



Paper to be presented at the DRUID Summer Conference 2007

on

**APPROPRIABILITY, PROXIMITY, ROUTINES AND INNOVATION**

Copenhagen, CBS, Denmark, June 18 - 20, 2007

**TECHNOLOGY SOURCING, KNOWLEDGE MANAGEMENT AND GOVERNANCE IN  
INTERNATIONAL INTER-ORGANISATIONAL INNOVATION NETWORKS**

**Florian Taeube**

Tanaka Business School, Imperial College, London  
f.taeube@imperial.ac.uk

**Jennifer Whyte**

Tanaka Business School, Imperial College, London  
j.k.whyte@imperial.ac.uk

**Abstract:**

This conceptual paper aims to improve our understanding of how internationalised firms use outsourcing and offshoring strategies to manage knowledge and information through the life-cycle of integrated product-service solutions. More precisely, we identify the appropriate theoretical framework for this analysis and investigate through in-depth case studies how UK engineering firms organise, coordinate, and incentivise work that is executed in globally distributed teams. Our research focuses on their UK and India offices to study the organisation and governance of distributed teams. The research has several theoretical dimensions - organization: geography: time and knowledge - that it addresses as boundary challenges.

# TECHNOLOGY SOURCING, KNOWLEDGE MANAGEMENT AND GOVERNANCE IN INTERNATIONAL INTER-ORGANISATIONAL INNOVATION NETWORKS

## *ABSTRACT*

This is a conceptual paper describing a scoping study which aims to improve our understanding of how internationalised UK engineering firms are using outsourcing and offshoring strategies in order to manage knowledge and information through the life-cycle of integrated product-service solutions. More precisely, we identify the appropriate theoretical framework for this analysis and investigate through in-depth case studies how these firms organise, coordinate, and incentivise work that is executed in globally distributed teams. Our research focuses on their offices in the UK and in India to study the organisation and governance of distributed teams. The research has several theoretical dimensions - organization; geography; time and knowledge - that it addresses as boundary challenges.

We conclude with the outlook that a 'flat' world seems rather unlikely, because processes and tasks that are more complex and/or require interaction with customers are viewed as unable to be executed across geographical space; yet, we suggest that ever more standardized processes will be executed from remote locations and a simultaneous standardization allows for a larger share of the division of labor in teams dispersed across the globe.

## **1. INTRODUCTION**

Innovation is increasingly happening beyond firm boundaries (Powell et al., 1996) and more globally distributed (Doz et al., 2006); mainly due to the growth of information technologies and modularization. This research programme is motivated by four inter-related phenomena and theoretical issues. On the one hand, there is a tendency of firms in the manufacturing and services domains to vertically 'integrate' and provide an integrated part of products and services in the value chain (Davies 2004). Secondly, in an increasingly global economy, many UK and other Western firms, mainly Multinational Companies (MNCs), but also Small and Medium Enterprises (SMEs) are using offshoring (and outsourcing) to India and other countries as a means of cost

cutting in order to stay competitive. This seems to be a viable and sustainable strategy as long as they can focus on a core competence and retain their competitive advantage that is *not* built on cost (Dutta, 2003). Usually this implies keeping the most knowledge-intensive parts of the value-chain in-house, in other words pursue innovation internally or at least proprietarily (Paoli, 2003).

Thirdly, innovation is increasingly happening beyond the boundaries of individual firms, in other words open to external sources (e.g. Chesbrough, 2006), in particular in knowledge-based industries (Powell et al., 1996). Moreover, the process of innovation seems to become more globally distributed (Blanc and Sierra, 1999; Doz et al., 2006) with new players arising in India and China. This is mainly due to the growth of information and communication technologies and resulting modularization and outsourcing, as witnessed in the case of the growing Indian IT industry.

Over the last decade or so there have been a number of people, both academics and practitioner-oriented, to argue that the improvement of information and communication technologies (ICT) led to an increasingly connected world (or ‘flat’, in the words of Friedman, 2005) in which distance does not play a role anymore, in other words, the ‘death of distance’ (Cairncross, 1997).

In this case, we would expect economic activity to be more evenly (‘flat’) distributed across the world. This seems to be very plausible, given the recent spate of offshoring activities, mainly to India. In a flat world, we would also witness a lot of activities, often project-based, executed by teams that are spread across the globe, with many players openly contributing to the delivery of a product or service.

## **2. A SURVEY OF THEORETICAL AND EMPIRICAL LITERATURE**

Theoretically, our interest lies at the intersection of literatures of modularity and open innovation, outsourcing and systems integration, and dispersed teams. Indian firms are using modular product and service designs in order to become ‘the integrated solutions provider’ (Davies 2004; Davies et al. 2006) – through outsourcing and open innovation. Interestingly, they seem to take the opposite route as Western firms that are moving into systems integration: whereas the latter typically have a background in products, or

manufacturing, the Indian firms primarily come from a services background. This new competition poses extreme challenges to UK firms whose competitive advantage is built on keeping an innovation edge.

We investigate mechanisms that govern the generation, storage and management of information and knowledge in long-term inter-organisational innovation partnerships, such as R&D alliances or outsourcing of R&D. In particular, we are interested in how collaboration networks, often informal and long-term, function and how they affect innovation performance.

An increasingly important form of inter-organisational collaboration is the strategic alliance, in particular in high-technology industries. There is a large body of literature investigating dyadic alliances, multi-partner alliances, and alliance management capability. Moreover, such alliances are often formed as R&D collaborations (Roijakkers and Hagedoorn, 2006).

The literature covers different industries, mainly in manufacturing, such as automobiles or information technology and countries such as Belgium (Veugelers, 1997), the UK (Tether, 2002), or Germany (Becker and Dietz, 2004). However, most of the R&D alliance literature focuses on intra-industry cooperation in biotechnology (although often in combination with pharmaceuticals), partly because of the publicly available database *BioScan*, and US settings.

Regarding modularity and open innovation, one view found in the literature is that increasing modularization is implicitly helping innovation to become more open, for instance, through outsourcing. However, while it is certainly true that modularity is helping more firms to participate in the innovation process, it is less clear how decentralized the core of the innovation process can be. The contrasting view argues that the main task of orchestrating innovation is (still) the domain of one firm, the 'systems integrator' that integrates the parts outsourced in an open innovation process (Hobday et al. 2003; Dhanaraj and Parkhe, 2006).

Yet, there is a gap in addressing *inter*-industrial collaborations, technology industries (other than biotechnology) as well as other institutional contexts, in particular emerging

markets. Moreover, there exist only few studies of services industries, compared to a rather comprehensive coverage of manufacturing. However, more recently there have been a few studies of strategies and technologies applied for innovation in engineering and construction as services industries (Acha, Gann and Salter, 2005; Whyte, 2003)

With regard to incentives, in the context of Indian software firms, it is crucial to understand how the effective contract design and reputation play an important role here (Banerjee and Duflo 2000) Moreover, the intellectual property rights of software developed in dispersed teams are often subject of potential conflicts (Metiu, 2006) that can be exacerbated by *geographical* ‘fault lines’ between the teams’ subgroups (Polzer et al., 2006). Despite these problems, Indian firms have established the reputation required to conduct R&D and develop intellectual property.

Yet, most studies in the field of international sourcing focus either on outsourcing and offshoring of manufacturing or on simple standardized services (e.g. Murray and Kotabe, 1999). In other words, sourcing seems to be predominantly associated with cost cutting and, therefore, with generic factor inputs, such as labour, or intermediate products (Gottfredson et al., 2005) but rarely with innovation or R&D.

R&D generates the new products, processes and services that give a company a competitive edge in the market (DTI 2006). In other words, “research and development is the creation of the know-how and know-why of new materials and technologies that eventually translates into commercial development” (Wheelwright and Clark 1992: 74). Mairesse and Mohnen (2004), in a recent study, find R&D to be positively correlated with all measures of innovation output in the French CIS-3 survey.

More recently, some scholars have acknowledged that companies can gain more from offshoring than just cutting costs, i.e. access to knowledge not available elsewhere (e.g. Dossani and Kenney, 2003; Maskell et al., 2005). However, at this stage, there is little theory to provide an informed rationale how such knowledge-seeking can be explained in terms of firm strategy. Thus far, the distinction of MNCs’ decisions to go abroad is usually between market entry and sourcing cheap labour, at least for emerging economies such as India.

### 3. CONCEPTUAL FRAMEWORK

In this research programme, we aim to close several gaps in the literature. Firstly, our research focuses on the organisation and governance of internationally distributed teams: Accordingly, this research has several theoretical dimensions that we address as boundary challenges:

(a) *Organisational boundary*: coordination of internal and external knowledge and information

(b) *Geographical boundary*: coordination of domestic (proximate) and foreign (distant) knowledge and information

(c) *Temporal boundary*: coordination of project and permanent teams and their interdependence over time

(d) *Knowledge boundary*: the influence of tacit vs. codified knowledge vs. information as signposts on a continuum.

Moreover, we aim to understand how firms are learning and ‘upgrading’ to become systems integrators; and how firms manage innovation in inter-organisational networks in order to benefit from outsourcing and open innovation governance structures. With regard to the latter, a particular emphasis shall be placed on incentive structures, since it seems to be an essential ingredient of outsourcing agreements and in particular with regard to innovation. Furthermore, on a conceptual level, there is (still) some confusion in the way the notions of ‘outsourcing’ and ‘offshoring’ are used. One objective is to develop a coherent framework for the analysis of outsourcing and offshoring of R&D and innovation.

Finally, this research project examines an inherent dilemma associated with these developments. On the one hand, extant research underscores the benefits for client firms all over the world to use outsourcing, offshoring or a combination thereof in order to focus on innovation and related core competencies. On the other hand, it is shown how outsourcing firms can move up the value chain and do increasingly innovative tasks previously done in-house at the clients’ sites. While it is possible that both outsourcing

firms and client firms benefit from such arrangements it is difficult to see how this can happen simultaneously. The issue of how Indian software firms and outsourcing providers benefited from initially performing low value-added services and sequentially taking over more and more activities of the global client firms' value chains has not been addressed yet. Given the project-oriented nature of the software and outsourcing business, there is some literature providing a framework for this upgrading (e.g. Brady and Davies, 2004; Gann and Salter, 2000; Sapsed et al., 2005).

#### **4. METHODS**

Following our preliminary work, we are addressing these theoretical issues using a mixed methodology, including both qualitative and quantitative techniques.

The former consists mainly of case studies of different teams within these organisations that are intended to understand the actual governance mechanism of inter-organisational R&D arrangements and the context in which they succeed or not. Comparative case studies will be carried out with UK firms and Indian subsidiaries in order to develop our theoretical model.

This will be tested through quantitative analysis, which will be mainly survey-based. Moreover, we will try to compile industry statistics at least at some descriptive level. The latter is probably easier for the Indian side, since here most potential sample firms pertain to the same industry organization of the IT industry (NASSCOM). A comprehensive source of data that shall be used for the Indian context is the Centre for Monitoring the Indian Economy's (CMIE) company database Prowess.

##### ***4.1 Case studies***

India provides interesting case studies for two reasons, and two types of organizations. Firstly, Indian firms are the best-known examples of software firms from emerging economies that have come from a very low reputation and achieved a status in software outsourcing for a broad range of industries that enabled them to enter innovation partnerships with their overseas clients. At least the large firms are diversifying upstream in order to reap the benefits from this reputation. They are now competing with international IT consultancies like IBM Consulting or Accenture that do not have

this growth and learning trajectory behind them. Secondly, many MNCs have set up their own R&D centres in India, including some from the engineering industry. These subsidiaries can be viewed as organizations themselves, whereby this research could even include offshoring of R&D, i.e. a relocation of some R&D within a global system of MNCs.

There are two main ways of offshore outsourcing: on the one hand, a firm can send work that was previously done in-house and in the home country to a domestic contractor who, then, sends it abroad; on the other hand, a company can send the same kind of work directly to a foreign third-party firm. An example of the first case is Accenture, the IT consultancy; Infosys, the Indian software firm, exemplifies the second case.

This leads to three basic types of organizations that shall be studied in comparative cases. Firstly, UK firms that outsource R&D and/ or send R&D to India (both in-house and outsourced), secondly, UK software firms that act as providers of R&D outsourcing and as intermediaries for offshoring R&D and lastly, the Indian outsourcing organization. The latter consists of two main sub-categories: subsidiaries of foreign firms and Indian companies. Both types can conduct either proprietary R&D for one client only, or do contract work for multiple client firms. Moreover, one would ideally need a comparison of a UK firm that innovates only internally. Again, in relation to the exploration of the firm backgrounds, we do not preclude the study of alternative types, if they materialize during the explorative part of this research.

#### *4.1.1 Sample selection*

To facilitate the empirical research strategy, we will limit our sample selection to the engineering industry. More specifically, the firms we study in the UK are predominantly engineering firms, although some divisions might also be active in other businesses. Given that Indian firms are strong suppliers of software, our study of internationally dispersed teams should be based on firms with a strong presence in India. The firms we selected have their own subsidiaries in India, but, of course, an in-depth case study needs to entail some relations with external suppliers as well.

In order to achieve a comparative perspective, with assistance from the companies, we will investigate teams working on temporary projects as well as permanent tasks; different degrees of collocation and dispersion, respectively; internal vs. inter-organisational composed teams; and teams working on different degrees of knowledge- or information intensity.

One subsidiary is a provider of remote-based technical services to the global construction industry, including projects such as T5, which will be insightful to study. Does this also involve through-life service support as in some IT outsourcing contracts, and which could be called an integrated solution? This subsidiary will be the first partner to approach in India, but the organisational question arises why these services are kept in-house; is there outsourcing from this Indian subsidiary. Or, when they move to India, do they need the organisational integration to avoid having too much complexity and achieve coordination? Therefore, we will conduct complementary interviews with some external sources as well in order to capture the inter-organisational dimension of dispersed teams.

#### **4.2 Survey**

We will use the findings from interviews and case studies to develop a questionnaire survey. This survey will be sent to members of the distributed teams and will measure different items, for instance, what proportions of R&D work is carried out through outsourcing or offshoring arrangements, how central they are to the overall innovation processes, how many (other) firms are involved, and whether the strategy is deemed successful by the client firm.

### **5. PRELIMINARY FINDINGS**

In our preliminary work, one of the main findings is the integrated approach UK multinationals are implementing with their subsidiaries in India (and elsewhere). Basically, these firms are following the “global delivery model” pioneered by Indian IT major Infosys. Analogous to offshoring, distribution of teams across geographical space is only feasible for those parts in the value chain of complex tasks that do not require cultural proximity and face-to-face contacts and where professional and organizational proximity ensures sufficient common background for clear communication.

As long as outsourcing providers in India and elsewhere are not moving up the value chain – and become integrated solution providers themselves – offshoring strategies of UK firms seem to prove effective. However, what seems to be happening is precisely that software firms in India are moving from simple programming and coding through IT consultancy to different kinds of R&D-related innovative activities (cf. Parthasarathy and Aoyama, 2006, Hamm, 2007). Regardless of the potential of Indian firms, the global distribution of innovation seems to happen at the intra-organisational as well as the inter-organisational level. In both cases, the organisation of tasks is often made through globally dispersed teams be it project-based or rather permanent teams.

The main lessons that can be drawn for distributed teams concern the organization thereof. In particular, efficacy and efficiency of distributed teams can be enhanced by understanding how proximities interact with each other. For instance, to build more effective teams across geographical space it can be useful to enhance professional, organizational, and cultural proximity between team members. This can be done through face-to-face meetings, such as induction or training events, early on through which later communication is facilitated. As for the somewhat ambivalent cultural proximity, it is not necessarily required to hire members from the same cultural background in terms of same nationality or ethnicity, although that certainly helps. Similar to increasing professional and organizational proximities between team members, putting them together in one location for a bit facilitates a convergence of cultures or acculturation. When people learn interacting with other cultures which has to happen in one physical location, they know better how to interact over distance later on.

Most importantly, such measures to counter the drawbacks of potential misunderstandings in distant communication is much more important the higher the value-added of the project team, which is often accompanied with a higher share of tacit knowledge.

## **6. CONCLUDING SUMMARY**

This conceptual paper describes the development of the appropriate theoretical framework to investigate through in-depth case studies the outsourcing and offshoring strategies of UK engineering multinationals. More precisely, we are interested how they organise, coordinate, and incentivise work that is executed in globally distributed teams

in order to manage knowledge and information through the life-cycle of integrated product-service solutions.

The four dimensions we study, space, organisational boundary, time horizon and knowledge connect to the aims of the KIM project. Space basically means between the UK and India and is applied to the case of engineering firms active in both countries. The time dimension is interesting because of the overall KIM theme of the life cycle; yet, 20 or 30 years might be too long a time horizon to expect stable structures. Therefore, we expect new insights from studying project teams and permanent teams, to see whether there are differences, convergence or divergence in terms of coordination and organisation.

Our theoretical contribution derives from the application and development of different notions of *proximity* borrowed from economic geography that lead to a somewhat skeptical view on the feasibility of work in teams distributed across geographical space, at least for projects with a high content of tacit knowledge.

We conclude with the outlook that a flat world seems rather unlikely, but a further flattening seems not unrealistic (cf. Svejnova and Vives, 2006). On the one hand, processes and tasks that are more complex and/or require interaction with customers are viewed as unable to be executed across geographical space (Deutsche Bank 2006). On the other hand, we suggest that ever more standardized processes will be executed from remote locations and a simultaneous standardization allows for the integration of a larger share in the global division of labor to be executed in teams within, an across, organizations spread across the globe.

## 7. REFERENCES

- Acha, V., Gann, D., & Salter, A. 2005. Episodic innovation: R&D strategies for project-based environments. *Industry and Innovation*, 12(2): 255-281.
- Banerjee, A., & Duflo, E. 2000. Reputation effects and the limits of contracting: A study of the Indian software industry. *Quarterly Journal of Economics*, 115: 989–1017.

Becker, W., & Dietz, J. 2004. R&D cooperation and innovation activities of firms—evidence for the German manufacturing industry. *Research Policy*, 33: 209-223.

Blanc, H., & Sierra, C. 1999. The internationalisation of R&D by multinationals: a trade-off between external and internal proximity. *Cambridge Journal of Economics*, 23: 187-206.

Brady, T., & Davies, A. 2004. Building project capabilities: From exploratory to exploitative learning. *Organization Studies*, 25(9): 1601-1621.

Cairncross, F. 1997. *The death of distance: How the communication revolution will change our lives*. Boston: Harvard Business School Press.

Chaudhuri, D. 2006. *Interview*. Head of Infosys Germany, Italy and Spain.

Chesbrough, H. 2006. *Open innovation – The new imperative for creating and profiting from technology*. Boston: Harvard Business School Press.

Davies, A. 2004. Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change*, 13(5): 727-756.

Davies, A., Brady, T., & Hobday, M. 2006. Charting a path toward integrated solutions. *MIT Sloan Management Review*, 47(3): 39-48.

Department of Trade and Industry, DTI 2006. *The importance of R&D for companies*. [http://www.innovation.gov.uk/rd\\_scoreboard/introduction\\_importanceofrandd.asp](http://www.innovation.gov.uk/rd_scoreboard/introduction_importanceofrandd.asp)

Deutsche Bank 2006. Indien spielt Vorreiterrolle. *forum – Magazin für die Deutsche Bank*, 20-22.

Dhanaraj, C., & Parkhe, A. 2006. Orchestrating innovation networks, *Academy of Management Review*, 31(3): 659-669.

Dossani, R., & Kenney, M. 2003. *Went for cost, stayed for quality? Moving the back office to India*. Berkeley and Stanford: mimeo.

Doz, Y.; Wilson, K.; Veldhoen, S.; Goldbrunner, T.; & Altman, G. 2006. *Innovation: Is global the way forward?*,

[www.strategy-business.com/media/file/global\\_innovation.pdf](http://www.strategy-business.com/media/file/global_innovation.pdf)

Dutta, S. 2003. Using offshore development to drive value: The experience of Motorola in India. In F.-J. Richter & P. Banerjee (Eds.), *The Knowledge Economy in India*: 87-105. Houndsmill, Basingstoke and New York: Palgrave Macmillan.

Friedman, T. 2005. *The World is Flat: A Brief History of the Globalized World in the Twenty-first Century*. London:Allen Lane.

Gann, D., & Salter, A., 2000. Innovation in project-based, service-enhanced firms: the construction of complex products and systems. *Research Policy*, 29: 955–972.

Gottfredson, M., Puryear, R., & Phillips, S. 2005. Strategic sourcing – From periphery to the core. *Harvard Business Review* (February): 132-139.

Hamm, S. 2007. *Bangalore Tiger. How Indian upstart Wipro is rewriting the rules of global competition*. New York: McGraw-Hill.

Hobday, P., Prencipe, A., & Davies, A. 2003. Introduction. In A. Prencipe, A. Davies, & M. Hobday (Eds.), *The Business of Systems Integration*: 1-12. Oxford: Oxford University Press.

Mairesse, J., & Mohnen, P. 2004. The importance of R&D for innovation: A reassessment using French survey data. *NBER Working Paper* No. 10897, November.

Maskell, P., Pedersen, T., Petersen, B., & Nielsen, J. 2005. *Learning paths to offshore outsourcing – from cost reduction to knowledge seeking*. DRUID Working Paper No. 05-17.

Metiu, A. 2006. Owning the code: Status closure in distributed groups. *Organization Science*, 17(4): 418-435.

Murray, J. & Kotabe, M. 1999. Sourcing strategies of U.S. service companies: A modified transaction-cost analysis. *Strategic Management Journal*, 20: 791-809.

Paoli, M. 2003. The cognitive basis of systems integration: Redundancy of context-generating knowledge. In A. Prencipe, A. Davies, & M. Hobday (Eds.), *The Business of Systems Integration*: 152-173. Oxford: Oxford University Press.

- Parthasarathy, B., & Aoyama, Y. 2006. From software services to R&D services: local entrepreneurship in the software industry in Bangalore, India. *Environment and Planning A*, 38(7): 1269–1285.
- Polzer, J., Crisp, B., Jarvenpaa, S., & Kim, J. 2006. Geographically-located subgroups in globally dispersed teams: A test of the faultline hypothesis. *Academy of Management Journal*, 49(4): 679–92.
- Powell, W., Koput, K., & Smith-Doerr, L. 1996. Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology. *Administrative Science Quarterly*, 41(1): 116-145.
- Roijakkers, N., & Hagedoorn, J. 2006. Inter-firm R&D partnering in pharmaceutical biotechnology since 1975: Trends, patterns, and networks. *Research Policy*, 35: 431-446.
- Sapsed, J., Gann, D., Marshall, N., & Salter, A. 2005. From Here to Eternity?: The Practice of Knowledge Transfer in Dispersed and Co-located Project Organizations. *European Planning Studies*, 13(6): 831-851.
- Svejenova, S.; Vives, L. 2006. Quo Vadis, Europe? *Academy of Management Perspectives*, 20(2): 82-84.
- Tether, B., 2002. Who co-operates for innovation, and why. An empirical analysis. *Research Policy*, 31, 947–967.
- Veugelers, R., 1997. Internal R&D expenditures and external technology sourcing. *Research Policy*, 26, 303–315.
- Wheelwright, S. C., & Clark, K. B. 1992. Creating project plans to focus product development. *Harvard Business Review* (March-April): 70-82.
- Whyte, J. 2003. Innovation and users: virtual reality in the construction sector, *Construction Management and Economics*, 21: 565-572.