

SUE –KM Project: Sources of Sustainability knowledge in Construction MNEs

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Abstract

This paper highlights the results of an EPSRC funded scoping study undertaken during the summer of 2004 at the Department of Surveying, Property and Construction, London South Bank University. The main concern of this study was to identify how knowledge and particularly sustainability knowledge is generated and sourced in large multinational construction companies. As main engines of innovation and change, multinational firms are at the forefront of any industry. Their contribution in terms of facilitating knowledge creation and transfer across wide technological as well as geographical areas is well acknowledged and documented. This paper initiates an investigation, although a first attempt, into the roles of two parent companies and their subsidiaries and examines the role of each unit in creation of local knowledge and its transfer across national borders. Preliminary findings suggest that transfer of knowledge from parent to subsidiary is not straightforward and the concerns of the parent company for sustainability may not find the same level of interest in the subsidiary company or vice versa. Our initial and cautious findings suggest that the level of legislation and client expectation in the host country may affect knowledge transfer between different divisions of the same organisation. It is suggested that new technologies capable of dealing with the challenges of sustainability would depend on the generation of new knowledge in the same way as any other conventional innovation would. It is further acknowledged that firms do not innovate in isolation and it is therefore important to consider the external environment in which they operate.

Introduction

In line with the overall goals of the SUEKM project to create a roadmap resource for glass recycling knowledge, this package considered how sources of knowledge (both internal and external to the firm) are created or used; and examined the relationships by which sustainability knowledge (both existing and new) are applied to various contexts and situations within large construction companies.

In this paper we present the results of a series of interviews conducted with two of the UK leading construction firms. Interview schedules used open and investigative questions as well as some

structured questions. Some elements of a recent OCED questionnaire on knowledge management were also integrated into one of the interview schedules.

A Core Bid and a Plus Project proposal have also been developed for the SUEKM project on the basis of this study and in relation to other on-going research activities at the University of Reading on the WEID, an EC funded research project (www.west-east-ID.net).

The overall objectives of the current study have been to:

- Identify different sources of knowledge/sustainability knowledge within the organisation (technical, organisational, legal, social, etc)
- Identify the existing deficiencies in the creation and dissemination of sustainability knowledge
- Understand the nature of knowledge exchange between the organisation and its customers, competitors, supply chain as well as informal networks (non contractual) such as industry associations and clubs in order to improve knowledge transfer within and between firms
- Investigate the motives for knowledge creation or harvesting at different layers of the organisation (within the divisional units as well as the parent company)
- Explore how creation and diffusion knowledge are effected in high, medium and low trust environments
- Facilitate means by which knowledge transfer between industries can be encouraged.
- Develop a methodological framework for our EPSRC core and plus projects (possible start April/May 2005)

The conceptual framework

The growing need for sustainable measures (technology or processes) within the construction industry not only depends on generation of new knowledge, but also relies on its rapid exchange and use in various contexts. Within the construction industry the role of “large construction firms” is of high significance. Due to the size and extent of their operations large firms are considered among major sources of innovation, employment and resource utilisation. Intense international competition in the past few decades has resulted in the diversification of construction firms and the invasion of the UK home market by many rival European, or other foreign firms from developed and developing countries. Many European multinational enterprises (MNEs) are now diversified companies with extensive activities both related and unrelated to construction. Within Europe construction MNEs show specific patterns of diversification. Table 2 in the Appendix indicates patterns of specialisation and diversification among the top European construction MNEs. This suggests that most European construction MNEs are highly internationalised.

Today diversification is a popular feature among some of the world’s largest firms. Within the construction industry vertical integration into related industries has long been commonplace. However, the modern firm has sought diversification into non-related industries as a means of seeking new technology or competencies, offsetting the cyclical patterns of demand for construction, or improving profit margins by selecting a mixed portfolio of industries. Large diversified firms have access to many technologies and innovations, which lie outside the remit of the construction industry and as a result such firms, can be vehicles for the transfer of sustainability knowledge and technology not only among industries but also among and between many nations. With the increased importance of global capitalism, we have experienced deeper and more extensive cross-boarder transactions. Resource mobility has increased the importance of multinational enterprises on the sustainability front by their extensive role in creation and dissemination of wealth. Furthermore these transactions are changing in character due to the digital

environment and electronic commerce. Today global capitalism faces many challenges (Dunning, 2001), the most significant being environment and sustainability where the main source of contemporary wealth creation, i.e., “knowledge or intellectual capital” is challenged to take a socially responsible role.

Globalised firms have a growing need to integrate their fragmented competences. Up to the mid 1980s internationalisation of activities in multinationals was based on what the firm had developed in the home markets; most of the R&D, strategic units were located in the parent company, and the only reason that these firms located in different sites was to take advantage of the existing comparative advantages in terms of given resources or to avoid barriers to entry. This changed in the 1990s when, following many mergers and agreements, transnational companies found themselves having islands of knowledge spread all over the world requiring new modes of integration and interaction.

With growing diversity and scale of operations the task of coordination of market and production information has become more crucial. In coordination of their productive activities firms will compare the cost of internal organisation with the cost of using markets. Coase (1937) highlighted that there is a cost of using the price mechanism. In the absence of transaction costs, all transactions will take place across markets and there would be no need for firms to exist. However, when transactions are costly the firm will undertake those activities for which internal organisation has a net advantage (Mudambi and Ricketts, 1998) and locate its boundaries where the costs of ‘internal’ organisation and ‘external’ markets are finely balanced. In this Coasian transaction cost paradigm the firm and market are substitutes and as the scope of a firm increases its transactions are ‘internalised’. Furthermore, the economic theory of multinational enterprise is concerned with explaining why multinationals exist and why their operations are in specific high-technology industries and why MNEs internalise flow of globally applicable technology and marketing expertise.

It is also acknowledged that in order to remain competitive firms seek market knowledge and technology which help reduce the level of uncertainty (Buckley and Cater, 2003). In reducing the costs of knowledge and information the firm relies on formalisation. Protocols, policies, routines and procedures are among some of the possible mechanisms that organisations can use to become more cost efficient. However, not all knowledge can be formalised and there is also a danger of becoming too bureaucratic. The quality of information available to the entrepreneur or the management will influence the outcome of their decisions and this can be improved by sharing knowledge at different levels within or outside the organisation. Sustainability knowledge also benefits from sharing existing know-how and information for increased effectiveness. Knowledge sharing can also help eliminate or reduce instances of replication as well as spread more effective practices. For new knowledge or technological advances in environmental practices the firm has to actively seek generation of such knowledge through its R&D activities.

Behind innovations there is knowledge. Thus, the capacity to produce, transmit, absorb and re-combine knowledge influences the innovation process and, consequently, determines both organisational and national success. Technological innovations for a sustainable urban environment cannot be indifferent to cost considerations, however. Kline and Rosenberg (1986) demonstrated that almost three-quarters of the most successful innovations have been initiated as the result of perceived market needs and only one-quarter have emerged from perceived technical opportunity. At the same time they showed that many characteristics that would have important advantages in the marketplace could not be realised with current technical infrastructure or are barred by the workings of nature (ibid, p 277).

Successful innovations or technological improvements of any kind are likely to emerge in environments in which the requirements of the new product and its manufacturing processes are met, market needs and the need to maintain an organisation that can continue to support all these activities effectively are satisfied, and the needs and tastes of eventual users, given the cost constraints, are closely matched. However, as the organisation grows in size the task of coordination of information becomes even more important. Williamson suggests a problem of information overload for the chief executives which explains why large companies shift to multidivisional structures in order to cope with growing diversification and inter-functional coordination.

In contrast to the contract-based theories of the firm, the evolutionary approach considers the firm as a "processor of knowledge" rather than a "processor of information". It is highlighted that where firm is considered as a processor of information, its behaviour can be understood as an optimal reaction to the environmental signals which are detected by the firm; but when the firm is considered as the "locus" of setting up, construction, selection, usage and development of knowledge, it is no longer sensitive to the distribution of information but it is rather sensitive to the sharing and distribution of knowledge. Here, the firm it is not so much worried about the saturation of its abilities to deal with information, but it is concerned with becoming too confined by "inefficient routines". Evolutionary theorists such as Alchian (1950), Penrose (1959) Nelson and Winter (1982), Teece (1988), Dosi , Teece and Winter (1991) and writers on organisations such as Chandler (1992) have all emphasised the key role of knowledge creation and management. At the core of Nelson and Winter (1982) evolutionary view is the concept of "routines". They are defined by a set of properties: routines as organisational memory; routines as truce and routines as target for control, replication and imitation. Building on this approach Cohendet and Ilerena (2001) consider that interaction between the individual and organisational levels are shaped and determined at an intermediate level, the level of communities. They consider two types of communities: first functional communities, organised hierarchically, homogeneous and sharing a disciplinary specialisation (such as finance, mechanical engineers) and second, epistemic communities and communities of practice, horizontally defined either by the production of new knowledge or by a common interest for a given practice. They argue that routines as "an executable capability for repeated performance in some context that been learned by an organisation in response to selection pressures" emerge by three interdependent mechanisms: a spontaneous auto-organisational process oriented by the market selection; a cumulative process of practices and discoveries; and a focalisation process organised by the hierarchical structure.

Learning has to cope with confusing experience and the complicated problem of balancing the competing goals of developing new knowledge (i.e. exploring) and exploiting current competencies in the face of dynamic tendencies to emphasise one or the other. In the evolutionary approach the cognitive mechanism is regarded as essential, and routines play a major role in avoiding the deliquescence of the organisation and maintaining its internal coherence. In contrast the information processing approach focuses on the firm's resolution of information asymmetries rather than the coordination and the development of new knowledge. Cohendet, *et al* (1999) argued that the main problem for the modern, globalised firm is not one primarily of the unequal distribution of information, but rather of the difficulty of mobilising and integrating fragmented forms of localised knowledge. They investigated new modes of communications and networking and showed that networking favours a transparent mode of governance characterised by inter-linked actors and continuous stimulation.

Methodology

The case study approach has been considered as an ideal methodology for holistic and in-depth investigations in the context where behaviour is not homogeneous or routine. As Yin (1994) suggests this approach is most effective when determining causality - when 'how', 'what', or 'why' questions are being asked. It provides an alternative to other research methods such as experiments, surveys, histories and the analysis of the archives. Case study research offers comparative flexibility, as the investigator is allowed to explore rather than prescribe or predict and therefore he/she is free to discover and address issues as they arise in the experiment. By concentrating on a small group of subjects, case studies specialise in 'deep data' based on particular context. Using a case study framework, it was the aim of this scoping study to remain flexible in order to propose a suitable methodology for a more in-depth study in the core project. In this context, social network methodology was considered as a means for comparing the effectiveness of knowledge processes within various teams within the same firm, both at the parent and subsidiary levels.

Fieldwork and findings

Two large construction companies were selected for the study. One of the above firms is a subsidiary of a foreign construction firm which has been specialising mainly in construction related operations.

An industry leader, company A's core activity is in construction, while offering a wide range of specialist skills to provide integrated solutions. Company A was first founded in the late nineteenth century as a material producer, but quickly diversified into construction and soon the company became internationally active. Growth in the home market followed by international expansion in the Middle East and Africa, Eastern Europe, and South America. The UK subsidiary which we refer to in this report as Company A is committed to the Group's Health & Safety Strategy and states that all its companies have attained certification to the management systems ISO 14001, ISO 9001 and OHSAS 18001. The UK subsidiary is part of a global construction group which prides itself in finding innovative solutions for its clients. World-wide, Company A offers a wide range of services from Project Development to Construction and facilities management.

Company B, also an industry leader, is a UK based global company which offers construction services in Health, Transport, and Defence in the home market as well as international services from building to rail projects in Europe, Canada, the Middle East and the Caribbean. Company B, with strong civil engineering experience, has a long tradition in innovation. This company has also aimed to integrate fully environmental and social factors into its business strategies and became an ISO 14001 certified company in the late 1990s. The current company was set up as a result of a de-merger in 1999. Both firms in this study offer Private Finance Initiative (PFI) projects mainly in Health, Education and Government sectors.

Face-to-face interviews at the management level were used to address some of the main questions. However, in this study we are also indebted to the UMIST team of researchers who made available some of their findings from a large questionnaire survey. In addition, interviews have been supplemented with additional information gained from publicly available sources such as companies' own WebPages and reports. The SUE-KM Final Report provides the complete results of this study and is available on request.

Industry initiatives in knowledge management

In conjunction with our proposed conceptual framework, our findings are in line with the conclusions of a recent study of knowledge management in the construction industry undertaken by the Construction Industry Research and Information Association - the CIRIA KM Benchmarking Project. This study focused on knowledge sharing between a club of 11 CIRIA Core members on the approach to KM and learning within their companies during 2002. Common points of reference were structured around 11 core KM themes addressing each of 3 focus areas, Strategy, Process and Tools and Measurement and Application (Table 1). Main issues identified for the construction industry were concluded to be as follows:

- Importance and difficulties in managing tacit knowledge
- Combining bottom-up and top-down KM initiatives
- Balancing human interaction supported by technology
- Linking KM to future objectives
- Allowing thinking, experimentation and challenging of the status quo
- Enabling communication from every angle and the opportunity to share
- Empowerment of the individual, disenfranchisement, motivation and incentivisation
- Challenges of project- based firms - 'Unique' knowledge
- Industry issues - Culture, time & resource restraints

Table 1. Core issues of knowledge management for construction – Source CIRIA (2003)

Strategy	Processes and Tools	Measurement and Application
1- Awareness and Commitment	8- Organisation of Corporate Knowledge Resources	11- Measurement and Application
2- Strategy	7- Using and Applying Knowledge Internally	
3- Culture	8- External KM and Learning	
4- Incentivisation and Reward	9- KM Tools	
5- Security and Protection	10- ICT and Information Management	

The current study drew also, in designing some of the structured questions, on some of the questions proposed by a recent OECD questionnaire on knowledge management. The OECD survey of knowledge management (KM) practices in central government ministries/departments/agencies was launched in January 2002. The results of the survey were discussed at the Symposium on "The Learning Government" which took place at OECD headquarters in Paris on 3-4 February 2003.

Main themes of the interviews

Drawing on the CIRIA's core themes the findings of this study presented in this paper are grouped into five key areas:

1. The extent of individual awareness and commitment to sustainability
2. Sources of sustainability knowledge within and outside the firm
3. Knowledge of legislation and its role in innovation (knowledge management)
4. Internal incentives and rewards for adopting sustainability solutions

5. Marketing of sustainability solutions to clients

The following section presents the similarities and differences in the response of the two firms participating in this study. Before presenting our preliminary findings we wish to remind the reader of the limitation of our findings due to time and resource constraints of the scooping study.

The extent of individual awareness and commitment to sustainability

Both Company A and B have publicly available policies covering sustainability issues, with Company B emphasising the importance of communicating policies to staff, shareholders and stock market. This company claimed a proactive attitude to the promotion of environmental performance through an approachable management. There was not an obvious sense of a hierarchical organisation.

Company A, although having publicly available policies and top management awareness of issues, exhibited less commitment further down the management chain. There was also a marked disparity between the attitudes exhibited by the parent company and the UK subsidiary, with the latter being less committed to sustainability. Within the UK subsidiary, the company was flexible and managers were approachable.

At a personal level it was observed that the environmental manager interviewed in Company A was personally committed to environmental protection and was also convinced by the scientific evidence of its urgency. This was reflected in the interviewee's attitude to re-cycling and her personal commitment to bicycling to work. As in Company A, the interviewee in Company B claimed to be actively involved in environmental practices both personally and professionally, although no specific examples of the personal commitment were offered. However, the company had received a number of awards for its environmental performance in which the interviewee has played a substantial role. Furthermore, in Company B the interviewee was aware of his company's environmental policy but he was not aware which of the environmental standards the company is registered for.

Sources of sustainability knowledge within and outside the firm

The main sources of knowledge for environmental/sustainability issues varied across the firms. While staff in Company A benefited from the extensive research and experience of the parent company, in Company B, most sources were internal to the firm. The environmental manager in Company A was convinced that there was no need for generating new knowledge in the field of sustainability: "there is enough knowledge existing and probably too much of it." This respondent was unhappy about the impracticality of a lot of knowledge generated in relation to sustainability: "Consultants and academics should be more financially aware".

Among the local institutions and research bodies, Company A relied on a larger number of institutions such as the Environment Agency, DEFRA/ODPM, CIRIA, BSRIA, BRE and CIBSE. On the other hand Company B's sources of sustainability knowledge, as expressed in the UMIST questionnaire survey with six of the Company A's environmental/project managers were as follows:

- Contacts elsewhere in the industry
- Industry / professional publications

- Short courses provided by professional bodies
- Waste management contractors
- Academic contacts
- Conferences

So far as Company B's sources of existing knowledge are concerned, the company shares all technical and organisational information with its suppliers, customers, parent company, public institutions and even its competitors. However when dealing with new sources of knowledge, the most important source of technical knowledge are the company "suppliers" which in turn is followed by their parent company, other divisions of the branch as well as their subcontractors.

Knowledge of legislation and its role in innovation (knowledge management)

Both companies acknowledged the influence of legislation on their policies in relation to sustainability. However, company A exhibited somewhat greater awareness of the general impact of future legislation. Matters related to environmental legislation were taken equally seriously in company B. Believing that the company is a "path finder", the interviewee in Company B expressed that they always try to stay ahead of the regulation rather than following it. In this context it was stressed that "building materials" will receive a considerable attention as they have been identified by Company B as playing a significant role in forthcoming legislation.

Company A also stated that some of the sources of innovation are from outside the industry, for example glazing techniques and renewable energy technology have improved building performance in the construction industry. However, the driver for energy efficient glazing stems mainly from demand in the construction sector alone. Ultimately, the driver for these innovations has been the growing demand for better environmental performance from the construction industry (clients or the builders) due to tighter environmental legislation. The interviewee in Company A also believes that, within the company, those areas which have been subject to environmental legislation, such as procurement and materials, have taken environmental issues more seriously than other parts.

As the interviewee in Company B asserts, drivers for change in the construction industry are from within the industry itself as well as the supplying (manufacturing) industries. This is a two-way process. For example, on behalf of his company he would ask the manufacture of a product for a specific requirement (such as an environmentally sound solution) and in response to his request the manufacturer will try to deliver. This will lead to the development of a new product by the interaction of the contractor and the manufacturer. Since he is known by his suppliers as an open-minded person he also receives new ideas from manufacturers. But there is a limitation in use of new ideas as in projects such as hospitals (especially) it is preferred that any applied solution has been tested before hand and there is a precedent for its use.

Internal incentives and rewards for adopting sustainability solutions

Both firms clearly did not have an incentive or reward system relating to sustainability that was readily available or known to the managers interviewed. At a personal level none of the managers interviewed believed that the company should have an incentive system in order to encourage "sustainable", "environmentally friendly" or "green" behaviour. Although both companies may argue that they have a reward/incentive system, the main finding here suggests that at the middle management level, this is not followed through as a useful or necessary policy.

Marketing of sustainability solutions to clients

Both firms consider themselves in a leading position and, as previously suggested, are not concerned by competition, but are aware of competitors. Company A asserts that there is not much competition from abroad, as none of these firms can offer the same level of environmentally friendly solutions as their parent can. Efficiency gains was regarded as the only reason why Company A would follow any environmental friendly practices. They demonstrate to their client how they can save money by reducing waste, the consumption of energy and water as well as improving the disposal of hazardous waste or reducing the burden of contaminated land. Good environmental performance also provides a promotional marketing tool for the company as a whole.

The same response was observed by Company B which believed that the use of environmentally friendly solutions always leads to efficiency gains by building faster, or effectiveness gains by making buildings cheaper to maintain. Environmental consciousness also avoids the risk of future prosecution especially in PFI projects where the company remain responsible for maintenance for a long time after the completion of a project. Even if there were no efficiency gains, the company would have to comply with environmentally friendly practices due to environmental pressure groups. As a whole the company plays a pro-active role in engaging environmental issues.

Conclusions

Although this study was limited in scope and covered detailed interviews with only two organisations, a number of interesting conclusions emerge. Both companies provide examples of good practice in relation to sustainability issues. They have identified and encouraged what can only be termed "sustainability champions", who have a personal commitment to the environment and who back this with action at a personal level. Both companies have defined policies relating to sustainability and, in one case, take measures to ensure that policies are followed down the managerial hierarchy. Existing knowledge relating to sustainability and environmental performance appears in both companies to be managed well and its value recognised. Both companies exhibit a good knowledge of the legislation driving sustainability and are attempting to keep ahead of legislative measures in the field.

Less successful areas include a lack of follow up for the personal commitment of the "sustainability champions". Indeed, both companies discounted the benefits of any reward or incentive system to promote sustainability innovations throughout their organisations and one company (company A) did not appear to drive knowledge actively towards the workforce.

Although both organisations recognised the importance of innovation, the value of new knowledge was to a certain extent discounted. This reveals an important weakness in relation to the Sustainable Urban Environment programme, which is largely concerned with new research and applications in the field. If industry leaders and examples of good practice, such as these two companies, are relatively sceptical in relation to new knowledge, how much more difficult is it going to be to encourage the take up of the results of the SUE programme when it comes to less enlightened firms?

Finally, although one company did mention the value of innovation from outside the construction industry, neither appeared to actively seek innovations from other industries. It is our belief that valuable lessons can be learned outside the construction industry with direct application within. In

our submission for a Core project, we are concerned not with innovation itself, but with the application of innovation. In other industries, necessity has been the mother of both invention and seeing that it is taken up much more quickly than in the construction industry. The way that other industries have reacted to the sustainability imperative should be examined in detail.

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Appendix

Table 2. European Multinational Construction Firms, by revenue, employees, international contracting, ISO 14001 and diversification, 2001

Firm	Revenue (\$m)	Employees	Year ISO 14001 awarded	% of international contracting	Diversification (SIC)
Technip Coflexip	3,156.30	18,000	(ISO 9001)	96	4619, 1389, 1629, 8711
ABB (parent to ABB Lummus Global)	23,726	156,865	1996	86	3511, 3613, 3822, 8711
Skanska AB	15,603	76,372	2000	85	1629, 1799, 6552, 8744
HOCHTIEF AG	10,781	36,962	2001	82	1611, 1622, 1629, 8711
Bovis Lend Lease, UK (Bovis)	4,304.60	10,369	Not certified	76	1629, 8711, 8712, 8741
Bilfinger Berger AG	4,072.60	50,277	Not certified	61	1542, 1611, 1629, 8711
AMEC	5,024	26,612	2002	54	1629, 8711, 8712, 8741
Impregilo PS (Gemina, parent co)	2,185.80	19,469	(ISO 9001)	50	1542, 1629, 1611, 1622, 9511
Ballast Ham Dredging (merger of Ballast Nedam Baggeren and HAM. Parent companies in 2001)	771.76	2,179	ISO 9001 in 2000	46	1542, 1522, 1531, 3277, 1629
Bouygues SA	18,135	125,000	2001	45	1611, 1629, 4812, 4833
NCC AB	4,357.10	28,170	1997	42	1542, 1629, 3273, 8711
Vinci	18,423	129,000	2000	39	1611, 1622, 1629, 8711
Grupo Ferrovial SA	3,755.80	23,522	AENOR in 1997	33	1611, 1622, 1623, 1542, 1522
Balfour Beatty	4972.1	27,210	2004 (going to register)	29	1611, 1622, 1629, 8711
Grupo Dragados	4,812.90	51,536	2003	26	1611, 1629, 8711, 8741
Eiffage SA	5,720	42,340	2002	14	1611, 1629, 1731, 8711
Total share of top 225 international contracting turnover in 2001 = 50 %					
Total value of international contracting in 2001 = \$ 53,748.60 million					

Source: Internationalisation Strategies of Multinational Construction Firms: A Critical Review Farshchi, M (2003), Reading Business History Conference.

References

- Alchian, A. (1950), "Uncertainty, Evolution and Economic Theory," *Journal of Political Economy* 58(3): 211-22 1.
- Buckley, P. and Carter, M.J.(2003), "Governing Knowledge Sharing in Multinational Enterprises", *Management International Review*, Gabler Veriag.
- Chandler, A. (1992), "Organisational capabilities and the economic history of the industrial enterprise", *Journal of Economic Perspectives*, vol.6,
- CIRIA (2003) "Doing the Knowledge II, An Overview of Knowledge Management in Construction", *Presentation at RIBA*, London, February 2003.
- Coase, R. (1937), "The Nature of the Firm", *Economica*.
- Cohendet, P. and Llerena, P. (1998), "Theory of the Firm in an Evolutionary Perspective: A Critical Development", *Conference Paper: Competence, Governance and Entrepreneurship, Copenhagen*, 9-11th 1998.
- Cohendet, P., Kern, F., Mehmanpazir, B. and Munier, F., 1999, "Knowledge coordination, competence creation and integrated networks in globalised firms", *Cambridge Journal of Economics*, Band 23: 225-241
- Dosi G., Teece D.J., Winter S.G. (1991), Toward of Theory of Corporate Coherence , in Dosi G., Giannetti R. and Toninelli P.A. (eds)*Technology and the Enterprise in a Historical Perspective*, Oxford, Oxford University Press.
- Dunning, J. H., "Whither Global Capitalism?" *Global Economy Quarterly*, Vol. 1, No. 1, March 2000, pp. 3-48
- Farshchi, M (2003), "Internationalisation Strategies of Multinational Construction Firms: A Critical Review", *Reading Business History Conference*. The University of Reading.
<http://www.druid.dk/conferences/summer2003/Papers/ABRUNHOSA.pdf>
- Kline S.J. and N. Rosenberg (1986), An Overview of Innovation, in R. Landau and N. Rosenberg (eds). *The Positive Sum Strategy. Harnessing Technology for Economic Growth*, National Academic Press, Washington, DC, p. 289.
- Levinthal D.A. and March J.G. (1993) "The Myopia of Learning", *Strategic Management Journal*, Vol 14, 95-112
- Mudambi, R. and Ricketts, M. (1998), *Economic Organisation and the Multinational Firm*, Routledge
- Nelson R.R., Winter S.G. (1982), *An Evolutionary Theory of Economic Change*, Cambridge, Massachusetts, Harvard University Press.
- Penrose E. (1959), *The theory of the growth of the firm*, Oxford Uni. Press.
- Teece D.J. (1988), "Technological Change and the Nature of the Firm , in Dosi *et al.*, pp.256-281.
- Yin R. K. (1994), *Case Study Research, Design and Methods* (Applied Social Research Methods Series Volume 5) SAGE Publications.