', *Research Policy*, Vol. 28, Nos. 2–3, pp.251–274.
- Hagedoorn, J. (1993) 'Understanding the rationale of strategic technology partnering: inter-organizational modes of cooperation and sectoral differences', *Strategic Management Journal*, Vol. 14, No. 5, pp.371–385.
- Hagedoorn, J. (2002) 'Inter-firm R&D partnerships: an overview of major trends and patterns since 1960', *Research Policy*, Vol. 31, No. 4, pp.477–492.
- Kuemmerle, W. (1999) 'The drivers of foreign direct investment into research and development: an empirical investigation', *Journal of International Business Studies*, Vol. 30, No. 1, pp.1–24.
- Lichtenthaler, U. and Ernst, H. (2009) 'Opening up the innovation process: the role of technology aggressiveness', *R&D Management*, Vol. 39, No. 1, pp.38–54.
- Narula, R. and Hagedoorn, J. (1999) 'Innovating through strategic alliances: moving towards international partnerships and contractual agreements', *Technovation*, Vol. 19, No. 5, pp.283–294.
- Narula, R. and Zanfei, A. (2003) 'Globalisation of innovation: the role of multinational enterprises', *Handbook of Innovation*, Oxford University Press, Oxford.
- Patel, P. and Vega, M. (1999) 'Patterns of internationalisation of corporate technology: location vs. home country advantages', *Research Policy*, Vol. 28, Nos. 2–3, pp.145–155.
- Pearce, R. (1999) 'The evolution of technology in multinational enterprises: the role of creative subsidiaries', *International Business Review*, Vol. 8, No. 2, pp.125–148.
- Singh, J. (2008) 'Distributed R&D, cross-regional knowledge integration and quality of innovation output', *Research Policy*, Vol. 37, No. 1, pp.77–96.
- Teece, D. (2009) *Dynamic Capabilities and Strategic Management: Organizing for Innovation and Growth*, Oxford University Press, Oxford.
- Van de Vrande, V., de Jong, J.P.J., Vanhaverbeke, W. and Rochemont, M.D. (2009) 'Open innovation in SMEs: trends, motives and management challenges', *Technovation*, Vol. 29, Nos. 6–7, pp.423–437.