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Qualitative Research Methods in Project Management Research in the Built Environment

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Abstract
It is now commonly accepted that qualitative research methods have an important role to play in project management research in the built environment sector. This acceptance emanates mainly from the realisation that projects and project environments are highly complex and context dependent; and therefore qualitative research is better suited for their exploration. Even so, there is a gap in the literature with respect to the execution of such methods in research projects and their appropriateness. This paper aims to make a contribution to closing this gap by evaluating the use of cognitive mapping and social network analysis (SNA) techniques in two research projects conducted on the UK construction industry. The first section reviews the recent debates on qualitative research paradigm in project management research in the built environment sector and concludes with the identification of the gap in the literature. The second section adopts a case study approach and conducts a SWOT analysis on the use of cognitive mapping and SNA in two UK research projects. The fundamental aim of this analysis is to determine the appropriateness and performance of these methods in the given contexts. A discussion on what qualitative research methods have to offer to the project management research community in the built environment sector concludes this paper.

Keywords
Qualitative, Research methods, Project management

1. Introduction

The debate on the role of theory in the construction and project management research community has recently been revived. Building Research and Information dedicated a recent issue (May 2008, Vol. 36, No.3) to discussing whether a 'theory of the built environment is needed'. There was a lively debate on the academic community's approach to research and the industry's perception of the research findings during the closing session of the CME 25 conference[1]. This discussion focussed on constituting the discipline. Most recently a discussion thread on Co-operative Network for Building Researchers (CNBR) on the ISI listing of journals in our field diverted into the role of theory and approaches to research in the field. Hence, discussions on theory-building, research methodology and methods currently occupy our research community in the field. This revival of interest in such matters follows on from the debate hosted by Construction Management and Economics (CME) in the mid-1990s which fizzled out towards the end of that decade (Dainty, 2007).

[1] CME 25 conference, construction management and economics: past, present and future, University of Reading, UK, 16-18 July 2007.

Perhaps, this interest emanates from the realisation that projects and project environments are highly complex and context dependent; and therefore quantitative research methods on their own, which have dominated the field, are not appropriate to understand such environments. There are a plethora of influences on developing and delivering a project from social relationships between members of the team to technical capability to economic feasibility to name but a few. Therefore, there is the need use a diverse range of research methodologies in order to understand this complexity and deploy qualitative research methods which are more akin to understanding highly complex and context dependent environments.

These statements resonate the debates in the general project management research community that took place between the end of the 1990s and mid-2000s. Williams (1999) rendered traditional project management approaches to be inadequate as projects became increasingly complex. Hence the methodological approaches needed to research complex projects must have the potential to identify and analyse complexity and allow for a more detailed insight into the processes involved. Williams (2003) stressed the value of the systemic models derived from qualitative data as illustrated by the work of Eden *et al.* (2000), whilst acknowledging the contribution made by those developing largely quantitative models of project management.

Against this background, Dainty (2007) recently identified that a diversification of research methods in the construction and project management field had not yet been reached and that the majority of research had been undertaken from a positivist perspective. Having acknowledged that his paper was based on a limited sample of journal papers published in CME, he posited that 'the ontological and epistemological standpoints of the research community were narrow'. Dainty (2007) proceeded to identify that the limited number of qualitative studies that were included in the CME volume that he reviewed used an equally limited range of research methods. Interviews (semi-structured and unstructured); focus groups and group interviews; observation (non participatory and/or participatory including ethnography); document or other textual analysis; and visual data analysis were the methods that were used in this volume, with an over-reliance on semi-structured interviews for data collection. Notwithstanding the limitations of this review, which Dainty himself acknowledges in his paper, it could be argued that the majority of the researchers in the field rely too limited a range of methods in order to understand highly complex phenomena. This of course cannot be a universal generalisation given the limited dataset.

However, this is a useful observation which highlights the importance of reporting research projects which has the potential to contribute to achieving diversification, and thus closing the gap in the literature with respect to the deployment of alternative methods such as Social Network Analysis (SNA) in research projects and their appropriateness to construction and project management research in the built environment. This paper aims to make a contribution to closing this gap by evaluating the use of cognitive mapping and SNA techniques in two research projects conducted on the UK construction industry.

2. Enquiry 1: Understanding Complex Re-use Processes Through Cognitive Mapping[2]

As reported elsewhere (Edkins *et al.*, 2007), this research project aimed to understand the process of re-using some Grade II listed heritage buildings. Its underlying proposition was that unravelling the actual dynamics of such processes through which different players interact, and identifying the factors/issues that increase the chances of overcoming challenges associated with re-use, would be instrumental in moving re-use from the periphery of commercial property development domain to a more central position. Such a move would increase society's capacity for sustaining architectural heritage.

London was chosen as the location of this research as it is the city with the highest concentration of listed buildings in the UK. Three case studies were chosen from three local authorities in order to reflect the

[2] This case study was published in Edkins *et al.*, 2007.

economic diversity of the Capital. The cases were all conversions of heritage buildings to up-market residential use. Their original uses were educational, administrative and residential/office.

2.1 The Method

Scarcity of existing knowledge on re-use processes dictated that this research be *exploratory* in nature. Twenty-eight in-depth interviews with key agents involved in re-use processes, and analysis of case file documentation yielded the necessary data. Case file documentation also facilitated 'triangulation' of interview data. To this extent, this research also made use of the most commonly used methods that Dainty (2007) identified. However, it differentiated from other qualitative research approaches by deploying powerful analytical tools which facilitated both coding-and-retrieving/theory building, and mapping contextual network systems. NUD*IST (now QSR N6) and Decision Explorer™ (DE), were used to ensure robustness of data analysis.

The first step of data analysis was coding in NUD*IST, followed by map building in DE and subsequent analysis of the maps. Available resources and the objective to map the project process by combining all agents' cognition of the process rather than mapping each respondent's individual cognition dictated the substitution of recommended 'live-mapping' by post-interview mapping from coded interview data.

DE's Cluster and Connect tools were used to overview the model. Cluster analysis segregates the raw map data into its various clusters. This segregation is based solely on the linking between concepts as the software package cannot interpret the text. Content analysis on these clusters enabled division of the development process into sub-stages and allocation of different clusters to these stages according to the timing of the key activities in each cluster.

Connect analysis identified the strength of every possible link between emergent clusters. Results were logged onto a matrix, and link strengths between individual clusters were graded. Hence, the interdependencies between different dimensions of the process were identified. Each stage of the development process could then be mapped in a product such as Microsoft Visio using the emergent clusters and the links between them (see Figure 1). Then central and domain analyses identified the key issues and activities at both local and global levels.

2.2 Methodological Added Value From Enquiry 1

The methodological approach facilitated the visual representation of a complex process without de-contextualising data, over-simplifying it, or fitting it into a prescribed framework. On the contrary, the emergent visual representation brings together the 'process stories' of all the key players involved in a project, hence an understanding of how different players' perceptions of the process relate to each other can be developed.

The approach also provided a visualisation tool which could be used for post-project reviews and learning from project experience. Moreover, this enquiry identified influences on project complexity and the critical factors to improve the process performance. These findings provide a basis for developing specific management strategies for re-use projects.

Methodologically, much was learnt. The emergent methodology, allows generalised results to appear whilst enabling the researcher to revisit the raw data from the generalized results. This is an important feature of the methodology which increases the robustness and rigour of data analysis. It also allows the case to be first described and then analysed.

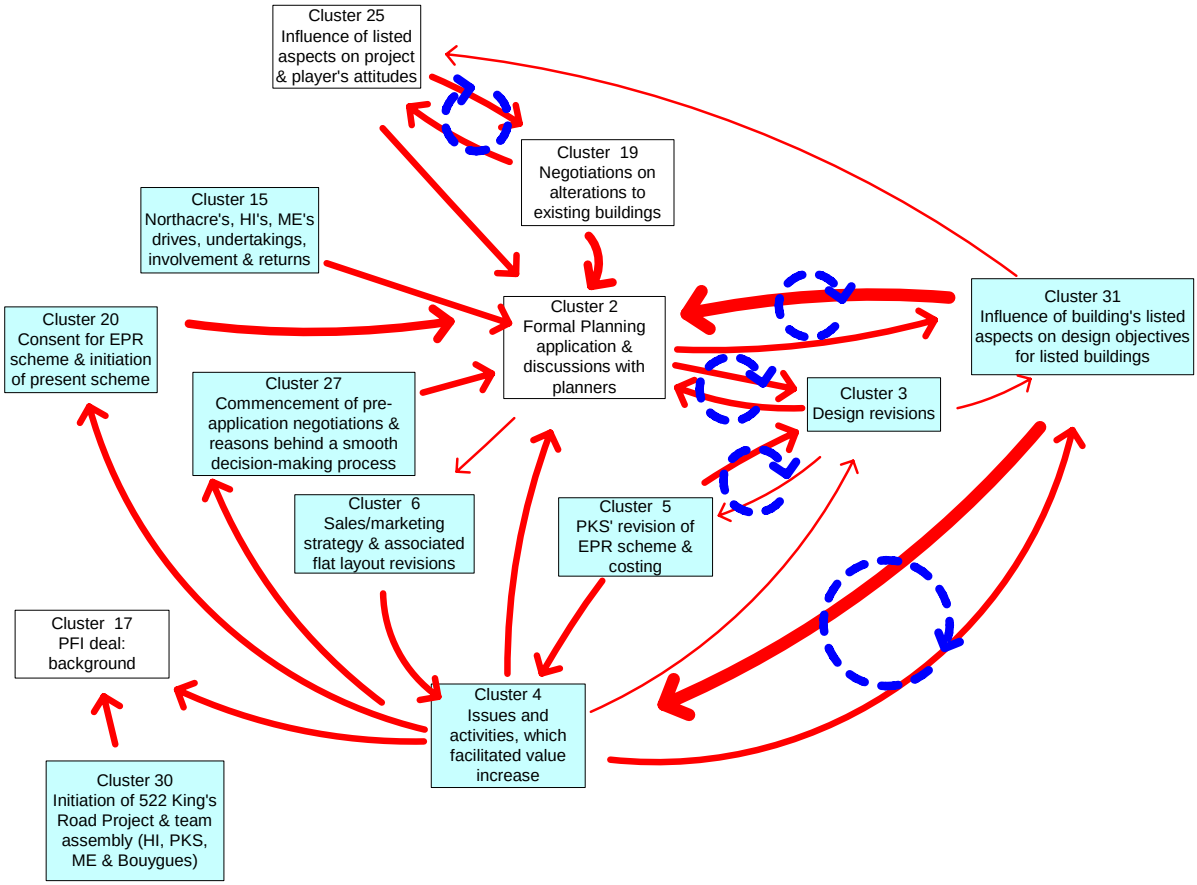

Figure 1: Design & Planning Application Stage of Case

3. Case Study 2: Evaluating Knowledge Creation Capability and Absorptive Capacity Through Social Network Analysis (SNA)[3]

This enquiry set out to identify how the utilisation of 'social capital' influences knowledge transfer and creation capability, and absorptive capacity of integrated project teams in the construction industry. Two qualitative case studies were used in order to achieve this aim. The choice of case studies resonated with the context-specificity of knowledge and knowledge processes. Once again, the limited amount of existing knowledge in this study area dictated an exploratory approach to the study. The cases in the context of this study were inter-organisational project teams delivering building projects for established clients.

3.1 The Method

A combination of Social Network Analysis (SNA) and content analysis was the main methodology. Here the discussion only focuses on SNA as content analysis is out of the scope of this paper. At the lowest level of analysis, SNA relies on data on the quantitative features of .the relations, e.g. frequency of

[3] This case study was published in Kurul *et al.*

contact, between the nodes[4] which form a network (Freeman, 1992). SNA was considered to be a robust methodology as it would facilitate the exploration of the structural features of a social network through the analysis of 'relational data' (Scott, 2000), as well as providing a collection of metrics to determine how the project teams used the resources embedded in their networks to source knowledge and advice (Wasserman and Faust, 1994). It was considered to be particularly suited to project teams that were studied because they were temporary coalitions bound together by flows of information and materials (Pryke and Pearson, 2006; Winch, 2002). Furthermore, it was anticipated that SNA would facilitate simple quantitative measures and the visualisation of the teams' networks, paving the way to very useful discussions amongst their members. It would thus enable limited deployment of action research. It had been acknowledged that SNA alone would not be adequate to explore the qualitative features of the relationships between the nodes despite these advantages. Therefore, content analysis was used at a later stage of the research project to systematically analyse the textual data on these features, and thus to address "the problem of relational content" (Burt and Schott, 1992).

Data was collected through semi-structured interviews with each participant during two fieldwork periods. The main means of relational data collection were "name generator" questions that the interviewees answered during the first fieldwork (Burt, 1997; Lin, 1999; Marsden, 1990). Once again, interviews were used to collect the data, taking this enquiry close to other qualitative enquiries in the field. However, the use of techniques such as SNA for data analysis differentiated it from mainstream research projects.

Raw relational data was tabulated in databases and analysed through SNA by using InFlow[5]. Tabulation was based on the names that emerged in response to the "name generator questions" and the frequency of the contact for knowledge and advice sourcing that was cited by the interviewees, i.e. daily, weekly, monthly and rarely. This tabulated data was used to draw network maps (see Figure 2) of the project teams and to calculate SNA metrics.

Many different SNA metrics could have been produced through the analysis. However, the review of SNA literature (e.g. Mizruchi and Potts, 1998; Otte and Rousseau, 2002; Reagans and McEvily, 2003;) and its previous applications (e.g. Loosemore, 1998; Pryke, 2004) revealed density, degree centrality, closeness centrality and betweeness centrality as the main metrics to be examined in order to explore the relationship between the structural dimension of social capital, stimulators of absorptive capacity and of knowledge creation. The analysis of relational data was confined to these metrics.

3.2 Methodological Added Value From Enquiry 2

At the conceptual level, it has been shown that SNA facilitates the exploration of the structural features of the social networks of the studied project teams. This was achieved through the basic interpretation of SNA metrics to determine how the project teams made use of their networks in sourcing knowledge and advice. This basic interpretation should be taken forward by correlating different metrics and interpreting the results of this correlation in order to get a more realistic understanding of how the networks behave.

[4] Nodes can be people, departments or whole institutions. In the context of this research, the nodes of each social network were members of the project teams that were studied.
[5] InFlow is the social network analysis software package that was used in this research.

A similar level of sophistication is also yet to be reached in the comparative analysis of the results of both SNA and content analysis. Once again establishing the correlations between these two different sets of results is the first step forward. As this has not yet been done, it may be possible that this research has just identified the actors who are key in terms of providing knowledge and information but not necessarily key in terms of creating new knowledge (Ashworth and Carley, 2006). One way of testing this is to establish the correlation between a node's position in the network as a knowledge and information provider and his/her knowledge creation capability.

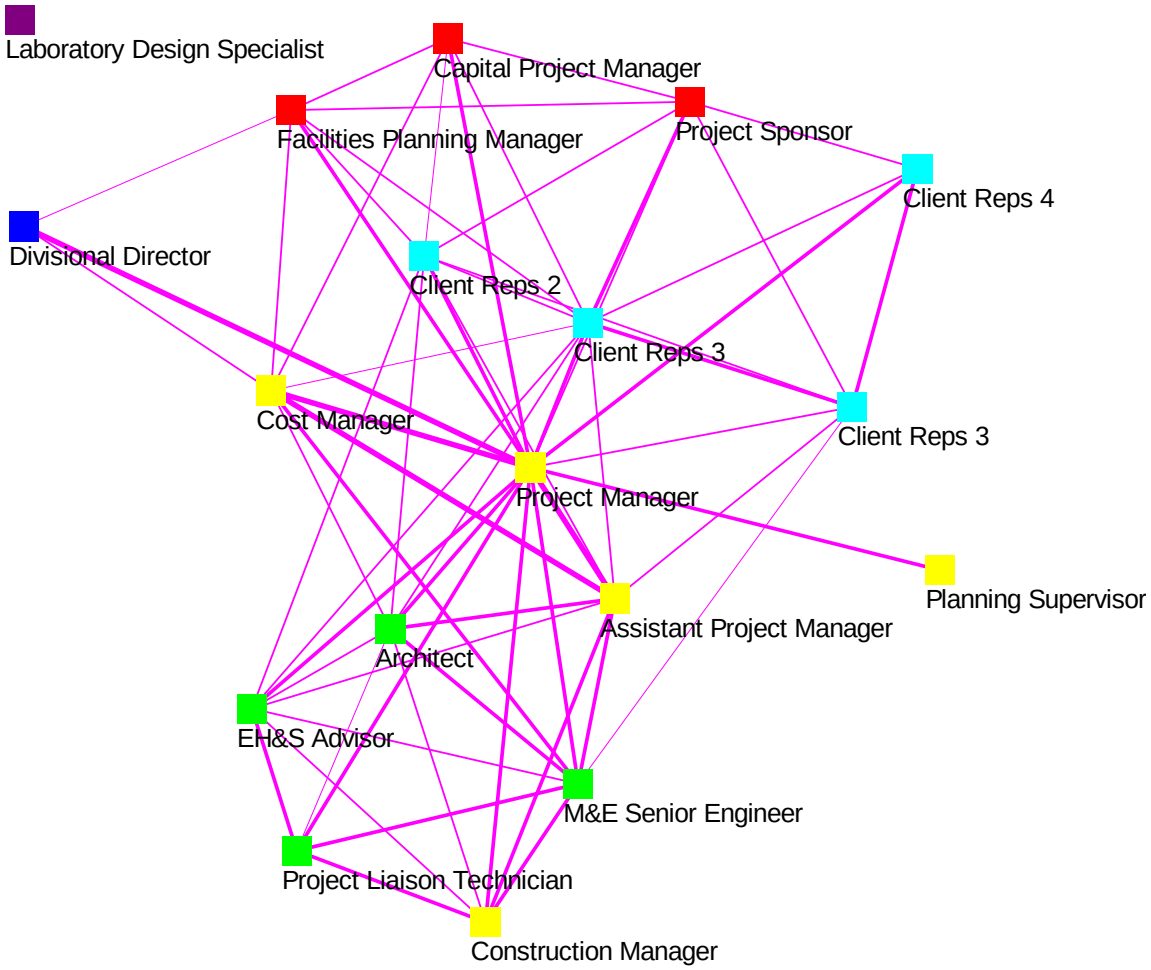

Figure 2: Network Map of one Intra-Organisational Project Team

At the operational level, basic utilisation of SNA enabled the visualisation of the teams' networks, paving the way to very useful discussions amongst their members and between the research team and the project teams. It thus facilitated limited deployment of action research. This was regarded to be very beneficial by the industrial partners, who also showed a strong interest in having the tools and knowledge necessary to map the networks at different stages of their projects and to compare themselves with benchmarks for measuring knowledge creation capability and absorptive capacity of project teams. This wish raised the issues of the temporal nature of the social networks, the lengthy data collection process, and the absence of such benchmarks.

Hence, the research team came to the conclusion that it was necessary to establish a much less time-consuming data collection tool without losing the opportunity to collect rich qualitative data and

benchmarks for knowledge creation capability and absorptive capacity. This requires a longitudinal study on a statistically significant number of projects and thus poses an operational challenge. It may be possible to follow Ashworth and Carley's (2006) approach and use simulation.

4. Discussion

The two methodological approaches reported above facilitated the achievement of research objectives in both enquiries. This section discusses in further detail the methodological value added by these research projects, and the strengths and weaknesses of the methods adopted. It aims to provide some guidance to future users of similar approaches and identifies the next steps for their further development and refinement.

The adopted methods enabled detailed understanding of the research domains through mapping and rigorous analysis of an individual's perception of a project process and knowledge and information flows amongst members of the project team. These were achieved without having to rely on prescribed analytical frameworks. The opportunity to omit normative frameworks, while remaining rigorous and systematic, meant that complex phenomena could be studied within its 'real-life' context without premature simplification which would inevitably rely on ex ante hypotheses or propositions.

Table 1 is the SWOT analysis of the two methodological approaches. In both cases, the research methods utilized facilitated the visualization of the complexity that is inherent in the case studied. The main advantage was that the subconscious observations of the project team members regarding the complexity of either the process or the relationships could be revealed using very powerful visual aids, i.e. process maps and network maps. These visual representations sparked in-depth discussions amongst the team members, augmenting their willingness to take part in action research to test some of the recommendations of the research teams. In this context, opportunities to refine these approaches to become a post-project review tool and a strategic management tool to form teams with high knowledge creation capability have presented themselves both to the research team and the industrial partners.

Table 1: SWOT Analysis of the Methods Used

S	W
▪ Powerful visualization tool ▪ No need for premature simplification ▪ Representation of complex phenomena without decontextualising data ▪ Robust, rigorous analysis ▪ Traceability of from results to raw data ▪ Ease of processing complex qualitative data	▪ Time taken to process & analyse data ▪ Validity of findings ▪ Labour intensive process ▪ Need to enhance visual output
O	**T**
▪ Opportunities for action research ▪ Opportunity to use both quantitative & qualitative techniques ▪ Opportunity to develop flexible but robust management tools for practitioners	▪ Reliance on interview data ▪ Heavy reliance on industrial support

Here it should be noted that these visualizations were not based on premature simplifications of either the project process or the flow of knowledge and information amongst the team members. The opportunity to represent complex phenomena without decontextualising data meant that meaningful visualizations could

be provided whilst retaining the complex relationships between different issues. In the main, this was a direct result of the traceability function of these methods.

One of the main limitations of these techniques is be that of the validity of the findings and the time taken to process and analyse the data. Taking individual accounts, reviewing and dissecting them in a relatively complex way, often then blending or merging the results, and finally presenting the findings using primarily visual instead of narrative tools allows for a critical concern that error, omission, and subjectivity will be present. The principal solution to this obvious criticism was to seek validation from those that originally gave the data. The subsequent discussion with participants was in all enquiries valuable, but as Hodgkinson and Jenkins (2002) have pointed out, there may be a need to supplement these with further tests, using statistical tools.

As identified by Dainty (2007), these research methods rely heavily on interview data which may be biased. It is therefore necessary to devise triangulate the interview data with data gleaned from other sources. Even if this is an important threat, it is not as insurmountable as having to heavily rely on industrial support for collecting data and to a certain extent for making sense of the data. Industrial collaboration has always been a challenge for the research community. It is destined to become more challenging in these difficult economic times.

5. Conclusions

This paper demonstrated that qualitative research methods assist in the analysis of complex phenomena without its premature simplification. It is clear that the currently available robust qualitative data analysis tools such as InFlow have the potential to be transformed into strategic management tools for the practitioners to analyse the project environments periodically and take strategic decisions based on rigorous analysis.

The validity of the findings and the time it takes to collect and analyse data points to the importance of refining these techniques to overcome these problems. The ‘culture’ of qualitative research has been such that data analysis starts from the low level, e.g. sentences in an interview transcript, and moves to the generic, e.g. issues common in the majority of interviews. Techniques such as cognitive mapping and social network analysis however allow for a generic analysis of the data and thus identification of key issues/areas at the beginning of data analysis.

6. References

Ashworth, M. J. and K. M. Carley. (2006). "Who you know vs. what you know: The impact of social position and knowledge on team performance". *Journal of Mathematical Sociology*, Vol.30, pp.43-75.

Burt, R. S. (1997). "A note on social capital and network content". *Social Networks* Vol.19, No. 4, pp. 355-373.

Burt, R. S., and T. Schott. (1992). "Relational contents in multiple network systems". In *Research Methods in Social Network Analysis* edited by. L. C. Freeman, D. R. White and A. K. Romney. New Brunswick and London. pp. 185-214.

Dainty, A. (2007). "*A review and critique of construction management research methods*", *Proceedings of CME 25 Conference, Construction Management and Economics: Past, Present and Future*, University of Reading, UK.

Eden, C., Williams, T., Ackermann, F., and Howick, S. (2000). "The role of feedback dynamics in disruption and delay on the nature of disruption and delay (D&D) in major projects". *Journal of the Operational Research Society*, Vol.51, No. 3, pp. 291-300.

Edkins A. J., Kurul, E., Maytorena-Sanchez, E., and Rintala, K. (2007). "The application of cognitive mapping methodologies in project management research". *International Journal of Project Management*, Vol.25, No. 8, pp. 762-772.

Freeman, L. C. (1992). "Social networks and the structure experiment". In *Research Methods in Social Network Analysis* edited by. L. C. Freeman, D. R. White and A. K. Romney. Transaction Publishers New Brunswick and London. pp. 11-40.

Hodgkinson, G. P., and Jenkins, M. (2002). "Managerial and organizational cognition". In *Strategic Management: A Multi-perspective Approach*, edited by. M. Jenkins, and Ambrosini,V., Palgrave, Hampshire, England. pp. 177-204.

Kurul, E., Otsuka, N., and Colantonio, A. (2007). "*Social network analysis: A robust methodology to evaluate knowledge creation capability and absorptive capacity*", *Proceedings of CME 25 Conference, Construction Management and Economics: Past, Present and Future*, University of Reading, UK.

Lin, N. (1999). "Building a Network Theory of Social Capital ". *Connections*, Vol.22, No. 1, pp. 28-51.

Loosemore, M. (1998). "Social network analysis: using a quantitative tool within an interpretative context to explore the management of construction crises". *Engineering, Construction and Architectural Management*, Vol.5, No. 4, pp. 315-326.

Marsden, P. V. (1990). "Network data and measurement". *American Sociological Review*, Vol.16, pp. 435-63.

Mizruchi, M. S., and B. B. Potts. (1998). "Centrality and power revisited: actor success in group decision making". *Social Networks*, Vol.20, pp. 353-387.

Otte, E. and R. Rousseau. (2002). "Social network analysis: a powerful strategy, also for the information sciences". *Journal of Information Science*, Vol.28, No. 6, pp. 441-453.

Pryke, S., and S. Pearson. (2006). "Project Governance: case studies on financial incentives". *Building Research and Information*, Vol.34, No. 6, pp. 534-545.

Pryke, S. D. (2004). "Analysing construction project coalitions: Exploring the application of social network analysis". *Construction Management and Economics*, Vol.22, No. 9, pp. 787-797.

Scott, J. (2000). *Social Network Analysis: A Handbook*, Sage Publications, London, Thousand Oaks, New Delhi.

Wasserman, S., and K. Faust. (1994). *Social Network Analysis: Methods and Applications*, Cambridge University Press Cambridge.

Williams, T. (2003). *The contribution of mathematical modelling to the practice of project management*, University of Strathclyde, Department of Management Science, Glasgow.

Williams, T. M. (1999). "The need for new paradigms for complex projects". *International Journal of Project Management*, Vol.17, pp.269-273.

Winch, G. (2002). *Managing Construction Projects*, Blackwell Science, Oxford.