The Role of networks in R&D Centres of Excellence.

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ABSTRACT
This paper addresses the question of how MNC subsidiaries build their resource capability by examining intra- and inter-organizational networks in R&D Centres of Excellence. Combining the concept of network embeddedness with resource dependency theory this paper argues that the unique nature of intra- and inter-organizational networks cultivated by centres of excellence are central to accessing and controlling knowledge resources that reinforce its strategic position as a centre of excellence. However, resource dependencies are not unidirectional. The findings suggest that in practice organisational networks are used to control the resources upon which their role as a centre of excellence is dependent. This they achieve via centralisation mechanisms. At the same time these networks are dependent on the tacit business and technical knowledge in other parts of the business to create these resources in the first place. There is an uncomfortable tension between on the one hand the need to control strategic resources as a means of perpetuating centre-peripheral resource dependencies and sustaining the centre of excellence strategic role, and on the other hand, the need to tap into tacit business and technical knowledge to create and renew strategic resources thus making the centre of excellence dependent on others.

Keywords
Subsidiary networks; network embeddedness; innovation; competence development; resource based view; resource dependency.
INTRODUCTION

This paper questions whether intra- and inter-organisational networks have a strategic function in enabling centres of excellence to meet their strategic role within the multinational. Frost et al (2002) identify Centres of Excellence as one way in which multinationals have redefined the subsidiary’s strategic role in order to effectively and efficiently exploit context specific expertise and knowledge for global competitiveness. Research in the field has tended to focused on conceptualisations of centres of excellence and on defining the mandate and structure of centres of excellence (Fratochii and Holm 1998; Holm and Pedersen 2000; Moore and Birkinshaw 1998; Surlemont 1998), with one notable exception. Frost et al (2002) considered the conditions under which centres of excellence were formed and found survey evidence supporting the role of internal and external actors in the development of organisational capability. However, less is know about how this influence is manifest in practice, specifically how inter- and intra-organisational relations are established and how they enable capability development. This forms the focus of the investigation here.

In the following section centres of excellence are defined and the importance of the networks they generate is examined. Then the nature of networks in terms of their embeddedness is outlined. Using resource dependency theory and the resource-based view of the firm an argument is developed for the strategic function of intra- and inter-organisational networks in meeting the mandate of a centre of excellence. Case study data are used to examine how centres of excellence use networks in practice. The paper concludes with a wider discussion of the implications of the findings for management practice and future research on the role of networks and their strategic contribution.
Centre of Excellence and Networks

Frost et al (2002:997) define a centre of excellence as:

*An organizational unit that embodies a set of capabilities that has been explicitly recognized by the firm as an important source of value creation, with the intention that these capabilities be leveraged by and/or disseminated to other parts of the firm.*

This definition draws on conceptualizations of centres of excellence in the literature and on company practice and suggests three fundamental characteristics. First, they have a physical form, rather than a virtual presence, although unlike conceptualizations of ‘product mandates’ they may not equate to a whole subsidiary. Indeed one subsidiary may have multiple centres of excellence established around functional expertise. Second, these centres act as a central point for the accumulation of competitive capability relating to tangible resources (e.g. equipment, patents) or less tangible resources (e.g. knowledge, know-how). Third, the parent bestows the title and role of centre of excellence upon a unit in recognition of their contribution to competitive competence development and expectation of their continuing role in this area for the benefit of the wider organization. Importantly this definition suggests that the strategic mandate of a centre of excellence is underpinned by its requirement to develop competence of value to the wider multinational organization, via the creation and accumulation of knowledge; and to contribute to the competence of other units, via the diffusion of knowledge.
Given the definition above, a centre of excellence potentially provides a structure through which the multinational can potentially access and assimilate knowledge from its local environment, a feature recognized as critical to the development of competitive competencies (Bartlett and Ghoshal 1990; Kogut 1991). It also provides important links to internal knowledge resources and a route through which knowledge can be spread across the multinational to enhance organizational performance. However, it raises the question of how this is achieved in practice. Frost et al (2002) examined, through a questionnaire, the perceived impact of internal (e.g. headquarters, internal suppliers, customers and research units) and external actors (e.g. external customers, suppliers and research institutions) on the formation of centres of excellence and competence development by foreign-owned MNCs operating in the Canadian manufacturing sector. They found that the CEOs of foreign-owned MNC perceived links with external actors had a significant positive impact on the formation of foreign-owned Centres of Excellence engaged in research, development and manufacturing activities. Conversely, the influence of internal actors on competence development was greater for manufacturing Centres of Excellence than research and development centres. This supports the general findings from the innovation literature that highlight the boundary spanning nature of R&D activity and the importance of links with the technological and science community, particularly externally, in terms of competence development and the emphasis on radical innovations as opposed to incremental learning (Andersson et al 2002; Nooteboom 2000).

Internal networks play an important role with regard to the diffusion of innovation or best practice within multinationals. Network based organizational forms highlight the increasing importance of intra-organizational structures as a mechanism
for acquiring and dispersing knowledge across geographical dispersed units, and suggests they underpin the international innovation process (Sölvell and Zander 1998), and are particularly pertinent in the case of incremental based innovation. However, realizing the innovation potential through internal networks is not unproblematic being affected by internal power games, communication failure particularly associated with cultural diversity and the difficulties associated with sharing tacit knowledge. The need for face-to-face communications appears to be critical in supporting electronic communications and enabling the innovation process (Brown and Eisenhardt 1995). The importance of intra-organizational networks is widely recognized and advocated as a strength of the multinational. However, the tensions inherent in utilizing such networks effectively are often under-emphasized.

In sum, for R&D centres of excellence networks potentially play a critical role in technological innovation and the diffusion of innovation to other subsidiaries or the parent, thus contributing to the competence development of other units within the multinational and to the corporate competence of the multinational (Andersson et al 2002; Frost et al 2002). In the following section, how networks contribute to competence development and value-creating activity for the wider multinational organization is examined.

**Network Embeddedness and Resource Dependency**

Conceptualisations of the multinational as a ‘differentiated network’ (Bartlett and Ghoshal, 1990) or as a social community (Kogut and Zander, 1993) suggest subsidiaries forge networks with internal and external actors to acquire or diffuse knowledge for competitive advantage. The resource dependency perspective (Pfeffer and Salancik, 1978) has been used extensively to explain the conditions under which
knowledge can act as a competitive resource. In essence this perspective argues that subsidiaries within the MNC network attempt to accumulate and control resources that are strategically important (i.e. valuable) and for which few alternative exist (i.e. scarce). Medcof (2001) argues that within internationally dispersed technology networks these resource characteristics are directly proportional to the power one organization in the network has over another, giving rise to implications for how this organizational unit is managed and controlled within the multinational structure. Thus in the case of centres of excellence the resource dependency perspective suggests understanding how and to what extent resources are accumulated and controlled could yield valuable insights into how a centre of excellence fulfils and maintains its mandate.

However, the resource dependency perspective with its origins in the organisational strategy literature tends to focus on the concept of power from an economic and strategic perspective. To address this the concept of embeddedness has proved useful (cf. Andersson et al 2002; Dacin et al 1999). Embeddedness is a term that is used to define and explore the nature of networks and the consequences they have for organizational action. The concept of embeddedness is concerned with the interplay between the social and economic context of organizational activity (Andersson et al 2002; Granovetter 1985; Gulati 1998; Zukin and DiMaggio 1990) and is increasingly being adopted by international management researchers to enrich their understanding of the nature of intra- and inter-organizational dependencies and how these evolve over time (Andersson et al 2002; Dacin et al 1999). Specifically an embeddedness perspective ‘offers institutionalist extensions to resource dependence … arguments’ (Dacin et al 1999:318) by identifying the salience of political activity and power, as opposed to primarily strategic and market driven factors, within the
context of specific network-based relationships. Furthermore, embeddedness implies firms are nested within multi-level relationships, which in turn define unique sets of relationships between the focal firm and, for example, its suppliers and customers. The unique nature of these relationships, and the closeness and intensity of knowledge exchange within them, can have a positive impact on the capture and assimilation of new knowledge and in turn on competence development associated with innovation (Andersson et al 2001). Thus in the context of centres of excellence the embeddedness perspective suggests an analytical focus on the nature of intra- and inter-organisational networks will yield valuable insights into understanding how centres of excellence fulfil their mandate.

As the centre of excellence concept is relatively new, work on how intra- and inter-organisational networks within this context operate in practice is absent. However, a number of studies have focused on the nature of strategic alliances (Gulati et al 2000). Gulati et al (2000) suggest that strategic networks act as a source for creating value and competitive advantage by a) accessing resources they do not have internally, b) because networks are idiosyncratic and path dependent they are difficult for competitors to copy or substitute, c) the resources are difficult to imitate and substitute because they are generated via the unique nature of the relations inherent in the network. For example, Westney (1993) demonstrated how powerful networks can be in accessing resources and local knowledge when they observed the failure of US owned R&D subsidiaries operating in Japan because they could not gain access to local networks linking R&D firms with suppliers and customers. Networking with local firms can be crucial for the performance of units of multinational organizations because of the access it provides to the capabilities of other network members (Afuah 2000), whether in terms of, for example, contacts with suppliers, logistical pathways,
or local business knowledge. Gulati (1999) refers to these as ‘network resources’ whereby the organization’s networks are a means through which it creates or accesses value-generating resources. Networks also embody history and trust relations between their members that can be extremely difficult for competitors to mimic and at the same time highly effective to the performance of the network (e.g. Dyer and Nobeoka 2001). However, Gulati et al (2000) also recognize that the networks can be a constraint in that they can lock the members into ways of thinking and resources that are less useful competitively to the organization. The limitations of over-embeddedness have also been discussed by, for example, Granovetter (1973) and Uzzi (1996) suggesting that multinationals need to adopt a compliment of tight and loose network relations.

Andersson et al (2002) argue that familiarity among network members makes it easier for business knowledge to transfer and for the network to innovate. When dealing with tacit knowledge, in particular, strong and established ties between members are crucial to the effective transfer of knowledge (Hansen, 1999; Lane and Lubatkin 1998). The reason is that such networks are characterized by two-way interactions, which enable its members to assimilate new information via multiple opportunities. Andersson, Forgren and Holm (2001) also found empirical evidence supporting the importance of the technical embeddedness of multinationals’ networks to market performance. They found that where multinationals had developed strong ties with local customers and suppliers this impacted positively on their ability to develop new products and innovative production processes. The work of Andersson et al (2001, 2002) identifies the importance of network embeddedness to both the performance of the multinational unit and its competence development. However, given the nature of the survey methodology they are unable to shed light on how these
networks operate in practice. Equally the research into networks has shed some light on the substantive nature of these relationships in the context of knowledge diffusion (Gulati 1999, 2000; Hansen, 1999; Lane and Lubatkin 1998). This paper attempts to build on these previous studies by bringing together the literatures on strategic networks and centres of excellence, combining the resource dependency and embeddedness perspectives, to question the role of networks in fulfilling centre of excellence mandates in practice.

METHOD

This study sets out to address the following question: How do inter- and intra-organizational networks contribute to the strategic mandate of a multinational’s Centre of excellence. To help unravel the answer two specific research questions were posed. First, what roles do networks in R&D Centres of Excellence perform? Second, how do these networks and the role they perform contribute to the strategic mandate of the Centre of excellence?

The case studies focus on two R&D units, of foreign-owned multinationals operating in the UK, that were identified and recognized by the parent as ‘Centres of Excellence’, namely CoE-Inks and CoE-Pipes. CoE-Inks was a centre of excellence within the Speciality Chemicals division of a French owned Petroleum company. It specialized in the research and development of printing inks for a range of product areas from packaging to photocopy machines. The Centre of excellence employed 80 research and development staff; most were located in two sites in the UK with around 15 at a site in France. CoE-Pipes specialized in the research and development of materials and technologies used in underground water systems. They were one of three Centres of Excellence making up the Global Research and Technology Network,
of the Water division of a French-owned Energy company. Each of the Centres of Excellence served the local water companies within designated regions of the world; CoE-Pipes served the English speaking regions. The UK Centre of excellence was located on one site in the UK and employed 10 permanent research and development employees, and used a system of intra-organizational secondments and inter-organizational partnerships to supplement this number on a project basis.

**Data Collection**

Interviews were conducted with five organizational stakeholder groups. These included, first, the Business Director for the Centre of excellence responsible for the strategy of the unit and, related to this, its strategic integration with the parent and other units. Second, the Research and/or Development manager with responsibility for R&D strategy affecting competence development in the Centre of excellence and beyond; Third, the HR director or senior HR manager with responsibility for the selection and international placement of managerial and technical employees. Fourth, the HR manager with responsibility for operational human resource management issues affecting the competence development and employment conditions of R&D employees. Fifth, R&D employees themselves who were involved in inter and intra-organizational networks, including those with line management responsibilities. Each interview lasted around 1 and half-hours. In all 18 case respondents were interviewed (CoE-Pipes=6 and CoE-Inks=12). While the number of interviews in CoE-Pipes was small this represented interviews with over 50% of the core staff. While, in CoE-Inks it represented around 15% of staff. In addition, multiple site visits were made over a period of 6 months during which the data was collected. The researcher worked with an internal project co-ordinator from the Centre of excellence who provided
supplementary data in the form of access to intranet materials, tours of the research and development laboratories, which in CoE-Inks were geographical dispersed at two locations in the UK and one in France, informal discussions, and documentary evidence (i.e. organigrams, company reports and promotional video materials). This was used to build a picture of the wider corporate context, the focus and centrality of R&D activity. Notes where taken during interviews and written up the same day (Yin, 1994).

A semi-structured interview was used that explored issues around the nature of internal and external collaborative networks, how they were instigated, how they operated, what type of knowledge was generated or shared during technological innovation, the types of methods used to disseminate technical innovations. These fundamental areas of questioning remained the same in both case companies, although the precise nature of the questions evolved as more information about the companies and their specific networks came to light over the course of the interviews.

**Data Analysis**

All interviews were taped and fully transcribed in preparation for analysis aided by the qualitative data management package QSR N4. The coding frame was developed both deductively from the literature and inductively from the interviews and researchers notes (Miles and Huberman 1994). Through reading the transcripts explanations regarding the two research questions were recorded as memos and an iterative process of checking the data and refining the explanation was undertaken. Supplementary information from internal company documents, the Intranet and Internet web-pages, PR video materials and annual reports was used to build a picture of the wider corporate context, the focus and centrality of R&D activity. Each of the
companies was given a report summarizing the data findings and a face-to-face meeting with the researcher to discuss the findings. This led to further refinement of the explanations.

CASE EVIDENCE

Structural and Strategic Characteristics of the Centres of Excellence: CoE-Pipes and CoE-Inks

Both CoE-Inks and CoE-Pipes had been designated technological centres of excellence by the parent company, but while their strategic objectives had much in common their structural arrangements varied greatly. This was due largely to the different ways in which the Centres of Excellence were established. As the case evidence will illustrate these structural arrangements had important implications for the existence and role of the inter- and intra-organizational networks as strategic enablers. Here we examine in brief how these Centres of excellence were structured and what they defined as their strategic objectives.

CoE-Pipes was one of three research and technology centres that formed the parent's Global Technology Network with each centre serving a different region of the business. The establishment of CoE-Pipes was driven by the requirements of the direct investment deal which may explain the small project-based organizational structure that characterized the Centre. Specifically, CoE-Pipes employed 10 permanent research and development employees, and used an extensive system of intra-organizational secondments and inter-organizational partnerships to supplement this number on a project basis. The Research Director for CoE-Pipes was British and had responsibility for developing the Research and Technical strategy for the CoE, reporting directly to the French Technical director responsible for the Global
Technology Network. However, when the CoE was first established the Research Director was French brought in from the parent company. This was seen by current CoE staff and HR staff in the UK water business as an explicit move to bring the research and technology centre closer to the French business and the global strategy of the business. Now frequent visits by the Global Technology Network Director and meetings between each of the Centres of Excellence within this network act as the primary medium for ensuring synergy without duplication and allows the parent to potentially influence the strategic objectives of each of the centres.

The strategic objectives of CoE-Pipes evolved around priorities for the development of new materials that would give the company unique access to raw materials designed for specific business/customer needs in combination with the exploitation of current technologies and research held within the global organization. These roles are seen as making a significant strategic contribution to the parent by building up the organization’s knowledge bank and ultimately its competitive competencies.

Given the small size of the Centre of excellence it begs the question how these objectives can be achieved in practice. As the evidence will illustrate the extensive use of internal and external networks becomes a crucial structural mechanism for fulfilling these roles.

CoE-Inks, by contrast, is much larger employing 100 research and development staff. While the majority are based across 2 UK sites, around 15 are located in France. Strategic and operational responsibility for CoE-Inks lies with a British R&D director located in London. He reports directly to the French managing director for the Chemical division located at the Paris Head Office. While the parent company sets financial targets for each of its businesses and the CoE it tends to leave
the detail of how these are achieved in the hands of the functional directors. The research director admits that the structure of the CoE is less than strategic being a historical and political artefact from the time the UK company was acquired by its now French parent. As a result the product development expertise is located alongside the major manufacturing sites, one in France and one in the North of England, and one in London also alongside the research expertise. Together these four areas of expertise in research and product development make up CoE-Inks. The company sees the advantage of locating the product development expertise close to the manufacturing site in terms of enhancing the utility of product applications. Equally, to ensure its research team are sufficiently focused on market needs the company adopted a project-based structure and shifted from employing primarily scientists to employing a combination of scientists and technologists who link up according to project needs. The function of these four areas ranged from the development of raw materials, to the adaptation of technology to customer needs and local environmental or legislative conditions, to the development of new product applications for customers.

Thus the strategic objectives at CoE-Inks and CoE-Pipes display the classic objectives of a Centre of excellence as defined by Frost et al (2002). These centres reflect the centralization of research and product development expertise under the managerial control of a functional director, with a fair degree of autonomy from the parent, but nevertheless with variable links into other local and international parts of the multinational network. Equally, their remit is concerned with issues of knowledge creation that is of competitive value to the company and knowledge exploitation to achieve a greater competitive position. The analysis that follows explores the role and characteristics of the inter- and intra-organizational networks used by both Centres of Excellence in meeting these objectives.
Role of networks in centres of excellence

The analysis identified three roles undertaken by the networks operating in the two centres of excellence (CoE) examined in this study. The first role is classified as the primary higher order role and is concerned with the strategic role of networks aimed at the capture and exploitation of knowledge. The latter roles are second order functions and are concerned with a) the accumulation of resources, and b) the establishment of trust relations. The strategic role of centre of excellence networks is dependent on these two second order functions. Figure 1 graphical represents these relationships in the centre of excellence context.

INSERT FIGURE 1 ABOUT HERE

Strategic Networks, resource based power and trust relations

Here the nature of the three functions performed by networks in centres of excellence and the inter-relationship between these functions is set out. The data suggest that networks established by the centre of excellence worked to create a high trust relationship in situations where its resource based power was low in order to facilitate the creation of unique company specific knowledge. In contrast, low trust relations were sufficient for enabling the capture of new knowledge, when working with external organisations in situations where the centre of excellence network members had greater expertise (i.e. high resource based power). Further, centralisation methods superseded intra-organisational networks as a means of capturing and exploiting knowledge in situations where resource base power in the centre of excellence was high. Each of these relationships is illustrated below.
Strategic networks in low resource-based power and high trust situations

Low resource based power is defined as situations in which there is a perceived absence of business or technological knowledge essential for knowledge capture or exploitation purposes. In these situations the research managers recognised the centre of excellence’s ability to create new knowledge or exploit current knowledge was inextricably linked to its ability to access customer knowledge and know-how that resided elsewhere in the organisation (quote 1). Intra-organisational networks were used as the vehicle by which experts from the centre could work alongside experts in different countries to generate novel solutions to customer problems or new products for the global market. In this way the aim was to exploit the knowledge held within the company for global purposes either by developing products in response to specific multinational customers or by developing new global or regional products in response to developments by their competitors. If products were developed in response to specific customer needs with applicability in one country only then this work was monitored by the centre but responsibility for doing the work was devolved to the country technical centres. In this way the centre of excellence networks remained focused on the capture and exploitation of knowledge for global purposes. Here the embedded nature of the knowledge in terms of how technology operates in different legislative or cultural settings or the interaction of customer needs and country context can provide an organisation with company specific expertise to innovate.

In the case of inter-organisational networks these too were established because of the perceived absence of specific expertise within the centre of excellence which could be accessed elsewhere (Quote 2). The types of external organisations involved with the centres of excellence included universities and private sector research
companies. In the two case companies observed here these external organisations were on the whole UK based, i.e. operating in the same country as the centre of excellence. The interview data suggested that the links with UK based research organisations were largely based on the perceived value and legitimacy (cf: Tregaskis, 2003) of the knowledge they held. For example, senior managers in both organisations described the universities they worked with as ‘the best’ in their field, some of their staff were recruited from these universities, or they were used for training specific technical skills. In the context of the centre of excellence having low resource based power the universities and private research companies were important sources of expertise of strategic value. For example, the knowledge base generated as a result of these networks was described by on senior engineer as the ‘company’s competitive resource’.

The type of knowledge that researchers in these internal and external networks dealt with was more tacit in nature and one route to leveraging this knowledge was through the development of close trust based relationships among the network members (quote 3). Here high trust relationships were characterised by face-to-face communications achieved either through secondments (quote 4) or frequent meetings between geographically dispersed network members throughout the duration of the project. These face-to-face communications were identified as important in accessing tacit knowledge of relevance. Face-to-face communications also facilitated smoother follow-up conversations through other media such as the phone or email. Stability of networks members also appeared crucial in terms of the confidence members of the network had in the value of the network’s activity (quote 5). Mutuality also characterised high trust relations whereby all parties felt they were gaining something from the relationship (quote 3). For the external organisations the gain is not always
knowledge, but financial rewards and a guaranteed income stream. For example, the research director in CoE-Pipes explained that their small size means they use external companies extensively as a means of accessing knowledge they do not have. As a result the research director explains that ‘everything is tied down by confidentiality agreements and anyone from outside helping us is tied down by these agreements. This is because [the company] is where it is today because of this knowledge base’. The final characteristic of high trust relations is time. Only over a period of time do individuals build up a better understanding of the capabilities of others and how these might combine for mutual benefits (quotes 3 and 5).

Low Resource based power and High Trust Relations

Quote 1: It’s important for us to work with the other countries in order to understand the nature of the markets those businesses have to operate in, and to build up expertise and knowledge about the customers in those countries. For example, the humidity in Asia is very high and that impacts on the performance of products. (Communications manager, CoE-Inks)

Quote 2: Part of the partnership networks is the links they give us to experts and institutions which we use so we don’t try and reinvent the wheel. The time to market on these things is very important, especially if you are looking at a particularly revolutionary piece of equipment. If you can get your product into the ground and start getting the contract for using it then you stand a chance of recouping your costs in a significant way. (CoE-Pipes, Research Director)

Quote 3: There are varying degrees of trust in that network. There are companies that we deal with that we have a very much customer vendor type relationship. There are others where we are quite close and we share management information to allow us to build each others business around the competencies which exist either in our partner’s organization or here. ..But it is more that you simply cannot do what we do and have a distant relationship…It is mutual trust and it is mutual benefits that are being derived from these things…They understand where it fits and the bit around it because it is
more long term because it has been a continuous development of a particular technology or a particular thrust of thinking. (CoE-Pipes, Research Director)

Quote 4: We are planning the transfer of about 6 continental Europeans to work at CoE-Inks on at least a 2-year secondment period. These assignments are on a project basis i.e. people are seconded to develop their expertise or develop products in other places where the technology exists so they can bring it back. They also forge contacts when they go on assignment. (CoE-Inks Research director)

Quote 5: What we try and do is build the relationship, the customer likes to think that one person is doing his work …We need to build trust, and I think if you keep giving somebody a different person each time he rings up he doesn’t think you are treating him very seriously (CoE-Inks, Product Development Manager.)

Strategic networks in high resource based power and low trust situations

High resource based power is defined as situations in which there is a perceived presence of business or technological knowledge essential for knowledge capture or exploitation. The case evidence suggests that in high resource based power situations intra-organisational networks were substituted with centralisation management mechanisms. For example, the intranet was seen as a driving force of centralisation in both CoE-Inks and CoE-Pipes. The intranet was used to hold databases containing technology knowledge about the know-how underpinning products. These databases were built by pulling together knowledge that had been made explicit in research documents and operating protocols but which had remained scattered throughout the geographically dispersed organisational structure (quote 6). Because the knowledge was explicit in nature this made it particularly amenable to this form of centralisation. These databases supported knowledge creation and
exploitation within the centre of excellence by providing research and development staff with quick access to the technical details and status associated with products.

Access to this knowledge was also restricted which gave employees in the centre of excellence an advantage over those in other parts of the organisation when it came to making modifications to products or developing products for customer needs (quote 6). Restricting access in this way increased the resource based power of the centre of excellence. However, these resources were not readily given up by other parts of the organisation. The interviews showed that in creating these databases intra-organisational networks were established by, in the case of CoE-Inks, the communications department of the centre of excellence with the explicit purpose of encouraging other parts of the organisation to store their explicit knowledge regarding product modifications. Overtime the communications director appeared able to build sufficient trust with partners to enable these databases to work fairly effectively (Quote 7). The use of high trust based intra-organisational networks in this instance suggests this might be one way in which the organisation moves from a low resource dependence position to a high resource based position. Once the knowledge has been captured by the centre of excellence the need for high trust based relations are minimised and can be replaced by alternatives such as in this instance intranet systems and procedural controls. However, despite these centralisation efforts some of the researchers in CoE-Inks noted that technical managers in some countries continue to ‘by-pass’ the systems and alter products. In such situations the technical managers in these countries have the expertise to change the product and their concern over loosing business by not responding to their customers needs strengthens their resistance against central controls (quote 8).
Both centres of excellence appear to use efficiency arguments for justifying the centralisation of knowledge. For example some of the reasons for centralising R&D activity included the need to minimise duplication of effort, or to control the quality of products to ensure that because of country modifications they did not end up with ‘products that didn’t do what they were meant to do’. However, the continuing resistance to this control by some parts of the organisation demonstrates the struggle for resource based power across the multinational.

High resource based power also changed the nature of the relationship the centre of excellence had with external organisations. As discussed earlier CoE-Pipes had extensive links with external organisations, in part due to its small size which meant it retained only a small core of expertise internally. As a result they used external organisations to tap into specific expertise on a needs basis. In turn they recognised that the trust relationships varied across their networks depending on how closely they needed to work with a partner to create new knowledge (quote 3). Where the centre of excellence was fairly clear about the expertise it needed and the outcome arms length contractual transactions were sufficient and the inputs and outcomes could be made fairly explicit. However, in situations where the inputs and outcomes were less clear and a product of the combination of inputs from all parties close high trust based relations were fundamental (Quote 3). It could also be argued that the use of multiple networks that varied in their trust relations helped the organisation guard against over-embeddedness and over-dependence on one or two networks (Gulati et al 2000; Granovetter, 1973; Uzzi, 1996).

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<th>High resource based power and centralisation</th>
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<td>Quote 6: We had a lot of expertise in the group and a lot of documents floating around but what we didn’t have was a central resource. What we have actually done is pull all that together</td>
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[through the intranet]...but access is restricted even within the organization. This is because we need to sell our services to others in the Group...but the engineers in the field can access all the documents in order to win contracts and apply our technologies in different countries. (CoE-Pipes, Technical Manager).

Quote 7: John [head of the communications] contacts each country and they give him a progress report and this is entered into the database and up-dated monthly or once every 2 months. Recently the countries have been coming forwards with information on product development without having to be prompted. This has happened because the centre has been working hard to show all the businesses the value of the database and how it can be used by everyone and equally that it is only useful if everyone contributes. This message now seems to have got across. Also John has been with the company 20 years and being in this role for 10 so he has built up contact and credibility with all the businesses. (CoE-Inks, technical manager)

Quote 8: Some countries are very reliant on certain products and if that product is adapted for another country but its performance is poor then the product may get a bad name affecting their ability to sell the product in their own country. This split is also noticeable by commonwealth vs. continental Europe with the former being more open and the latter being more closed.(CoE-Inks, Communications Manager)

In summary, table 1 provides a brief overview of the relationships discussed. It is argued that in low power-based resource situations high trust relations are fosters by centre of excellence networks as a means of exploiting and capturing new knowledge for competitive purposes. In contract, in high resource-based situations internal and external relationships work differently. External links with other organisations can operate highly effectively with low trust relations and still perform the strategic network function of knowledge capture and exploitation. This is because the centre of excellence has sufficient knowledge resources to drive any innovations. In terms of internal relationships across the multinational these tend not to be pursued through
networks, but instead centralisation management controls provide a medium of the effective exploitation and capture of knowledge.

**Table 1: Summary of the relationship between resource based power, trust relations and strategic networks**

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<th>Resource-based power</th>
<th>Trust relationship</th>
<th>Strategic network</th>
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<td>Low</td>
<td>High</td>
<td>Intra- and Inter-organisationally focused on knowledge creation and exploitation</td>
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<td>High</td>
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<td>Inter-organisational networks focused on knowledge creation and exploitation</td>
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<td>Intra-organisational networks absent, substituted with centralisation mechanisms</td>
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**DISCUSSION AND CONCLUSIONS**

The findings raise a number of specific points regarding the role of networks in centres of excellence. First, they perform a strategic function in terms of knowledge capture and exploitation by providing a mechanism for tapping into expertise and knowledge that has potential strategic value. In the case of internally located knowledge and expertise its strategic value is derived from its embeddedness within business and technological contexts that are unfamiliar to the centre of excellence network members but important in creating global innovations relevant to customer and market needs. In the case of externally located knowledge and expertise its strategic value is derived from its embeddedness within organisations that are seen as
credible and valuable sources of knowledge and in how this can be combined with
organisationally specific knowledge and expertise. Thus the networks developed are a
means by which the multinational can leverage resource, internally or externally
located, for competitive purposes.

Second, how these networks operate in practice is a function of the resource
based power of the network and of the trust relationships established. The extent to
which the centre has already accumulated resources in terms of knowledge and
expertise impacts on the degree of resource-base power available to the centre of
excellence network members. Where this is low, high trust relationship within the
network appear more suited to capturing and exploiting knowledge. This is because
high trust relationships are characterised by face-to-face relationship based exchanges
built over time, stability of network members and the reciprocal exchange of
competitively sensitive information. Under these conditions tacit knowledge is
exchanged more rapidly and effectively leading ultimately to greater opportunities for
strategic competence development. Where the centre of excellence already has
expertise and knowledge greater to that in other parts of the organisation it uses its
position accumulate more resources by adopting centralisation mechanisms. When
dealing with external organisations it again uses its greater knowledge and expertise
base to leverage resources on a more transactional basis. Thus the strategic function of
networks in centres of excellence can be fulfilled through multiple internal and
external collaborations which vary in their trust relationships in line with the resource-
based power available to the centre of excellence network members.

Third, in practice centres of excellence are characterised by an on-going
tension in its resource dependency relationship with others. Centres of excellence
accumulate resources and encourage the adoption of centre driven innovations
through centralisation mechanisms, thus they have high knowledge-based power. At the same time a centre of excellence’s ability to innovate is, partly, dependent on the skills of others. Fourth, there is evidence of the on-going battle for resource-based power between the centres of excellence and other subsidiaries. The networks appear to have a potentially powerful role to play in negotiating with others to give up their resources. Particularly as there is evidence that formal centralisation mechanisms are less effective in controlling maverick behaviour when subsidiaries feel it losses more than it gains by doing so.

There are a number of more general conclusions that can be drawn from this work. The concept of embeddedness has been valuable in illustrating the importance of the network context when exploring competence development and its relationship with local innovation systems. Issues around personal relationships, familiarity of network members and the legitimacy of knowledge held by network members all play a role in explaining why networks become embedded in certain social contexts, such as local universities or research bodies, as opposed to others, such as international research communities. The unique nature of these networks, in terms of members, location, ease of tacit knowledge exchange, contributes to our understanding of how subsidiaries can develop competencies that are valuable.

The emergence of Centre’s of Excellence has important implications regarding assumptions about the nature of knowledge diffusion in multinationals. Sölvell and Zander (1998) argue that the development of semi-autonomous subsidiary units is likely to work against the diffusion of local knowledge back to the parent for international innovation purposes. In contrast these subsidiary units use and reinforce local innovation systems (Nelson, 1993) to accumulate greater competitive resource capabilities and as such the local innovation systems and networks become the source
of innovation. Andersson et al (2002:993) recognize the need for a new emerging role for addressing this potential fragmentation in multinationals. Namely, bridging-tie roles for subsidiaries whereby their explicit role is to ‘connect the competence development taking place in the MNC’s external relationships with similar activities in its international relationships’. The role of the centre of excellence, in theory, addresses this to some degree. However, the reliance on local innovation systems by the centre of excellence calls into question their ability in practice to make these connections.

The evidence here suggests the embedded nature of subsidiary level networks are multi-level spanning both external and internal organizational collaborations that have important influences on knowledge development at the subsidiary level, its spread to other subsidiaries and competence development within the multinational corporation. Given this future research would benefit from a multi-level perspective (Kostova 1999; Zaheer et al 1998). Equally, given the potential role of centres of excellence in knowledge creation the implications this has for the development of international innovations in multinationals, the role of boundary-ties for subsidiaries and the nature of competence development at the parent level warrant further investigation.

In conclusion this work has focused on understanding how the role of networks facilitates the mandate of R&D Centres of Excellence. It has illustrated the interaction between resource dependence relations and trust relations within the network. It has moved beyond parent-subsidiary relations to recognize the significance of horizontal relations with other units in the corporation and the criticality of networks with external organizations in both accessing knowledge and spreading technological innovations. Finally, it suggests that high trust based
networks can be a powerful vehicle for the capture and exploitation of knowledge when centres of excellence are operating from a weak resource-based power situation.

REFERENCES


effects of interorganizational and interpersonal trust on performance’. *Organization
Science*, 9, 141-159.

Zukin, s. and DiMaggio, P. J. (eds) (1990) *Structure of Capital*. Cambridge University
Press: Cambridge, UK.
Figure 1: First and Second Order Network Functions

- Trust Relationship (High/low)
- Resource-based power (High/low)
- Strategic Network Knowledge capture & exploitation

Diagram shows the relationship between trust, resource-based power, and strategic network knowledge.
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