The Tacit Knowledge Problem in Multinational Corporations: Japanese and US Offshore Knowledge Incubators

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The Tacit Knowledge Problem in Multinational Corporations: Japanese and US Offshore Knowledge Incubators

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Abstract

This paper examines the 'cognitive' and 'societal' aspects of the tacit knowledge transfer problem in MNCs. Based on a comparative analysis of the overseas R&D labs of US and Japanese MNCs in the UK, it examines how home-based models of learning influence MNCs' transnational social spaces for learning and their capabilities to address the tacit knowing problem. It illustrates how the US professional 'networks of practice' (NoP) and the Japanese organizational 'communities of practice' (CoP) approaches to transnational learning unfold in practice. It also examines how divergence between home and host country institutions governing knowledge production inhibits cross-societal tacit knowing.

Keywords: comparative thinking; tacit knowledge; knowledge transfer in MNCs; innovation and R&D; organizational learning; communities of practice.

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INTRODUCTION

Multinational corporations (MNCs) are unique knowledge creating organisations because of their structural position spanning diverse institutional contexts and their ability to transfer knowledge across national borders (Kogut and Zander 1993; 1995; Kotabe et al 2007). Recent research has emphasised the learning and knowledge creating aspects of foreign direct investment and overseas subsidiaries as sources of competitive advantage (Frost and Zhou 2000; Birkinshaw 1997; Frost et al 2002). Especially in the high-technology sectors, one notable recent trend has been the extension of firms' research and development (R&D) activities on a global scale to augment their knowledge base (Florida 1997; Kuemmerle 1997; 1999 a&b). It has been noted that one of the main changes in the innovation strategies of MNCs since the early 1990s has been the move towards 'international learning companies', and the utilisation of overseas laboratories as 'knowledge incubators' to generate new scientific knowledge that can underpin their technological distinctiveness (Meyer-Krahmer and Reger 1999; Pearce and Papanasatassiou 1999; Lehrer and Asakawa 2003).

MNCs pursue global knowledge sourcing in search of emerging new scientific knowledge and technological capabilities, a large part of which is embedded in local innovation networks and scientific human resources. The sharing and transfer of knowledge across organisational and national borders is inherently difficult. The problem is even greater in the case of tacit knowledge which is difficult to articulate and communicate across wide geographical and social spaces. Several authors have highlighted the difficulties in transferring tacit knowledge across borders (Teece 1977; Simonin 1999) and the constraints that tacitness of knowledge places on international business expansion (Martin and Solomon 2003). Much of the existing literature has focused on the 'cognitive' dimension of the problem and the role of intra-corporate mechanisms in resolving it (Gupta and Govindarajan 2000; Szulanski 1996). In this paper, I draw attention also to the 'societal' aspect of the problem that MNCs have to face when they attempt to transfer and create knowledge across major institutional-societal borders.

The cognitive dimension of the tacit knowledge problem arises from the experiential nature of knowledge, that is, the classic Michael Polanyi (1958; 1966) problem as depicted in his observation: 'we know more than we can tell'. Here, Polanyi draws our attention to the deeply personal and action-based nature of knowledge that defies easy articulation and communication. He argues that a large part of human knowledge is tacit. This is particularly true of operational skills and know-how acquired through practical experience. Even scientific knowledge, according to Polanyi, originates in tacit knowing that comes from the deep engagement of the focussed scientist in the phenomena to be explained. Tacit knowledge, in this sense, is a form of 'knowing' that is inseparable from action because it is constituted through action (Orlikowski 2002). The experiential and personal nature of tacit knowledge create significant barriers to knowledge creation within the MNC because of the difficulty in engendering interactive learning and maintaining mutual knowledge (Cramton 2001; Sole and Edmonson 2002) within its geographically dispersed and socially diverse contexts. MNCs face a distributed organisational learning problem in general but the problem becomes especially complex in the case of R&D and innovation activities which involve the collaborative creation and sharing of tacit knowledge.

The 'societal' dimension of the tacit knowledge problem originates from its socially embedded nature and the potential barriers to cross-societal knowledge transfer when MNCs seek to tap into locally embedded knowledge. Michael Polanyi's original conception of tacit knowledge, with its heavy emphasis on the individual realm and its cognitive base, gives only limited attention to the wider social and institutional context that shapes such cognitive frameworks. One cannot fully understand the nature of the tacit knowledge problem without considering the social context from which it arises. Social cognitive theorists (e.g. Vygotsky 1978; Reber 1993) argue that individuals acquire their cognitive abilities and inner experiences by internalization the meanings and patterns of thoughts current in their culture and society. Much of an individual's tacit knowledge can be associated with their social and collective identity. Durkheim's (1964) notion of 'collective consciousness' suggests that social entities cognize and learn only to the extent that the individuals, who make up the social entity are socially defined beings. Nonaka and Takeuchi's (1995) theory of organizational knowledge creation is rooted in the idea that shared cognition and collective learning, grounded in the '*Ba*' (shared mental and social space), constitute the foundation of organizational knowledge creation. The notion of 'community of practice' (CoP) stresses the importance of the social locus and shared practices within which learning and knowledge creation take place (Brown and Duguid 1991; Wenger 1998). Transferring knowledge to new comers, according to the CoP perspective, involves transferring not only the body of codified knowledge but also the tacitly shared ground rules and cognitive schemes for interpreting and decoding the meaning of the knowledge (Duguid 2005). Tacitness, in this sense, is not simply a feature of the knowledge itself associated with non-codifiability and cognitive ambiguity, it is also a relational feature inherent in the process of knowing in that 'common sense thinking' and shared assumptions that enable joint action are taken-for-granted by the social actors and remain unspoken (Schutz 1953). Although firms may face the 'social' aspect of the tacit knowledge problem within their own country or region, it is often accentuated and becomes a 'societal' one when MNCs engage in knowledge transfer across national boundaries where social contexts and rules are shaped by larger national institutional forces (Gertler 2003; Whitley 2000). Thus, MNCs may face a local learning problem especially when the societal institutions governing knowledge production diverge significantly between the home and host country contexts.

There is a large comparative literature demonstrating how knowledge accumulation within firms is heavily influenced by wider socio-economic forces and the institutional framework at the national level (Hall and Soskice 2001; Whitley 2000; 2002; Lam and Lundvall 2006). My own previous research (Lam 1997; 2000 and 2002) demonstrates how the dominant types of knowledge in use within firms, its degree of tacitness and patterns of knowledge transmission are powerfully shaped by wider societal factors, especially nationally constituted organisational forms and labour markets. For example, large Japanese firms characterised by firm-based internal labour markets and stable employment relationships have been able to develop strong capacities for internal organisational knowledge creation. The firm-centred organizational community (Dore 1973) provides the main social locus for the creation and sharing of knowledge in Japanese firms (Nonaka and Takeuchi 1995). By contrast, knowledge creation in Anglo-American firms takes place within more open, fluid occupational-based labour markets which enable the flow of person-embodied knowledge across organizational boundaries. The main social container that supports knowledge transfer, in this case, is rooted in the occupational community or professional networks that transcend organizational boundaries (Saxenian 1996). This suggests that the type of network relationships and social containers needed for the generation and transmission of knowledge may differ significantly between firms of different national origins. When MNCs seek to tap into locally embedded scientific knowledge and capabilities, they have to develop close external network relationships with a variety of local actors and manage the interaction between R&D communities in the home country and the host region. The ease of local learning and knowledge creation may depend on the dynamics of interaction between the MNCs and host-regional context, and the extent to which the R&D communities of MNCs are able to develop social and relational proximity with their local counterparts.

The main aim of this paper is to examine how MNCs, characterised by contrasting home-based models of learning, develop different strategies for solving the tacit knowledge problem in their global R&D activities. It compares the US 'professional-oriented' with the Japanese 'organisational-oriented' model of learning and innovation (Lam 2002; Westney 1993; Whitley 2002). The former relies on external learning and open recruitment of scientists and engineers in a professional-oriented labour market for knowledge renewal; whereas the latter builds its innovative capability on cultivation of collective organizational competences supported by a well-established internal labour market to produce cumulative learning. The study examines how US and Japanese MNCs differ systematically in their capabilities and propensities to address the challenges of tacit knowing both internally within their globally distributed R&D organizations, and externally, between the home and local R&D communities. It seeks to understand how MNCs draw on their distinctive home-based organizations and competencies to develop their transnational social spaces for learning, and the ways in which home-based models of learning interact with the local host country context to shape their abilities to harness local knowledge. The empirical research is based on four in-depth case studies carried out in the R&D laboratories of US and Japanese MNCs in the UK.

OVERSEAS R&D AS KNOWLEDGE INCUBATORS AND TACITNESS OF SCIENTIFIC KNOWLEDGE

The global dispersion of R&D has increasingly been driven by firms' needs to acquire new knowledge and capabilities, and gain access to unique human resources. A key element of this has been the growth of transnational collaborative relationships with academic institutions (Kaounides 1999; Granstrand 1999). This trend is particularly prominent in the science-based industries where the traditional barriers between scientific and technological disciplines are breaking down, and there is an increased interchange between basic and applied research. Although US firms have been able to draw upon a strong academic science base at home to support their radical innovation strategies, they are subject to intense competitive pressures to broaden the scope of innovative search. Since the early 1990s, many leading US MNCs have sought to create a global scientific space through their global R&D networks and academic links (Gerybadze and Reger 1999). Japanese firms are relative latecomers in setting up R&D facilities abroad (Cantwell 1995). However, since the late 1980s, many firms in the electronics and pharmaceutical sectors have become increasingly concerned with the need to develop more creative research organisations with greater capabilities in basic research and radical innovation (Methe 1995; Roehl et al 1995; Methe and Penner-Hahn 1999). The relative weakness of the academic science base at home (Coleman 1999; Nakayama and Low 1997) has prompted Japanese firms to go abroad to search for productive university ties and set up basic research facilities.

Lehrer and Asakawa (2003) use the term 'offshore knowledge incubators' to describe R&D units established in a foreign environment with a strategic objective of building close ties with local universities and research organisations in order to capture and cultivate new scientific and technical knowledge to support the MNC's global innovation strategies. This type of overseas unit poses special managerial and organisational challenges for the MNC because of the tacitness and localised nature of the knowledge involved, and the open-ended knowledge creation process that they undertake within globally dispersed organisational contexts.

The mandate of these overseas knowledge incubators is to search for new scientific knowledge that potentially has high economic and commercial value for the MNC. New knowledge tends to be developed in tacit form and is highly personal, initially known by one person or a small team of discovering scientists, and is difficult to transfer to others (Zucker et al 2002). Indeed, much empirical research in the sociology of science has shown the tacit character of scientific knowledge production and diffusion (Shapin 1995; Collins 1982; 2001), despite its supposedly generic nature. This tacitness is rooted in the skill or craft of the scientist engaged in experimentation and laboratory work, as well as the social connectivity and network relationships that underlie the construction and transmission of scientific knowledge. In other words, both the 'cognitive' and 'social' dimensions of tacit knowing are present in scientific knowledge production. The craft, experiential nature of scientific inquiry is well illustrated by Collin's study (2001) which shows that the development of scientific knowledge always involves a process of trial and error experimentation depending on a body of knowledge that is unrecognized and uncognized (or uncognizable). This 'embodied', tacit knowledge cannot be passed on systematically in formulae, diagrams, or verbal descriptions and instructions for actions, but can only be transmitted through site visits, personnel exchanges and developing trust among the scientists involved. This is especially so in the case of emerging new knowledge which tends to deviate from prior knowledge or text book descriptions, and where even the source scientists have not been aware of all the relevant parameters. The effective transfer of this sort of knowledge requires the recipient scientist to engage in bench level collaboration with the discovering scientist to observe 'how the science is done' (Zucker et al 2002: 143).

Scientific knowledge also has a socially embedded and localised character because its transmission is often restricted to members of a professional community who share similar endowed knowledge base, cognitive norms and common practices that enable them to interpret and understand the new knowledge. Fleck (1979) used the term 'scientific thought collectives' to indicate the cognitive dependence of individual scientists on thought styles and social collectives of the community of scientists for training and cultural resources. Thus scientific knowledge production is rooted in tacit knowing because the interpretation and understanding of scientific statements and observations required researchers to possess the complementary tacit cognitive associations based on unarticulated and shared background knowledge. The notion of 'absorptive capacity (Cohen and Levinthal 1990) also suggests that individuals or organizations need prior related knowledge to assimilate and use new knowledge. The prior related knowledge includes knowledge of the most recent scientific and technological developments as well as the shared language or skills of the community that enables tacit knowing. Participating in scientific communities and collegial research networks is necessary for acquiring the capability for scientific tacit knowing.

When MNCs seek to tap into the foreign academic knowledge base through their overseas R&D units, they will need to foster close interaction between their home-based R&D community and the external scientific community embedded in the local national innovation system. This could pose a significant challenge to MNCs because national innovation systems tend to vary in the ways they organize knowledge production and develop different types of innovative competences and strategies (Whitley 2002; Hage and Hollingsworth 2000; Nelson 1993). There can be significant national differences in the extent to which firms develop links with public science system and draw on new scientific knowledge and skills for technological innovation. The tacit knowing problem is likely to be more acute when their R&D units are located in a national innovation system that differs considerably from the domestic one.

MNCs AND TRANSNATIONAL SOCIAL SPACES FOR TACIT KNOWING: ORGANIZATIONAL COMMUNITIES OF PRACTICE (CoP) AND PROFESSIONAL NETWORKS OF PRACTICE (NoP)

Tacitness of knowledge has a cognitive (experiential) and social (contextual) component which are mutually constituted. Sharing practice, or 'knowing in action', within a particular social context enables actors to develop common knowledge, mutual understanding and embedding circumstances which makes tacit knowing possible. Practice can have a 'local' as well as a 'global' dimension, depending on the boundary of the relational space in which it is situated and the nature of social interaction. The different kinds of situated practice that develop around distinct forms of social interaction are associated with varied knowledge processes and learning orientations (Amin and Roberts 2008).

The original concept of 'communities of practice ' (CoP) (Wenger 1998; 2000) emphasises the centrality of the local organizational context in which members interact and work in close proximity, and develop shared norms, trust and common identities that support learning and knowledge creation. Here, the idea of a 'community', denotes a socially and cognitively dense group with a shared history and culture developed through an extended period of local interaction involving face-to-face encounters between members (Wenger 1998). The strong social bonds within a CoP generate mutual engagement and shared repertoire that guide the practice and activities of members. Thus tacit knowing within a CoP is rooted in communal background knowledge and common ways of doing things. CoPs are adept at creating and transferring experienced-based, tacit knowledge, and are often associated with an exploitative mode of learning (March 1991; Miller et al 2006). However, communities are closed social units and the shared practices cannot be easily stretched across wide social and spatial boundaries which may limit their capabilities for exploratory learning.

On the other hand, the idea of 'networks of practice' (NoP) (Brown and Duguid 2001; Duguid 2005: 113) suggests that practice can also be shared widely among practitioners, many of whom may never come into direct contact with each other. Typical examples are international groups of scientists or project teams involved in joint knowledge production or problem-solving. The practice within a NoP is much more loosely coordinated, and members are bound together by their common professional background, codes of practice and commitment to a particular set of knowledge or project goals. A NoP is similar to Lindkvist (2005)'s idea of 'collectivities of practice' characterised by a more dispersed and individualised knowledge base. Its shared identity and social bonds are much weaker than in the case of a CoP. However, members of NoPs are able to share knowledge by virtue of their common professional practice, overlapping individual knowledge base and shared task goals that make tacit knowing possible among proximate and distant members. Unlike CoPs which are bounded social containers and have a strong local character, NoPs are more open and flexible, and have a potential global beach. Their more distributed and varied knowledge process generates a higher propensity for new knowledge creation and exploratory learning (March 1991; Miller et al 2006).

A key challenge for MNCs, then, is the development of transnational social spaces within which shared practice and common knowledge can be developed and reproduced across diverse organizational and institutional contexts to facilitate knowledge creation and transfer. In other words, tacit knowing within MNCs will have to draw on a combination of different types of situated practice and forms of social interaction, drawing on the deep relational ties of CoPs as well as the more loosely connected NoPs. However, the relative dominance of the CoP vs. NoP as the main social locus of learning may vary between firms.

Building on the institutional perspective that stresses the strong influence of home-based institutions on the structure and behaviour of MNCs (Whitley 1999; 2001; Morgan 2001; Pauly and Reich 1997; Doremus et al 1998), I argue that the global coordination structures of MNCs and their strategies for addressing the tacit knowing problem will bear the strong imprint of 'home country effects'. This does not imply the replication of home-based organisational forms and learning patterns in the global arena, but refers to the ways in which MNCs' draw upon their existing organisational models and competences to develop their distinctive approaches to transnational learning. In particular, I argue that the main social space that supports knowledge sharing and transfer will differ significantly between US and Japanese MNCs.

US firms have traditionally relied on an external learning strategy that takes advantage of the country's mobile and open professional labour markets to support radical innovation through continuous knowledge renewal (Hage and Hollingsworth 2000; Whitley 2000). Within the firm, coordination of innovation activities is carried out by individual experts operating in flexible project teams. Beyond the firm, knowledge is transmitted within the loosely structured professional networks of scientists and engineers who share common scientific norms and technical practices. Thus the main social locus that supports tacit knowing is that of a professional or occupational community that cuts across heterogeneous organizations. The dominance of this professional model in scientific knowledge production in the US has also been reinforced by the prominent role of universities in the national innovation system (Mowery and Rosenberg 1993), and the strong inclination of US firms to develop close links with universities through collaborative research and recruitment of PhD scientists into their laboratories (Hane 1999; Spencer 2001). This has facilitated the formation of a common scientific community straddling the two sectors, allowing firms to embed their local R&D communities within the wider scientific networks involving more distant members. The wider social and spatial reach of the professional-oriented model of knowledge creation facilitates the development of a more decentralised global R&D and distributed learning within a loosely coordinated structure. One would also expect US firms to have a strong inclination to develop globally distributed R&D networks (Barlett and Ghoshal 1990) because of the national innovation system's focus on achieving scientific breakthroughs and radical innovation. This kind of innovation system requires firms to develop highly flexible and permeable organizational structures to search and appropriate knowledge from a wide variety of external sources through exploratory learning. Thus:

> Hypothesis 1. US MNCs will have a greater propensity to develop the 'professional networks of practice' (NoP) approach to transnational learning, taking advantage of their strong organisational capacity for exploratory learning and knowledge creation through the open professional networks of their R&D communities spanning organisational and institutional boundaries.

Japanese MNCs, on the other hand, are generally more tightly integrated and seek to maintain a high degree of internal organisational proximity and coherence (Westney 1999). They develop their internationalisation strategies by building on and extending their existing technological expertise to overseas markets. The Japanese approach to product innovation is characterized by a tight integration between R&D and manufacturing operations and frequent rotation of people across functional boundaries. This particular feature of the Japanese innovation system inhibits the decentralization R&D to foreign subsidiaries (Cantwell and Zhang 2006). Moreover, Japanese firms have historically built their innovative capabilities on a well-established firm-based internal labour market with a strong emphasis on internal knowledge creation. Coordination of innovation activities relies much more on extensive organizational routines and shared procedures as emergent collective capabilities. The social locus that supports tacit knowing is more narrowly confined within the 'organizational space' defined by the firm rather than the wider 'professional space' as in the case of US firms. This organizational-oriented knowledge production system is further reinforced by the institutional separation between industry and academia (Hane 1999). Unlike their US counterparts, Japanese firms have limited experience in developing external network ties with the academic scientific community and in conducting exploratory basic research. Their innovation strategies have tended to focus on applied R&D to promote a cluster of continuous and incremental innovation through exploitative learning. Thus:

> Hypothesis 2. Japanese MNCs will have a greater propensity to develop the 'organizational community of practice' (CoP) approach to transnational learning, relying on their unique organisational capacity for internal knowledge creation and exploitative learning through the development of shared identities and problem-solving routines within firm-centred organizational networks.

Whilst recognizing that home country institutions provide the main basis from which MNCs develop their transnational learning strategies, I consider also the host country as part of the social context within which the activities of MNCs are embedded. MNCs have to manage the interaction between the R&D communities at home and those in the host country. A subsidiary's ability to gain access to local knowledge sources is dependent upon its embeddeness in the host country context and the social relations of technological innovation (Frost 2001; Zanfei 2000). Proximity between home-based institutions and the host context may facilitate the local embeddedness of MNCs and their ability to harness local knowledge.

Both the US and UK business systems are organized around liberal market institutions and they share a similar ‘professional-oriented’ approach to knowledge production and innovation (Hall and Soskice 2001 ; Whitley 2000). The two countries also share a similar background of having a strong higher education sector and scientific research base. By contrast, the scientific base in Japan is generally less strongly developed and the role of professional researcher is not well institutionalized (Westney 1993). The R&D researcher in Japanese firms is less of a professional scientist but more of a member of an engineering or technological community characterized by a strong orientation towards product development. This ‘organization-oriented’ model of R&D cannot be so easily enmeshed with the UK ‘professional-oriented’ R&D communities. Thus:

> Hypothesis 3. Relative to their US counterparts, Japanese R&D laboratories in the UK will encounter a greater degree of cross-societal tacit knowing problem because of the greater divergence between the local institutions and the Japanese MNCs’ domestic ones.

RESEARCH METHODS AND THE SAMPLE

Selection of Case Studies

The research was based on four case studies of two US and two Japanese MNCs from the same two sectors: ICT and pharmaceutical (thereafter referred to as US-ICT, US-Pharma, J-ICT and J-Pharma). Since the aim of the investigation was to use deep probing case analysis to demonstrate the divergent national patterns hypothesised and to extend our understanding of the complex relationships and processes involved, I used a ‘theoretical sampling’ method (Eisenhardt 1989) to select the cases which are most likely to demonstrate and refine the theoretical expectations.

All the four cases selected are large multinational firms operating in dynamic and innovation-intensive industries. Firms operating in these industries are under intense pressure to speed up innovation while at the same time to develop research capabilities in the newly emerging scientific fields. Forging close links with research universities on a global scale has become an important component of their innovation strategies. The two sets of companies chosen for the study had to meet three main criteria: a) they had in-house R&D facilities that conducted advanced research; b) they had R&D units in the UK aiming at cultivating new scientific and technological knowledge through university links; and c) the laboratories were of an internationally interdependent type with a mandate to generate product and process innovation for global application. The two US companies were identified through the author’s earlier research contacts and the two Japanese companies were subsequently chosen to match as closely as possible with the US sample. I was able to match the two ICT firms in terms of their size, scale of R&D investment and the duration of their R&D operations in the UK. US-ICT's Bristol Laboratory was established in 1985 and, J-ICT's Cambridge Laboratory in 1989. The two companies in the pharmaceutical sector, however, are less precisely comparable because of the substantial differences in their size and R&D investment. Moreover, US-Pharma's R&D site in the UK was established in 1955; whereas J-Pharma's London Laboratory was initiated in 1990. The less good sample match here is inevitable because of the contrasting national patterns of sectoral development in pharmaceuticals between the two countries. The Japanese pharmaceutical industry is much younger, firms are relatively small and the scale of R&D investment is not comparable to the US global giants. These differences may influence the transnational learning behaviour of the two pharmaceutical firms in terms of the resources for and experiences in establishing external R&D links.

All four R&D units chosen for the study are located in the UK with the objectives of exploring new technologies or researching new scientific fields. They can be described as 'knowledge incubators'. The two U.S. laboratories are part of the globally distributed corporate R&D headquarters of the MNCs; whereas the two Japanese laboratories are subsidiary R&D units rather than distributed corporate R&D centres. Table 1 gives a profile of the international R&D organization of the four companies studied.

Data Collection and the Interview Sample

Data were collected by semi-structured individual interviews with senior managerial and technical staff in R&D, human resource and academic liaison groups as well as those directly engaged in external collaborative activities. In all the cases, first contacts were made with the R&D director to gain an overview of the history and organization of the labs. A snowballing method was then used to identify other informants. The semi-structured questionnaires covered three main areas: a) international R&D organisation and global knowledge sourcing strategies; b) organizational coordination and knowledge integration; and c) patterns of interaction with local universities and scientists. A small number of interviews were also conducted with the MNCs' local academic partners in order to gain a deeper understanding of the knowledge transfer process. The interview sample is shown in Table 2.

In the case of the Japanese firms, initial interviews were also carried out with senior management at the headquarters in Japan. This was necessary for gaining access to the laboratories in the U.K and for obtaining essential company information not readily available in the U.K. With hindsight, interviews could also have been conducted at the US headquarters, but there was less pressing need to do so because of the greater availability of company information and access to key staff in the UK. The Japanese interview sample was much smaller owing to the difficulties in gaining access to key staff in Japan and the small scale of the local laboratories. Access to J-Pharma in Japan was relatively restricted and only four interviews were carried out. However, this was compensated by the fact that the two interviewees at the headquarters in Japan had previously worked in the overseas laboratories in the U.S. and U.K., and were able to provide rich information on the experiences of these laboratories.

The interviews in Japan were conducted in Japanese and, in the U.K., in English. The interviews were conducted between 2000 and 2001. Each interview lasted for about 75 minutes. All the interviews were recorded and transcribed. These data were supplemented by company documents, press releases and other relevant published materials.

Table 1 A profile of the international R&D organisation of the four companies

Company	**US-ICT**	**US-Pharma**	**J-ICT**	**J-Pharma**
R&D Headquarters	USA and UK	USA	Japan	Japan
Global R&D structure	R&D is distributed between corporate laboratories and R&D groups at divisional level. Central R&D is globally distributed employing 800 people in six sites around the world.	Global R&D division employs approximately 12,000 employees, with six discovery sites. Central Research organized as a globally distributed network.	Seven corporate research labs in Japan, employing a total of 2,700 research staff, with the Central Research Lab employing 930 research staff. Global research networks include four research and design centres in the U.S. and five sites in Europe. The facilities in the US employ a total of 60 people and, in Europe, around 30.	Central research in Japan functions as the nucleus of drug development activities and employs around 400 research staff. The research lab in Boston (60 staff) and the London lab (40 staff), together with the central lab in Japan form the company's tripolar research networks.
Role of local labs (units investigated)	Bristol Lab (UK) -the company's second largest research labs and is among the premier corporate research labs in Europe -employing around 200 people.	Central discovery research (UK) - the company's European headquarters for the discovery and development of new drugs - the largest research facility outside the U.S. with over 600 R&D staff at the site.	Cambridge Lab (UK) - campus-based lab aiming at creating new concepts of advanced electronic/opto-electronics devices -employs 10 research staff and collaborates with 25 university researchers.	London Lab (UK) - campus-based lab with its initial focus on basic research in cell and molecular biology, but has recently shifted towards more applied research -employs 40 research staff.

Table 2 The Interview Sample

Company	**US-ICT**	**US-Pharma**	**J-ICT**	**J-Pharma**
No. of company interviews Position of interviewees	10 -Managing director of R&D Lab -Human resource manager -Academic liaisons manager (twice) -Project leaders/researchers (6)	14 -Vice President of Lab - HR Director - Recruitment and academic liaison manager -Research directors (3) - Managers, external technology acquisition (2) - Director, project management - Project leaders/researchers (5)	7 Headquarters: -R&D manager -General Manager of Global R&D -Managers, human resources (3) Cambridge Laboratory: -Research director -Project leader/researcher	4 Headquarters: -Director of Planning and Coordination in Clinical Research (formerly coordinator and researcher in U.K. Lab); -Director, R&D Planning (formerly laboratory manager in U.S. Lab); London Laboratory: -Research Director -Project leader/researcher
No of interviews with local academic partners	2	3	2	1

A COMPARATIVE ANALYSIS OF THE CASE STUDIES

The analysis reveals some significant contrasts between the US and Japanese MNCs' in their global R&D structures, and the ways in which they develop shared social spaces and knowledge leveraging practices to integrate globally distributed R&D activities, and forge external network ties with local R&D communities. The main differences are summarised in Table 3.

Table 3 MNCs and transnational learning: the US Professional NoP vs. Japanese Organizational CoP approach

	US MNCs	**Japanese MNCs**
Home-based model of learning and innovation	Professional-oriented model	Organizational-oriented model
Modes of international R&D organization	Integrated networks	Hub model
Approach to transnational learning	Professional networks of practice (NoP)	Organizational communities of practice (CoP)
Distributed organizational learning	Project team level integration Projects and tasks as basis of common knowledge and shared experience to aid knowledge transfer	Organizational level integration Organizational routines and shared identities to promote trust and knowledge transfer
External networks and local learning	Extensive external network ties through multiple university partnerships and collaborative projects Use local 'star scientists' as focal links in local innovation networks Structural embeddedness for exploratory learning	'Embedded laboratories': institutionalized university partnerships as organizational space for collaboration Use expatriate scientists as organizational bridges to integrate local labs Relational embeddedness for exploitative learning

International R&D Organization and Transnational Social Spaces for Learning: 'Integrated Network' vs. 'Hub' Model

The two US MNCs examined here have sought to build an integrated form of network R&D organisation on a global basis since the early 1990s. A main policy focus of the R&D organisational restructuring in recent years has been to enhance global coordination and integration of the geographically distributed research laboratories into the global knowledge networks. The global R&D structure can be characterised as that of an 'integrated network' (Barlett and Ghoshal 1990; 1998) whereby the central R&D evolves into a competency centre among interdependent R&D units which are closely connected by flexible and diverse coordination mechanisms. An important objective of their global knowledge sourcing strategies has been to broaden their global scientific space and external knowledge networks. The local laboratories enjoy a clearly defined and coordinated autonomy within the MNC groups in terms of their R&D and business strategies, and relationships with local research organizations. The R&D directors and management team were recruited locally in the UK. Both companies manifest a strategic aim to build a systematic and all encompassing approach to the way they interact with local universities and research organisations. Gaining access to and recruitment of scientific personnel appears to be a key strategic objective of their academic links. Moreover, the companies also increasingly seek to enlarge their space for the search of scientific expertise by tapping into the wider European labour markets.

The two Japanese cases examined here are both university-based laboratories, and can be considered as typical of Japanese firms' approach to tapping into foreign scientific academic knowledge base (Turner et al 1997). They were established about fifteen years ago, representing the European nodes in the companies' tripolar global research networks. The R&D organisation of the Japanese MNCs approximates what can be described as the 'hub model' (Gassman and von Zedwitz 1999): the central research laboratories at home maintain tight control over decentralised activities by means of long-term R&D programmes as well as resource allocation and close monitoring through personnel allocation. This reflects Japanese MNCs' long accustomed ethnocentric mode of coordination (Lehrer and Asakawa 1999; Westney 1999). Both laboratories were managed by Japanese research scientists dispatched from home. The pharmaceutical company's initial attempt to grant its London laboratory autonomy by appointing a foreign scientist as research director had proved to be 'unsuccessful' in the view of the parent company. This led subsequently the company to dispatch a Japanese research manager to re-integrate the overseas unit within its domestic research facilities (see below).

The differing coordinative structures and behavioural orientations of the two sets of MNCs observed are consistent with the findings of several other studies which also suggest that the network model of R&D tend to be more widespread among leading US and European MNCs than Japanese ones (Gassman and von Zedwitz 1999; Gerybadze and Reger 1999; Reger 1999). Japanese MNCs generally experience a strong isomorphic pulls towards the 'ethnocentric', 'hub' model of international R&D organization (Asakawa 2001).

Distributed Organizational Learning in Global R&D: 'Project' vs. 'Organization' as Shared Space for Tacit Knowing

MNCs face a distributed organizational learning problem. Common execution of tasks and social interaction are important for developing shared cognitive frameworks and mutual engagement to overcome the tacit knowing problem in distributed organizations. The two sets of MNCs differ in their emphasis on the relative importance of 'project team' vs. 'organization' as the locus of social interaction, and basis of common knowledge and experience.

The US MNCs placed a heavy emphasis on project team level integration, using projects and task-related common knowledge to facilitate global coordination. Both companies relied on global research programmes and multi-site projects for integrating the dispersed R&D communities. For example, US-ICT's corporate R&D was organised into four research programmes which cut across different laboratories and could be located anywhere in the world. Several project managers interviewed commented on how their affiliation to the different research programmes meant that they were 'all part of a global organization rather than being a single entity' and how the programmes set the common 'cultures' in which they operated and served to integrate the 'local cultures'. US-ICT also increasingly used global project teams to align and coordinate global product development (interview with Human Resource Manager). Commitment to joint project goals and virtual social interaction served as important integrating devices to facilitate joint work. However, the interviews also suggest that virtual interaction on its own was insufficient for engendering the kind of mutual understanding needed for the transfer of more fine-grained information and tacit knowledge in product development. Temporary co-location of teams and facial interaction were needed from time to time to ensure smooth project collaboration. One US-ICT project manager interviewed, for example, talked about how recurrent face-to-face meetings were needed to 'hash things out' and to tackle the problem of global team members 'working in their different geographies and subtly changing what they're doing' according to their local practices and understanding.

In US-Pharma, the Central Project Management function has assumed a central role in coordinating globally distributed drug development teams. The company has recently developed a global project management system universally adopted by the research labs worldwide. The intention, according to the project manager interviewed, was to have a set of common definitions, codes and activities to enable the company to 'roll up' all the projects into a portfolio view. The project templates serve as shared background knowledge to align globally dispersed activities: 'to get the right people in the right place doing the right things', to put it in the words of one of the project managers interviewed. Projects provide focal points for developing common knowledge and shared procedures within globally distributed R&D networks. They assume an identity within the global organisation, allowing the members to relate to it and provide a common context for knowledge sharing (Mendex 2003). Projects also allow companies a great deal of organizational and spatial flexibility to extend their reach to different knowledge pools and resources both internally and externally.

The Japanese MNCs, by contrast, relied on an organizational level integrative strategy that aimed at maintaining a cohesive internal R&D system through ongoing enactment of shared organizational identities and routines. Both the Japanese laboratories were of a small scale and focussed on specific technological fields. The two companies used a combination of formal control structures, informal socialisation and person-oriented mechanisms to integrate their geographically dispersed activities. The overseas laboratories were under the formal control of Corporate R&D Planning Group at home and, the managers and key technical staff responsible were Japanese. For example, J-ICT's European R&D sites were coordinated by a parent organization, the Corporate Technology Group, based in the UK. The management team of the Group was solely Japanese, comprising a general manager and four local laboratory managers, all of whom were Japanese. Indeed, a distinctive approach adopted by the Japanese MNCs was the reliance on expatriate managers and research scientists, with extensive home-based R&D experience, as key liaison persons in bridging the relationships between the home and overseas laboratories. These expatriate manager-researchers played a critical role in transferring home-based product development routines and work practices to the local laboratories, and in fostering strong inter-personnel connections between the home and local laboratories. The manager of J-ICT Cambridge Laboratory was a Japanese researcher from the Central R&D who acted as the key liaison person between J-ICT and the local laboratory. He visited Japan several times a year to report on progress and discussed the future objectives of the Cambridge Lab. Likewise, the director of J-Pharma London Lab was an experienced Japanese researcher dispatched from Central R&D whose main role was to integrate the London Lab into the home R&D system. He described how he adopted a 'hands on micro-management' approach, using regular meetings to give 'advice and suggestions' in order to transfer home-based drug development knowhow to the local teams. It appears that the Japanese MNCs have sought to extend their firm-centred CoPs across geographical boundaries in order to promote common routines and shared work orientations to integrate the dispersed R&D activities.

While both sets of MNCs have sought to develop shared practice to aid tacit knowing in globally distributed R&D activities, the basis of the shared practice and the social and spatial dynamics of such 'knowing in action' differ between them. In the US MNCs, the shared practices are embedded in joint projects and task goals which provide a cognitive basis for knowledge sharing; whereas in the case of the Japanese MNCs, they are shaped by wider organizational routines and common orientations that define work relationships. Projects and tasks are less bounded social units and can be flexibly reconstituted, and thus enabling firms to have a greater degree of organizational and spatial reach. By contrast, organizational routines have a vertically binding character and they build on a relatively stable and cohesive organisational membership base. This inevitably means that they cannot easily be stretched across wide spatial and social boundaries.

External Network Construction and Local Learning: Cross-Societal Tacit Knowing

Both the US and Japanese MNCs have sought to develop external network ties with the local scientific communities in order to tap into the local scientific knowledge base. However, the network structures and the basis upon which they are constructed differ significantly between them, reflecting their divergent learning goals and knowledge leveraging strategies. Several authors (Rowley et al 2000; Reagans and McEvily 2003) have identified two distinctive types of network structures that support knowledge transfer across institutional and organizational boundaries: structural embeddedness and relational embeddedness. The former describes ties that go beyond the immediate vicinity of firms, spanning multiple knowledge pools that facilitate the capture of diverse knowledge; whereas the latter refers to the strong interpersonal connections built around a relationship that promote trust and facilitate knowledge transfer. The two types of network structures are not necessarily mutually exclusive but they are associated with different modes of learning and there is often a trade off between them.

The evidence presented below will show that the US MNCs sought to extend their knowledge networks to the academic partners in a fluid and expanded way through flexible project links and the professional networks of scientists. Their dominant orientation was to attain structural embeddedness in the local innovation networks for broad knowledge search and exploratory learning. By contrast, the Japanese MNCs invested heavily in deep relationships with a single university partner and used 'embedded laboratories' to create their own distinctive organizational spaces and cohesive relationships to facilitate knowledge transfer and exploitative learning.

US MNCs: Strategic University Partnerships and Scientific Networks

Multiple university ties to expand knowledge and talent search. The two US companies used what they described as 'strategic partnerships' to forge long-term, multi-dimensional ties with selected local universities to support their exploratory knowledge search. Since the mid-1990s, US-ICT has been making a conscious policy effort to develop more systematic and stronger links with universities. A new position responsible for academic links was created in 1995 at the Bristol laboratories. The mandate of this new role was the development of a 'Strategic University Relations Programme' on a global scale to support the role of the R&D laboratories in 'providing options for the future' (interview with R&D director). A strong focus was placed on long-term relationship-building with the selected university partners, aiming at gaining 'early access to the best ideas and trusted access to the best people', according to Academic Relations Manager interviewed. By becoming a trusted partner to the universities, US-ICT sought to venture into the 'private' social and cognitive space of university researchers in order to capture emerging new knowledge that has not yet been formalised or not even fully cognizable to the researchers themselves (Collins 2001). The emphasis on the search for emerging, tacit knowledge is well-illustrated by the remarks by the Academic Relations Manager:

> "…if that university has a trusted relationship with you, then they are more likely to show their crown jewels… So you're more likely to get into the *secret garden* and see all the best things that they have on offer. And you're more likely to do that *before they know that their particular things are going to ripen* into something very interesting. So I mean the analogy I suppose would be that it's like a rose breeder and you're interested in a black rose, let's say. You want to know about it *when they are starting to develop* the variety, not when it's blooming…" (emphasis added).

US-ICT also stressed the importance of capturing person embodied knowledge, using 'a network of deep research relationships with key institutions to recruit the most innovative and entrepreneurial peopled worldwide' because the company believed that 'the best way to acquire knowledge is to acquire the people who have it…'' (interview with academic relations manager). Likewise, US-Pharma's attempt to develop strategic links with key universities was prompted by the need to search for the best quality scientists and to access a greater variety of knowledge sources in an increasingly competitive environment. Besides links with UK universities, the company also increasingly cast its knowledge search and recruitment net wider by extending their ties to continental European universities and research organizations. This, according to the director of discovery research, reflects the need to 'go out further afield' and a wider search for the 'potentials of innovation'.

Projects as mechanisms for bench level collaboration. Beyond the broad strategic objectives of knowledge search, the two US companies also sought to mobilise the professional and personal networks of scientists in building network ties with particular academic groups, and used collaborative projects to stimulate direct interface between scientists at the bench level. US-Pharma, for example, stressed the importance of 'getting the science' right in their external collaborative projects and used a bottom-up approach to identify project partners: 'Much of the seeking for collaborative opportunities is done by the scientists. So they're going out looking for collaborative opportunities…' (manager, external technology acquisition, US Pharma). The company also fostered the development of closer links between the laboratory scientists and their academic peers to ensure that new knowledge generated could be readily identified and fed directly into the therapeutic project teams. A technical director responsible for a major academic collaboration commented on the importance of bench-level scientific connection to ensure project success: 'Good links between the scientists. This is a scientific collaboration and so it has to be driven by the science …You have to involve the scientists on both sides'. Social and cognitive proximity between US-Pharma scientists and their academic peers appears to be a critical factor facilitating collaboration: 'I feel comfortable talking to them up in University X about anything. As do our scientists… I feel that as part of a team' (Technical Director).

US-ICT also used collaborative projects to gain close access to specific academic knowledge pools and to facilitate joint work with their academic partners. For example, the company set up a virtual research centre in mathematics in the mid-1990s as part of its new initiative to widen the research base and explore new avenues of knowledge. The centre sat at the interface between US-ICT Bristol Lab and two partner universities. It provided a forum for collaborative research and personnel exchanges. The core research staff comprised a mix of US-ICT researchers and academic scientists working on joint projects. The problem-solving experiences spanning the two sectors constitute an important mechanism for knowledge transfer.

Star scientists as 'brokers' in open knowledge networks At the core of the US-MNCs' strategies for developing close ties to the local scientific communities was the desire to gain access to a small number of 'star scientists' (Zucker et al 2002a) who act as focal links in the local innovation networks. 'Star scientists' are vital sources of knowledge and academic interfaces for firms not only because of the value of their deep scientific expertise but more critically, their connections to the wider scientific networks and 'brokering' role in knowledge transfer (Murray 2004). Both US companies looked at in this study have developed their local university partnerships through the personal contacts and deep engagement of such star scientists in the collaborative relationships. US-Pharma, for instance, recently engaged in a 5-year large-scale consortium research project with a university in Scotland. The engine behind the creation of the project was a 'star' bio-scientist who had developed strong personal links with the company through consultancy activities and advisory board membership. Over the years, this professor became a vital source of intellectual capital for US-Pharma through joint research, and his key role in creating and transferring early discovery results via direct personal contacts with the company's scientists. More critically, he also acted as a magnet for other top scientists and high quality post-docs to his laboratory, providing a source of reliable researchers for collaborative projects, and a potential source of recruits for the companies. Likewise, US-ICT's strategic partnership with a university in the west of England also revolved around a renowned professor in computer scientist who represented a centre of expertise for the company, and was also it's 'local window' of contact 'to generate links with other kinds of research groups around the world', to put it in the words of the professor. These star scientists are what Burt (1992) describes as 'structural hole spanners', enabling the companies to build extensive 'know-who' networks, bridging local and more distant ties within the scientific communities.

It is apparent that the professional ties of scientists provide the main basis on which the US MNCs develop multiple links with local universities to tap into the scientific knowledge base. Proximity between the US and UK research environment has enabled the US MNCs to develop extensive university links and embed themselves in the local innovation networks. However, this does not necessarily imply that the companies are able to exploit the full benefits of knowledge transfer. Although the broad scope of the network ties may lead to knowledge search benefits, they may also cause problems in knowledge transfer (Hansen 1999). For example, a problem mentioned by some of the academics who collaborated with US-ICT was the lack of clarity in project objectives and the difficulties in identifying the potential users of the research results. It appeared that the academics were given a great deal of discretion to define their research agenda without much regular input from the company. This problem is symptomatic of an exploratory mode of learning.

Japanese MNCs: 'Embedded Laboratories' and Organizational Networks

In contrast to the US MNCs' broad knowledge search through multiple university ties, the Japanese MNCs sought to establish deep, dyadic relationship with one particular university. Both the laboratories were physically located on the campus of their respective partner university and engaged in relatively focused research activities. J-ICT used the term 'embedded laboratory' to refer to the physical and relational embeddedness of the laboratory in the host university environment. Both labs were relatively small and they served as focal points for the companies to construct tight organisational spaces to facilitate the sharing and transfer of two types of knowledge: a) new scientific and technical knowledge produced locally; and b) home-based product development routines and knowhow to exploit the new knowledge created.

'Embedded laboratory' as organizational space for knowledge transfer: J-ICT Cambridge Laboratory. The J-ICT Cambridge Laboratory (JCL) was established in 1989 in close collaboration with a Cambridge university laboratory. It aimed to create new concepts of advanced electronic devices. J-ICT made an initial donation towards the building of the laboratory and its subsequent extension, and rented laboratory space in the building which was purposely built to house them along with the university lab. The co-location of the labs in the same building separated just by a single door facilitates intensive communication and intimate collaboration. J-ICT considered the main advantage of an embedded laboratory to be the opportunity to interact-face-to face with the local researchers and develop a sense of shared understanding so as to influence the purpose and targets of research identified within the university lab. The Japanese lab manager interviewed stressed the importance of

‘working together’ and being ‘in the same place’ for relationship building with the university scientists:

> “So, as you see here, through the one door, J-ICT’s area and the University’s area are just next door. And in the daytime, you can’t distinguish which person is a university person…So we have a very deep collaboration, close collaboration really. So far, I think everything came quite smoothly. The very important factor is that we are working so closely everyday…So we have been discussing the research and administration everyday”.

Indeed, one of the main roles of JCL was to integrate the fundamental research conducted at the university with the strategic objectives of the company. The subject areas and research direction of JCL were regularly discussed at an annual advisory committee meeting at Cambridge, involving people from J-ICT and the collaborating academics. As the Japanese laboratory manager noted, the collaboration was not simply a case of 'asking university people, please do this sort of research and we want to receive some results'. Rather, as researchers from the company and university worked together, it strived to achieve common understanding and direct research towards the same goal. In other words, the company was focusing on promoting the ‘knowledgibility of action’ or *knowing* rather than *knowledge* (Orlikowski 2002: 250).

One of the main difficulties encountered was bridging the different research and work orientations between the Cambridge scientific community and the product development community in Japan. Both parties believed that physical proximity and intensive communication had gone some way to reduce the cross-community barriers to collaboration. The following quotes are illustrative:

> “The biggest difficulty is … we employ basically the researchers with physics background. So they have a strong motivation to achieve some research goals. But as an industry, we have certain direction and targets. So to discuss the target and also to reach an agreement, by concerning research from Japan, that is somehow one of the most difficult parts. And also the approach and the way of thinking for the research here is very different from those in Japan…So it’s very useful that we have the opportunity to discuss such a target from the beginning with University staff and also students so they understand fully what’s going on” (Japanese laboratory manager).

> “…It [the collaborative relationship] needed very careful day-to-day management, very strong communication on both sides.. So, on both sides, it takes a lot of work, a lot of day-to-day communication, both locally and between the local managers, and also between our manager here and the hierarchy in Japan” (Cambridge researcher).

At the time of the study, there were three on-going collaborative projects, one of which had reached a stage of product development in collaboration with the Central Lab in Japan. The project started ten years earlier, at the initiation of the Cambridge lab, with research on single electron devices lasting for seven years representing a cumulative learning period necessary to gain the expertise which formed the foundation of this invention. JCL regarded its role in interfacing 'the scientific' with the 'development' world being critical for the successful innovation. This interface involved the sharing and transfer of knowledge between the Cambridge scientists and development engineers in Japan. The Japanese manager pointed out that having the Japanese researchers on-site at JCL was vital for the interface in order to 'translate' the scientific results into the kind of data that could be understood and used by the engineers at home:

> "…That's our role. That's the reason why we need the Japanese staff here, myself and two more Japanese… And also the interface between the scientific world and the development world is very, very difficult to fill so we are working very hard… For scientific purposes, to show the scientific results clearly, there is a certain way to prepare the sample and prepare the end results. But to use that for the actual products there are a lot more data necessary to show, to convince the people working in the factory. So it takes more than the initial scientific work to get some engineering data. That's done jointly with people on the Central Research Laboratory. We don't have enough expertise here, but by collaborating with the people in Central Research, we try to get some necessary data".

This quote highlights the critical role of the Japanese expatriate manager and researchers as 'knowledge brokers', engaging in arbitrage between the engineering communities at home and the local scientific communities.

The evidence thus far suggests that the JCL-Cambridge collaboration has been a success, in terms of tangible outputs and its apparent strategic importance for J-ICT. Both the J-ICT management and researchers at Cambridge described the partnership as 'stable and successful'. J-ICT was able to extend its corporate CoP to its overseas lab through an emphasis on management processes that support the formation of common understanding and shared identity among its local laboratory staff. Concern was placed not only on gaining access to scientific expertise, but also instilling a sense of shared identity through subtle socialisation so that the key local researchers got to know the company and its established routines. A local Cambridge researcher talked about the importance of 'careful daily management' of relationships in 'little things' like wearing a suit when he visited the company's European headquarters 'because there everybody wears suits and if I turned up dressed up like this I wouldn't be taken seriously'. He also boasted the strong links that his team had developed 'with everybody at every level and also up to Board level within the Central Research Lab [in Japan]'. It appears that the intensive personal interaction and frequent two-way visits of researchers have facilitated the development of 'relationship specific heuristics' (Uzzi 1997) that helps to ease the cognitive and societal barriers to knowledge transfer.

'Embedded laboratory' and problems in local embedding: J-Pharma London Laboratory. J-Pharma's London Lab was initially set up to focus on basic, curiosity driven research that may provide new drug candidates which would then be developed at the Central Lab in Japan. Initially JLL was given sufficient independence to carry out this mandate. The company made a conscious attempt to signal its commitment to basic research by appointing a US scientist director with strong connections with the local academics. During the first 5 years, despite the formal centralised management structure, JLL was able to establish close links with the university and engaged in various exchange activities. This was made possible through the scientific network ties of the US scientist director and a small group of university academics initially involved in setting up the laboratory, as noted by one of the professors:

> "… so with J-Pharma in the first five years, remember, the structure was identical. The Japanese had absolute control, J-Pharma had absolute control of what went on there [at JLL] but because of the Director and the people he hired and so on, it was terrific. There was a lot of flow back and forth, we collaborated with them, we published with them, as did other people in the University. Students were flown here. I mean, it was like part of the University, it was tremendous… Because the ethos was, you know, they [JLL] were integrated, it had to do with the scientists and Director, and the way it worked out".

However, after a few years without producing what was felt to be significant drug candidates it was reintegrated within the research activities of the Central Lab. The American director was replaced by a Japanese, an experienced drug development researcher from the Central Lab. Tight control was maintained through project management and intensive two-way communication between the two labs. The reason given for this dramatic change of research orientation and management, according to the interviews with senior managers at J-Pharma headquarters, was that following three or four years of investment, no new drug candidates had been discovered. It was stated in the interviews that the president of J-Pharma became impatient for some return on the investment made. There was clearly an expectation on the part of the company that five years was a reasonable time frame to expect some tangible outcomes. However, this expectation and the sudden change in direction came as 'a shock, an enormous disappointment' to the local academic community, to put it in the words of one of the university professors who was closely involved in the set up of JLL. He repeatedly pointed out in the interview that 'there were some very serious misunderstandings' about the nature of doing basic research and the role expected of JLL.

> "…the real problem was this misunderstanding about direction from the beginning. Their claim was they had always had the same thing in mind, they wanted to see drugs on line in three to five years and that was not on the table in the early years.…We on the Advisory Board were under the impression that what J-Pharma wanted was to have a first rate research institute focused on XX disease. Basically doing basic research for drugs that would emerge from principles fifteen, twenty years, this was long-term research… Now I don't understand how that happened…".

It would appear that the 'misunderstanding' was partly caused by the different expectations between industrial R&D and academic science. This was accentuated in the case of a Japanese company and western academic partner because of the added difficulties arising from the 'cross-societal' differences in the attitudes towards science and dominant modes of knowledge production. The dominant technical logic of Japanese pharmaceutical companies has been traditionally weighted towards development of products based on existing scientific knowledge as opposed to basic research needed to create new scientific knowledge (Methe 1995; Kneller 2003). For example, for J-Pharma, 'basic research' meant 'some concepts for new drugs' because 'drug discovery research is business', according to the Japanese director interviewed. This stands in stark contrast with the deeply ingrained scientific ethos of the local academic scientists who believed that basic research should be kept 'pure', long-term and separated from drug discovery (interview with university professor). J-Pharma, governed by an exploitative mode of learning, might have found it difficult to understand and appreciate the taken-for-granted assumptions of exploratory science upheld by the UK scientists.

The dramatic shift in the research direction of JLL also reflects the strength of the dominant technical logic and power of control of existing organisational routines. Japanese pharmaceutical companies have traditionally built their success on using a cohesive internal product development system to achieve world product-output levels despite their small size compared with major global rivals (Roehl et al 1995). The system is geared towards internal knowledge creation and transfer. The presence of a non-Japanese laboratory director at JLL posed a challenge to the system: it created difficulties in communication from the viewpoint of the Central Lab. It was considered by head office that the foreign research director sought 'too much independence' and could not be held accountable for the direction of research: 'foreign director has his own thoughts and own opinions… our president thought the lab director should be Japanese' (interviews with manager at head office and Japanese director at JLL). Indeed, the change of research director, from an American scientist to a Japanese researcher from the headquarters signified an attempt to re-integrate the local laboratory in order to harness and exploit its research results. Both the Japanese director and another experienced researcher from the headquarters explicitly pointed out in the interviews that their main role was 'to integrate and bridge' basic and applied research, and to 'educate' the local researches on drug development routines.

The dramatic change in research direction and the departure of the US director resulted in high staff turnover, with half of the research staff leaving, and the subsequent alienation of numerous academics and cessation of substantial links with the university. There is now little formal collaboration between JLL and the university. Informal contacts and personnel exchanges also appear to be minimal. One of the key academics initially active in the links claimed that JLL is now 'a non-entity to the university'. He reckoned that 'none of the really good basic research at the university will ever find its way through the doors of J-Pharma … because the community of academic scientists on campus no longer felt that they were connected'. For the local scientists, being able to 'talk the same language' and engaging in a 'give and take' relationship, according to the professor interviewed, were part of 'the ethos' and bases for knowledge exchange. Lack of such scientific connections had meant that even 'here they are right next door… there's no participation', as bluntly pointed out by the professor. This clearly illustrates that the two parties had difficulties in creating a shared space for situated knowing despite spatial proximity.

J-Pharma was failing to tap into the local knowledge base. The collaboration was not considered a success by both parties concerned. The 'misunderstandings' between J-Pharma and the local academic scientists are symptomatic of the cross-societal tacit knowing problem. Evidence elsewhere (Chikudate 1999; Roehl et al 1995) also shows that the cognitive and social distance between 'managerialism' of Japanese pharmaceutical companies and 'scientism' of western academic laboratories often leads to communication breakdown in cross-border partnerships.

DISCUSSION AND CONCLUSIONS

The case studies reveal some fundamental differences between the US and Japanese MNCs in the ways they develop transnational learning spaces to address the problem of tacit knowing across oganizational and geographical boundaries. While the US MNCs have sought to use projects and the professional network ties of scientists to construct their global relational space to extend the spatial reach of their learning activities, the Japanese MNCs have relied on the creation of firm-centred 'organizational space' for deep relational building to support their transnational learning activities. The evidence presented supports hypotheses 1 and 2 which suggested that US MNCs would have a greater propensity to develop the professional NoP approach and the Japanese MNCs, the organisational CoP approach to transnational learning.

These differences illustrate the contrasting logics of the US 'professional-oriented' and Japanese 'organizational-oriented' model of learning playing out in the global arena. The study relates the 'network' and 'hub' models of R&D to the different knowledge leveraging practices and learning orientations underlying the two distinctive approaches to transnational learning. It shows how the two sets of MNCs differ systematically in the ways they seek to address the tacit knowing problem, and the different challenges that they face in extending their distinctive models of learning to the global arena.

The US professional NoP and the Japanese organizational CoP approach can be taken to represent two ideal type models of learning at the opposite ends of the 'global' vs. 'local' continuum. All MNCs have to face the challenge of connecting the local and global aspects of knowledge creation, and they may draw on a combination of the two approaches to a greater or lesser degree. However, the US and Japanese comparison suggests that there is a potential trade-off between them in terms of the 'spatial reach' and 'social depth' of learning, and consequentially the balance between knowledge exploration and exploitation – a central organizational learning tension highlighted by March (1991). The US professional NoP approach enables firms to achieve a higher degree of structural embeddedness by building multiple external network ties in the local region to support an exploratory learning orientation. It facilitates broad knowledge search and the potential benefit is that firms are more likely to access diverse and novel knowledge, and able to engage in the social production of new (tacit) knowledge, as suggested by Granovetter's (1973) weak tie theory. Weak ties, however, may cause problems in transferring and integrating complex and experience-based tacit knowledge (Hansen 1999). The transfer of this kind of knowledge requires strong ties and close up observation. The US MNCs looked at in this study used bench level collaboration among scientists, temporary co-location of teams and the personal connections of local scientists to create pockets of local CoPs within their global NoPs to aid knowledge transfer. The Japanese organizational CoP approach, by contrast, builds on deep relational embeddedness that promotes social cohesion and trust in network ties within the immediate vicinity of the firm. It supports an exploitative mode of learning. Relational embeddedness generates cooperation and emotional engagement that facilitates the transfer of fine-grained information and experience-based tacit knowledge (Coleman 1998; Uzzi 1997). Knowledge creation in this context, however, occurs within a restricted and well-defined social space mediated through organizational codes and shared identities. A major challenge for the Japanese MNCs was to stretch their firm-centred CoPs to the global arena. The creation of 'embedded labs' and reliance on expatriate scientists to 'socialize' and 'teach' local researchers were attempts to extend their CoPs across geographical boundaries. However, the spatial and knowledge reach of such CoPs is inherently limited because 'you can only work closely with so many people…' (Brown and Duguid 2000: 143).

The study also considers the interaction between home and host country context as a factor that influences the ability of MNCs to gain access to local knowledge. Hypothesis 3 suggested that relative to their US counterparts, Japanese MNCs in the

UK would encounter a greater degree of the societal aspect of the tacit knowledge problem because of the greater divergence between the home and host country institutional environment. The evidence broadly supports this argument. The US MNCs have been able to draw on the occupational similarity and professional ties of scientists to build extensive links with the local scientific community. The US professional-oriented model of learning generally allows firms much greater flexibility to extend their knowledge creation activities across organizational and institutional boundaries. One might argue that US firms in general enjoy a 'comparative institutional advantage' in developing transnational learning spaces to broaden the scope of knowledge exploration. This advantage is reinforced when they locate their R&D units in an environment where the institutions governing knowledge production are congruent with those at home. The US and UK share a similar professional-oriented approach to learning and having a strong scientific research base. The common English language and shared cultural heritage between the two countries are added advantageous factors. The Japanese MNCs, on the other hand, have to face greater cross-societal strain in their local learning activities. They are culturally more 'foreign' to the UK environment and, more crucially, their exploitative learning orientation does not sit comfortably with the exploratory research orientation of the local scientific community, as vividly illustrated by the J-Pharma case. Other studies (Askawa 2001; Lehrer and Asakawa 2003) also support the observation that Japanese basic research labs in Europe generally encountered greater cross-societal strain in embedding themselves in the local innovation systems, compared with their US counterparts.

Another factor to be considered is the relative R&D strength of the companies and how this might have affected their abilities to engage in external learning. Cohen and Levinthal's (1990) notion of 'absorptive capacity' suggests that a firm's ability to recognise and exploit external knowledge is a function of its level of prior related knowledge and those with greater capacity in internal R&D are also able to contribute more as well as learn extensively from it. In other words, firms' investment in R&D not only confers scientists the cognitive ability to interpret and understand new knowledge generated externally, but it also enhances their social connectivity to the wider scientific community. There are significant differences in the size of R&D labs and investments in basic research between the two sets of MNCs. The US labs are much larger and both companies have historically conducted more basic, exploratory research than the Japanese ones. This would have given them more resources and greater scientific knowing capabilities to forge extensive links with the local scientific community.

Likewise, this could also be a factor explaining why the organizational CoP strategy has met with greater success in the case of J-ICT than J-Pharma. There are substantial differences in the domestic R&D capabilities between the Japanese ICT and pharmaceutical industries (Kitschelt 1991; Odagiri and Goto 1996). The Japanese ICT and electronics industry has been able to maintain a large domestic R&D capability and sustain their global competitiveness over the last three decades. The J-ICT scientists have basic research experience and appear to be able to engage in knowledge exchange with local scientists, thus opening up the potential for mutual assimilation in their collaborative ventures. For example, a Cambridge scientist interviewed emphasized the importance of the 'two way process' in the collaboration and how JCL 'brings a lot of extra scientific expertise and knowledge to the university group'. Conversely, the Japanese pharmaceutical industry is younger, firms are much smaller in size and have less well-developed domestic R&D capacities. Recent evidence suggests that Japanese pharmaceutical companies continue to pursue an 'autarkic' innovation strategy, relying predominately on in-house R&D for drug discovery and long-term employment of master level graduates in cohesive teams (Kneller 2003). Unlike J-ICT, J-Pharma does not appear to benefit from a strong scientific home base and so is less well endowed in the necessary knowledge base and scientific tacit knowing capability to engage in effective external learning. Such sectoral differences appear to be less evident in the case of the US firms.

The study is based on a small number of selected cases and it is clear that one cannot make broad generalizations without caution. The emphasis on national institutional logic underlying the learning behaviour of firms by no means implies national uniformity. The characteristics of the sector and size of R&D investment are clearly factors that can influence the learning orientations and capabilities of MNCs. The duration of R&D operation overseas is another factor that could affect firms' learning capabilities, given that international experience is a primary source of organizational learning in MNCs (Kogut and Zander 1993; 1995). US firms were pioneer investors in R&D facilities abroad but Japanese firms only established their foreign R&D sites much later (Cantwell 1995). Belderbos (2003) argues that the 'latecomer' status' of Japanese firms in the internationlization of R&D means that they have fewer opportunities for learning how to manage decentralized networks of R&D. The two pharmaceutical firms looked at in this study differed significantly in terms of their duration of operation in the UK which might have contributed to their divergent cross-societal tacit knowing capability. Future studies could expand the sample to take account of sectoral, size and duration factors more systematically. It is also worthy of note that there are different types of overseas labs and their role typically evolves over time (Ronstadt 1978). This study is limited to the 'knowledge augmenting' type (Kuemmerle 1997) in the context of collaboration with universities. While this brings out the unique challenges in 'up-stream', exploratory learning, the findings may not be so readily generalizable to other types of labs or collaboration such as inter-firm alliances which involve 'down-stream', exploitative learning. An extension of the research could consider a variety of collaborative contexts and possible shifts in the strategic focus of labs to triangulate the results.

Tacitness of knowledge inhibits its sharing and transfer across wide geographical and institutional contexts, and thus poses a major problem for MNCs. This study makes a contribution to our understanding of the knowledge transfer problem in MNCs by drawing attention to the mutually constituted nature of the 'cognitive' and 'social' (or 'societal') aspects of tacit knowledge. It highlights the importance of understanding the relationship between knowledge, context and institutions. The study demonstrates how home-based institutions influence MNCs' transnational social spaces for learning, and their abilities to use different types of situated practice and forms of social interaction to support tacit knowing across organizational and societal boundaries. It shows that the divergent ways of solving the tacit knowledge problem are associated with different modes of R&D organization, knowledge processes and learning orientations. The study also shows the effect of varying degrees of institutional proximity on cross-societal tacit knowing. International management researchers have long recognized the socially embedded nature of knowledge and the difficulties this may cause in cross-national knowledge transfer (e.g. Hamel 1991; Simonin 1999). However, few studies have attempted to link the social aspect of knowledge to its cognitive dimension and the problem of tacitness. This study illustrates how cognitive barriers to knowledge transfer can be linked to the very concrete differences in the societal institutions governing knowledge production. It makes a contribution to the global R&D literature by demonstrating that the sharing and transfer of seemingly universal scientific and technical knowledge also requires tacit knowing.

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