



Liverpool John Moores University School of the Built Environment

# Association of Researchers in Construction Management (ARCOM) Doctoral Workshop

Liverpool Research Methods Doctoral Workshop

May 2009

Proceedings of the Association of Researchers in  
Construction Management (ARCOM) Doctoral  
Workshop

Liverpool Research Methods Doctoral Workshop

Editor Dr. Andrew Ross

Published by Liverpool ARCOM Doctoral Workshop

Copyright © 2009 Liverpool John Moores University

All rights reserved

ISBN 978-0-9562633-0-8

## **Preface: ARCOM 2009**

Firstly can I welcome you to Liverpool and Liverpool John Moores University for today's ARCOM doctoral work shop on qualitative methods, its gratifying to see so many researchers coming along to an event such as this to share their experiences and to listen to the papers selected for presentation.

This is the second workshop to be held in Liverpool, in February 08 we organised a workshop on quantitative methods and at the end of the event I discussed with colleagues on the committee about replicating one on the qualitative approach. Today's event is a result of that discussion.

The need for researchers to constantly critique their approaches has never been more relevant than it is now. New technologies, whether they support statistical modelling or qualitative text searching and matching, make the process of data analysis so much quicker than previously. Such speed and power of analysis can tempt researchers to move quickly from proposition to analysis without really reflecting on some of the philosophical underpinnings of the methods used.

This workshop has been designed in such a way as to allow the researcher the opportunity to position their work within the qualitative paradigm and the paper by Monty Sutrisina sets out the landscape of qualitative research. This is followed by Wendy Guthrie who takes an in depth look at approaches to grounded theory. Kerry Woolfall is researching in the area of health and she will be presenting work from this area to allow researchers to consider experiences from other fields. Paul Chan will consider how one can uncover hidden agendas in organisations.

The practical aspect of qualitative data analysis is presented by Fiona Wiltshier from QSR and she will focus upon the use of the NVivo software package for data management. This presentation is then followed by two research projects considering health and safety and supply chain management.



Andrew Ross

On behalf of the ARCOM committee

# **Table of Contents**

Papers:

**Chan, P**

Uncovering hidden agendas in organisations

**Ejohwomu, O**

Incentivisation of Innovation in Construction Supply Chains

**Guthrie, W**

Glasarian grounded theoretical approaches to data analysis

**Manu, P**

Health and Safety and subcontracting: An inverse relationship

**Sutrisna, M**

Underpinning philosophies of qualitative research

**Zerjav, V**

Identifying Key characteristics of Dispersed Engineering through Exploratory Research

# METHODOLOGICAL CHALLENGES IN UNCOVERING 'HIDDEN' AGENDAS IN ORGANISATIONS

Paul W Chan and Michelle Littlemore

Northumbria University, Newcastle upon Tyne, UK

There has been a proliferation of qualitative methods employed in construction management research. Yet, it is argued that much qualitative research in construction management remains doggedly positivistic and rationalistic. In this paper, reflections are made on the methodological debates that developed in the field in the mid 1990s. Despite calls for more interpretive approaches and subsequent increase in the utilisation of qualitative methods, it is noticeable that few truly interpretive studies exist in the field. There is a serious lack of studies engaging in deeper and richer ethnographic methods. Questions are raised here as to how researchers can help articulate 'hidden' agendas in organisations through methods like participant observation. Methodological challenges associated with such methods are also discussed here, which highlights the limitations of the ethnographic approach with respects to the career scholar.

**KEYWORDS: critical perspective, ethnography, interpretive research, methodological challenges**

## INTRODUCTION

Researcher: Do you employ women on your construction site?

Site manager: We certainly do... we employ quite a lot of women here actually.

Walking around the site, the researcher noticed however that there was only one female toilet on a site that employed a few hundred workers during the peak of operations. Intrigued by this observation, the researcher proceeded to ask the site manager, "Just how many women do you currently employ on this site?" To this question, the site manager responded with a startling "Six!"

This excerpt, taken from notes and recordings of casual conversations emanating from a research project investigating the nature of construction labour productivity (see Chan and Kaka, 2007), reveals the fundamental problem faced by many social scientists; that is, the pursuit of truth. Had the researcher not consulted his sense of sight and subsequently mobilised to ask the site manager further questions, the true extent of diversity on the construction site in question and more importantly, the site manager's conceptualisation of just how many women is "quite a lot", would have remained 'hidden' in the research process. Often, there is the danger that such 'hidden' aspects could result in incomplete findings being presented; at its worst, such findings could even be false. Uncovering the 'hidden' aspects in organisations is essentially important in the pursuit of truth, especially in the investigation of social relations that are pivotal in the field of construction management. An attempt is made, therefore, in this paper to examine what researchers in construction management need to consider when addressing 'hidden' aspects in construction, in view of the growing interest in more interpretive and qualitative research in construction management.

The paper is organised as follows. First, key methodological debates in construction management research initiated by Seymour and Rooke (1995) will be outlined. It is suggested that challenging traditional, positivistic and rationalistic research approaches in construction management has resulted in increasing acceptance of more qualitative research. Yet, it is argued that a lot of qualitative research in construction management remains deeply rooted in positivistic traditions that maintain the supremacy of the researcher's position to determine what is included or excluded in the conceptual frameworks that are produced in research. Thus, it is debatable as to whether there is a genuine shift towards more interpretive research in construction management and whether a holistic understanding of the relationship dynamics in construction remains the Holy Grail. Nonetheless, exposing 'hidden' aspects in organisations is not unproblematic. Challenges abound, which include researcher resistance to operating in ambiguity and their reluctance to keep an open mind, coupled with material concerns over the time and effort needed to proverbially not leave every stone unturned. It is intended that the critique offered in this paper help clarify key issues and pitfalls for construction management researchers confronted by the task of uncovering 'hidden' aspects in organisations.

## **BRIEF OVERVIEW OF METHODOLOGICAL DEBATES IN CONSTRUCTION MANAGEMENT RESEARCH**

In the mid 1990s, a debate on research methodology was sparked amongst the construction management research community in the UK. Seymour and Rooke (1995) were getting frustrated with the predominant rationalistic assumptions of the positivistic paradigm adopted by, and which they felt were becoming institutionalised and deeply embedded within, the construction management research community. This, and the increasing focus on understanding the culture of the industry at that time, prompted them to put across a message for an alternative interpretive approach, for they felt that "[...] the rationalists takes for granted the interpretative frameworks that are used to organise and communicate perception, thus effectively ignoring them. Instead of investigating the interpretations of others, they simply assert one of their own (p. 513)". They saw the problem as "[...] the rationalist paradigm [...] does not require researchers to question their own position. Instead, rationalists put their faith in the use of particular methodological routines to guarantee their impartiality. The researcher's values are regarded as either irrelevant or self-evidently correct (p. 521)". Furthermore, they considered the egalitarian approach resulting from adopting the rationalist paradigm to be inappropriately dominant in attempting to understand the issues within construction management, since these locate within both the physical and social sciences.

Critics of Seymour and Rooke's (1995) recommendation of adopting *verstehen* sociology in addressing meanings of human interaction have considered this to be too unwieldy, undisciplined and unscientific (Runeson, 1997). Others have criticised Seymour's *et al.* (1998) subsequent call for greater emphasis on "localised relevance in their accounts" by claiming this to be "consulting" and not research (Harriss, 1998). Still, Raftery's *et al.* (1997) remarks sounded conciliatory: "[...] it is fair to say that the majority of research [...] is in the positivist/rationalist tradition. Although it is worth noting that when qualitative methods have been used [...] there has been no consequent attack on the method used (p. 294)".

## **Growing acceptance of qualitative research in construction management research**

Since Seymour and Rooke (1995), there is progress in the development of more sophisticated analytical techniques in explaining the dynamics of social relations in construction. There is wider acceptance of qualitative methods and techniques like interviews and case studies regularly feature in research reported in the field. A notable example of research that utilises strong qualitative methods include Dainty *et al.* (2000), who undertook 41 pairs of in-depth interviews with males and females working in 5 out of the top 20 construction firms in the UK to illustrate organisational career development issues, structural and cultural dimensions of careers in construction, so as to understand the limitations of the diversity in construction agenda.

Other examples include Hare *et al.* (2006) who conducted a comprehensive literature review and a series of focus group interviews with experienced practitioners, which led to the development of a conceptual model that integrated health and safety considerations in construction planning. Baiden *et al.* (2006) interviewed managers of nine award-winning projects to examine the extent of team integration needed for successful projects. Lingard and Francis (2008) also adopted the interview technique; they interviewed 31 participants that originated from an earlier survey phase to explore adaptive strategies of working families in the Australian construction industry context. Interestingly, 7 out of their 31 interview participants were domestic partners, extending the perspectives to include the personal lives of those who work in the industry.

The use of qualitative methods in construction management research has seen increasing sophistication over time. Sustrina and Barrett (2007) adopted rich picture diagrams co-produced between researchers and stakeholders to model case studies of construction projects. Another area that has seen much sophisticated development is the exploitation of social network analysis in construction. Pryke (2004) found social network analysis appealing because it allowed for a more accurate and dynamic exposition of how project relationships are governed.

### **The missing link of participant observations and engaged scholarship**

Without a doubt, the critique provided by Seymour and Rooke (1995) signified a turning point in the way research in construction is undertaken. They challenged the dominant positivistic research approach adopted by construction management researchers and argued that idiosyncrasies associated with understanding social relations in construction have to be accounted for; asserting “[...] the objective of practitioners, for example, quality, efficiency, productivity or profits, cannot be taken to be self-evident by the researcher. An essential purpose of research is to establish what participants in the situation under study, managers, engineers or steelfixers, mean by these terms and what values and beliefs underlie such meanings. Researcher may well share some of the understandings of some of the participants, but it is imperative that they suspend their own understandings. Only by doing so can they allow practitioners to speak for themselves (p. 522)”.

However, far too often, the voice(s) of all participants in construction across various organisational levels remain silenced in the research findings. For example, Hare’s *et al.* (2006) selection of experienced managerial practitioners to participate in their focus group discussions on health and safety in construction planning meant that the perspectives of other practitioners, e.g. less experienced workers who would actually benefit from improvements in



health and safety, might have been excluded. Similarly, Baiden's *et al.* (2006) collaboration with managers of award-winning projects might have neglected richer stories of what might really happen in practice from those who delivered those very projects at the grassroots. Sustrina and Barrett's (2007) rich picture methodology also runs the danger of researcher's imposing their own position without articulating their value system transparently. Even the sophistication of social network analysis requires some level of researcher discretion in 'quantifying' relationships that can result in a somewhat simplistic analysis (Pryke and Pearson, 2007). Furthermore, the reliance of the interviewing technique as the dominant form of qualitative research in construction runs the risk of participants offering an idealised account, thereby hiding the details that matter in reality (Alvesson, 2002). It is no wonder that researchers have little faith on depending solely on qualitative methods, and feel the need to triangulate using multiple methods to strengthen qualitative analyses with quantitative methods.

In defence of researchers, however, the need for expedience can often compel researchers to succumb to over-simplification and reductionism when reporting their research findings. Whilst researchers should in principle maintain a wider long-term view of the issues faced by the industry and not consumed by short-term, quick fixes. Yet, the pressures of meeting research funding requirements and increasing commercialisation of academic work constantly creates hurdles in attempts to adopt more interpretive research approaches that are often time consuming. Baiden *et al.* (2006), for instance, emphasised the need for adopted methodology to "[...] create typologies, find associations, and seek explanations for the emerging phenomena. It also allows the sifting, charting and sorting of data into key issues and themes and enables rapid comparison of research findings across cases investigated (p.16)." It is not surprising therefore that quick wins are often sought through quantitative analysis obtained through surveys or a 'grab-and-go' approach to analysing case study material, rather than the notion of engaged scholarship (Van de Ven, 2007) through much slower, but richer and deeper ethnographic methods.

Indeed, studies involving researchers entering the field for a long time as an ethnographic observer become increasingly rare. Examples include LeMasters (1975) seminal work exposing the personal lives of construction workers stemmed from intensely, if covertly, observing the behaviours and capturing the conversations of patrons at a working-class American tavern over a five-year period. Unlike many studies examining social phenomena in construction that invariably result in prescriptive, if speculative, recommendations for government and corporate policy-makers, it is interesting the example of LeMasters (1975) sought only to describe the state of affairs. But, in so doing, he had diligently sought to uncover aspects that would be otherwise 'hidden' if conventional quick-fix methods are perpetuated. Bruno Latour, a sociologist who specialises in the study of science and technology and a founding member of Actor-Network-Theory, warned against social scientists' endeavours to merely contribute to policy recommendations as an outcome of social science research (see Latour, 2007). Instead, Latour (2007) contended, it is far more fulfilling and honest to trace the associations that matter between subjects and objects, humans and non-humans, and describe how these associations help shape our understanding of the social. Accordingly, this "reassembling of the social" provides a more holistic picture of social relations that can be helpful in efforts to uncover the 'hidden' aspects in organisations. There is clearly more scope for doing this in construction management research.

## CONCLUDING REMARKS

The complexities of social relationships especially in multi-organisational, project-based construction imply that it is highly likely that aspects of what goes on in reality could potentially remain 'hidden' from academic researchers. Shortcomings of the traditional, positivistic and rationalistic approaches that have dominated methodological approaches in construction management research have been acknowledged. Consequently, there is wider acceptance of more qualitative methods in construction management research, and some of these techniques have matured in sophistication. Nevertheless, many of these studies remain doggedly positivist. In uncovering 'hidden' aspects in organisations, it has been argued, necessitates deeper ethnographic approaches that cut across various levels of organisational stakeholders. One such approach is participant observation.

Operationalising such an approach is far from straightforward though. First, it takes a certain degree of open-mindedness on the part of the researcher to broaden their perspectives, often to include multiple perspectives deriving from participants of all levels in organisations across the supply chain. Second, there is a need for more studies that engage participant observation process. However, even here is problematic; observations undertaken by insiders invariably invoke ethical considerations, whereas novice researchers require often lengthy periods of time to first learn the ropes of practice before immersing in the observational process (see Rooke and Kagioglou, 2007); Van de Ven, 2007). Only then will it be easier for researchers interested in deeper ethnographic approaches to identify wholly the pragmatic challenges and concerns encountered by those who work in the coal-face of practice. Still, the pressures imposed by funding agencies and the increasing commercialisation of academic work might result in the severe delimiting of uncovering 'hidden' aspects, especially by relatively inexperienced researchers in the field, e.g. a career scholar.

Indeed, the main limitation of any research project is the lack of time to undertake a truly longitudinal analysis of the issues. At some point, as pointed out by Alvesson (2002) *inter alia*, the research process has to conclude and the findings written up. So, there is a point in the process when categories have to be locked in and aspects revealed. Without a doubt, some aspects will remain 'hidden'. However, what is important is the ability for researchers to remain honest and transparent by articulating the limits of the findings. By placing findings in the public domain, it should not be the intention of interpretive research to offer prescriptive explanations of concepts under investigation. Rather, the purpose is to describe, in Latourian sense, the phenomenon at the point of reporting; and in good academic manner, there is always room for further research. The uncovering of 'hidden' aspects in organisations will forever remain an emergent, lifelong learning process.

## ACKNOWLEDGEMENTS

This paper is an earlier version of a manuscript prepared for submission to the CIB W55/W65 Joint Conference in Dubrovnik, held over the period 27 September to 1 October 2009. To cite this reference, please contact the lead author via email (paul.chan@northumbria.ac.uk).

## REFERENCES

Alvesson, M. (2002) *Postmodernism and social research*. Buckingham: Open University Press.

- Baiden, B. K., Price, A. D. F. and Dainty, A. R. J. (2006) The extent of team integration within construction projects. *International journal of project management*, **24**, 13 – 23.
- Chan, P. and Kaka, A. (2007) The impacts of workforce integration on productivity. In: Dainty, A. R. J., Green, S. and Bagilhole, B. (Eds.) *People and culture in construction: a reader*. London: Spons. pp. 240 – 257.
- Dainty, A. R. J., Bagilhole, B. M. and Neale, R. H. (2000) A grounded theory of women's career under-achievement in large UK construction companies. *Construction management and economics*, **18**, 239 – 250.
- Hare, B., Cameron, I. and Duff, R. (2006) Exploring the integration of health and safety with pre-construction planning. *Engineering, construction and architectural management*, **13**(5), 438 – 450.
- Harriss, C. (1998) Why research without theory is not research: a reply to Seymour, Crook and Rooke. *Construction management and economics*, **16**, 113 – 116.
- Latour, B. (2007) *Reassembling the social: an introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- LeMasters, E. E. (1975) *Blue-collar aristocrats : life-styles at a working-class tavern*. Madison: University of Wisconsin Press.
- Lingard, H. and Francis, V. (2008) An exploration of the adaptive strategies of working families in the Australian construction industry. *Engineering, construction and architectural management*, **15**(6), 562 – 579.
- Pryke, S. (2004) Analysing construction project coalitions: exploring the application of social network analysis. *Construction management and economics*, **22**(8), 787 – 797.
- Pryke, S. and Pearson, S. (2007) An analytical Anglo-French comparative study of construction procurement and management strategies. *RICS research paper series*, **7**(5), July. London: RICS.
- Raftery, J., McGeorge, D. and Walters, M. (1997) Breaking up methodological monopolies: a multi-paradigm approach to construction management research. *Construction management and economics*, **15**, 291 – 297.
- Rooke, J. A. and Kagioglou, M. (2007) Criteria for evaluating research: the unique adequacy requirement of methods. *Construction management and economics*, **25**(9), 979 – 987.
- Runeson, G. (1997) The role of theory in construction management research: comment. *Construction management and economics*, **15**, 299 – 302.
- Seymour, D. and Rooke, J. (1995) The culture of the industry and the culture of research. *Construction management and economics*, **13**, 511 – 523.
- Seymour, D., Crook, D. and Rooke, J. (1998) The role of theory in construction management: reply to Runeson. *Construction management and economics*, **16**, 109 – 112.
- Sutrisna, M. and Barrett, P. (2007) Applying rich picture diagrams to model case studies of construction projects. *Engineering, construction and architectural management*, **14**(2), 164 – 179.
- Van de Ven, A. (2007) *Engaged scholarship: a guide for organizational and social research*. Oxford: Oxford University Press

# INCENTIVISING PROCESS INNOVATION IN CONSTRUCTION SUPPLY CHAIN: BEYOND THE FORMAL COMMUNICATION STRUCTURE

Obuks A. Ejohwomu and Will Hughes

School of Construction Management and Engineering, University of Reading, UK  
[O.A.Ejohwomu@reading.ac.uk](mailto:O.A.Ejohwomu@reading.ac.uk); [w.p.hughes@reading.ac.uk](mailto:w.p.hughes@reading.ac.uk)

The UK construction and building services sector is under pressure to engender the culture of innovation and incentivisation as normal working practice in the delivery of 'flexible' and 'complex' infrastructures. The role of contracts in the incentivisation of performance and particularly the diffusion of innovation in construction supply chains is not well understood. The contract structure, communication network and organisation analysis frameworks are used to explore the extent to which tendering and contractual provision provide the space and freedom that encourages or hinders the emergence, communication and implementation of innovative products and practices. The main findings demonstrate the innovative role of the specialist contractor; identifies the limitations of the formal structure; and emphasizes the role of power in the incentivisation of informal communication in the effectiveness and the diffusion of process innovation.

**Keywords: communication network, contract, incentivisation, construction supply chain, power, process innovation**

## 1.0 INTRODUCTION: A HEALTHCARE DELIVERY PERSPECTIVE

The significance of UK's National Health Service (NHS) cannot be overemphasized. The NHS aims to provide healthcare for all, free at the point of need. Proposed investments within NHS estates in the UK are in excess of £70 billion (NHS 1999). The impact of frequent changes in policies and healthcare technologies on the adaptability and performance of these infrastructures cannot be overemphasized (Barlow and Koberle-Gaiser 2008). The Private Finance Initiative (PFI) which is one of the favoured procurement model of the NHS since the late 1990s has been under scrutiny. But these days the question being asked is whether the PFI procurement model has delivered on its promises<sup>1</sup>? Evidence from the literature suggests that there is a divided consensus on the potential role of PFI to enable effective diffusion of innovation (Carrillo *et al.* 2006, Dixon *et al.* 2005, Ball *et al.* 2001).

---

<sup>1</sup> Inject innovation into the healthcare sector; contractual arrangements that would ensure better facilities management; means of renewing NHS facilities faster (Barlow and Koberle-Gaiser 2008)

And there is an inherent conflict among construction and building services actors about what adaptability and innovation means to the delivery supply chain. Barlow and Koberle-Gaiser (2008) investigated the relationship between PFI and innovation in the design of healthcare infrastructure to enable future adaptability but did not recognize that lessons too can be learnt from the interplay between the formal and informal communications within PFI and non-PFI procurement models in recommending a shift towards ‘smart PFI’.

The purpose of this research is to understand the relative contractual provision within construction procurement models that incentivise innovative practices and its diffusion in construction supply chains. Contract interfaces in the construction supply chain will be explored to examine how construction clients, contractors, designers, manufacturers and suppliers are motivated to improve the performance of products and services they procure and provide. The evidence to be collected will be on incentives, innovativeness, organisational behaviour and the interrelationship between network actors within and across organizations.

## 2.0 INNOVATION, CHANGE AND INCENTIVES IN CONSTRUCTION SUPPLY CHAINS

The most straightforward definition of innovation is that innovation is technical and organizational change (Gann 2003). A more widely accepted definition – “...the actual use of a nontrivial change and improvement in a process, product, or systems that is novel to the institution developing the change” is offered by Slaughter (1998). However, the study of innovation predates the late 1960s (Gann 2003), yet the key benefits of innovation as a driver for business competitiveness, quality and productivity improvements and, ultimately, economic growth, is largely only ‘thought of’ and not ‘exploited’ by most sectors in practice. The manufacturing sector is often portrayed as a good example of the latter, where creativity and innovation are increasingly driving the boundaries of performance (Guilford 1959, Barron 1969, and Stein 1991); this compliments the argument that manufacturers invest more in research and development of ‘creativity’ than contractors and consultants (Gann 1977). Where, creativity is the generation of creative ideas while innovation is the successful implementation of creative ideas (Eaton *et al.* 2006).

To this end, the widespread perception that the construction industry performs badly compared to other industrial sectors (Winch 2003) may suggest that the construction industry is less proactive and more reactive in adopting the culture of innovation. Fragmented supply chains and the existing divide between academia and industries have been identified as inhibitors to innovation adoption in the construction sector (Dulaimi *et al.* 2002). Other commentators argue that this could be remedied through the proactive influence of clients and manufacturers (Manley 2008, Brandon and Lu 2008). In particular, Barlow (2000), without emphasising the likely influence of power shift among construction actors, reported that clients have enormous capacity to encourage innovation diffusion amid integrated working practices, which Manley and Marceau (2002) argue can be cultivated by clients' demand for 'total package' solutions.

Several reports spearheading calls for change (Banwell 1964, Higgins and Jessop 1965, Crichton 1966, Latham 1994, Egan 1998) have also drawn attention to the inherent difficulties caused by the organizational systems and contractual arrangements in which the construction process operates. In particular, Latham and Egan reports have called for cultural change in the way construction work is procured in the UK. However, most research efforts still lay emphasis on cost, time and quality rhetoric during project planning and little consideration is given to the impact of engaging the right or wrong procurement strategy. For example, it has been shown that there is a direct correlation between procurement methods and risk allocation (See Murdoch and Hughes 2007 81-99). In other words, construction and building services actors respond to the allocation of risk differently. And the apportioning of risk up and down the supply chain has a strong bearing on the diffusion of innovative ideas, products and services (Brandon and Lu 2008).

Overall, there are limited studies that draw on the lessons of other Public Private Partnership (PPP) procurement models, such as Local Improvement Finance Trust (LIFT); and what incentives are used in construction contracts for effective delivery of work packages in the supply chain. We need to understand what contractual or non-contractual incentives are used for incentivising effective delivery, and how are incentivisation and process innovation facilitated or inhibited in the construction supply chain.

The focus on the recurring question in construction contracting of "how to get people to improve their performance" is gradually shifting to that of "what kinds of incentives are in

use in the construction sector” (Hughes *et al.*, 2006 and 2008). In other words, what motivates construction participants to innovate throughout the supply chain? Notably, Hughes *et al.*, (2008) have argued that the term incentives is better investigated by contextualising its economic, relational, legal, and psychological perspectives, which may be associated with monetary and non-monetary incentives, contractual incentives and extra-contractual incentives. Although, these (including Hoag and Gunderson 2005, Hoag 2008) contributions on the economic perspective have enlivened the discussion on incentivisation in the construction sector; there is need to understand the NHS’s organisational structure which Barlow and Burn (2008) argue are potentially significant barriers for stimulating the incentivisation and diffusion of innovation. Among the range of papers reviewed about incentivisation of performance there is almost no recognition of the extended supply chains (Hughes *et al.* 2008).

### 3.0 RESEARCH STRATEGY

This is an exploratory, multi-method case study of an NHS-procured hospital. The unit of analysis is the contractual interface, of which there are hundreds in a typical case. Based on open, unstructured interviews and documentary analysis, we will attempt to map and describe all of the interfaces to provide an analysis of the organisational behaviour and structure of the different construction procurement models. We will interrogate the interview data to compare the perceptions of data subjects in relation to contract types, interfaces, supply chain management experience and meaning of innovation. Social Network Analysis (SNA) will be used to identify and analyse the “informal” relationships in the construction supply chain. In other words, the data would be analysed through a combination of template and content analysis, and graphical representation of contractual, organisational and communication structures. By delineating these processes, we will be able to detect whether there are consistent and systematic features that encourage or impede the diffusion of innovation, leading to recommendations about contract drafting policy and supply chain structures.

### 3.1 DETAILS OF RESEARCH METHOD

A combination of purposeful sampling, random sampling and opportunistic sampling were used in the selection of participants and case (NHS-procured hospital) for achieving the purpose of the research. Purposeful sampling is suitable strategy for the purpose of in-depth understanding inquiry in qualitative research (Patton 1990; Maxwell 1996). In contrast probability sampling depends on selecting a truly random and statistically representative sample for the purpose of generalization in qualitative research. Opportunistic sampling was used to follow new leads during field work. A total of 30 open, unstructured interviews were conducted. The average interview time lasted 90 minutes. Interviewees were UK wide construction actors (clients, manufacturers, suppliers, main contractors, specialist contractors and sub contractors) who operate in the healthcare, housing, roads and education sectors. The interview transcript were interrogated (not the data subject) for evidence and construction industry classification of innovation ideas, communication and diffusion of innovation, and contractual and non-contractual incentives up and down the supply chain. Nvivo 8 was used for the data coding process. Netdraw was used in the analysis and mapping of nodes. The units of analysis (contract interface and organisational behaviour) is clearly identified and defined in the context of their interaction with the social networks, organisational structures and contract structures. The approach to analysis mirrored that of theory building. Stage 1 of collating and analysis resulted in 118 preliminary codes. A detailed secondary coding was conducted within these codes to identify 6 higher levels themes that were multi-layered (see Appendix 1). The analysis of interview transcript was then checked and recorded with these higher level themes. During the coding of interviews minor changes were made to clarify and expand the definition of themes. Reliability and validity were achieved through the maintenance of a clear distinction between the data and the analysis, the communication trail and analytic induction process of theory building (Creswell 1998).



## 4.0 CASE STUDY ANALYSIS

### 4.1. EXPERIMENT: EXPLORATORY STUDY

The interviewees which include clients, manufacturers, main contractors, specialist contractors, sub contractors and suppliers have an average work package that range between £10s of thousands and 100s of millions. Framework agreement, competitive tendering and partnering were their main method of selection. The methods of contracting deployed encompassed management contracting, design and build, general contracting, novated design and build, package deals and relational contracting. Price based on work, price based on value, services paid at point of delivery, shadow tools and unitary charges were amongst the host of pricing mechanisms detected. Key Performance Indicators (KPI) were a commonplace in the data analysis. KPI is also used to determine who the strategic members of the supply chain where. In other words, there where cases when clients were subjected to KPI measures. Interviewees were at the top end of the organisational structure (directors, project managers, supply chain managers, procurement directors...). The interesting thing here was that interviewees were able to draw on first hand experience of completed and ongoing projects.

### 4.2. CONTROL EXPERIMENT

This is a short case study of a PFI-procured hospital. No informal background interviews of domain experts were required. Interviewee encompassed senior representatives from the Department of Health, design project manager, the general manager, construction project manager and architect. We are required to maintain confidentiality over the location of this hospital. The research included semi-structured interviews and analysis of background documentary materials. Together with the exploratory study data collection exercise spanned a 12 month period in the second quarter of 2007 and half of 2008. The attribute of this hospital is best described as urban site with flexible and specialist ward layouts developed for the innovative service delivery model of 'graduated care'. The hospital's selection is depended on an example of an adoptable and innovative PFI scheme. All interviewees were assured of confidentiality to elicit as much unrestricted information as possible. A major constrain of this retrospective case study was that key actors and stakeholders who where part of the construction supply chain were inaccessible.

## 5.0 FINDINGS AND ANALYSIS

The findings have been grouped into 5 sub-sections, addressing the above research aim and questions.

### 5.1. WHAT INNOVATIVE PROCUREMENT MEANS TO PRACTITIONERS?

Innovative procurement in the context of this research is either innovative approaches to procurement or procurement approaches to encourage innovation. There are different types of innovation. Most commentators have focus on various aspects of technological innovation. The trend is now shifting towards exploring other forms of innovation, such as, process innovation (Pisano 1996); technical innovations (Henderson and Clark 1990, Utterback 1994); service innovation (Gallonj and Weinstein 1996); management innovation (Birkinshaw *et al* 2008); strategic innovation (Hamel 1998, Markides 1997). In other words, the different actors in the construction procurement process ascribes relatively skewed meanings to the concept of innovative procurement. And this is not helpful in understanding incentivisation of innovative practices up and down the construction supply chains. Particularly in the context of relationships between organisational structures, contract structure and informal networks. Following the data analysis, client's perception of what innovation mean was best captured as something which works "*...we did obviously give a lot of input and a lot of steer to what we thought worked well for us now and we therefore, led them to examples of what we thought worked well to show them that and say, "Well, this works well for us, you know, can you replicate that? IN2 Line :98 Col 17"*". Notably, clients saw themselves as drivers of innovation but their wielding power is diluted down the supply chain regardless of the client's willingness to engage "*...Obviously, when we moved onto construction, there were, sort of – we were perhaps more further removed, although some of the work on, say, interior design and decoration was taking place at that stage, but in the period, say, from about 2002 to 2004 when the building actually started, quite a lot... IN2 Line :94 Col 60"*".

Building flexibility in the context of space management and improvements relating to the patient experience was captured as examples of service innovation "*We don't invest in any research and development of new materials and forms of construction. If a client comes to us, and they want us to research something for them, and they'll pay us a fee for doing that,*

*we might do that, but we'd go to the supply chain, you know, to see what's around, but.. IN8 Line :721 Col 0.” “This is what needs doing here” but we have probably less control than most other elements in the chain of... IN4 Line :261 Col 63”*

The more technical innovation was captured by manufacturers and specialist contractors. The remainder of the actors couldn't separate innovation from the cost, time and quality rhetoric of the construction industry. In other words, except innovation is quantified it not an invention.

## 5.2. INCENTIVISATION

Evidence of direct incentives for people who do the work is rare in practice. There were no standard incentives in the various procurement models for incentivising innovative practices. However, there were traces of intuitive organisational practices and behaviours which could encourage innovative practices. These were captured in the form of:

**Repeat businesses** “..We try and get as much discount off them as we possibly can, to secure them the job. It's a bit difficult. I mean, the incentive is the prolonged relationship that if they continue to provide us with a fair price and a good product, and deliver it on time, then they can be – rest assured that they will be given another opportunity on the next contract... IN11 Line :127 Col 9”;

**Open book contracting agreements** “..We then selected, we selected a mechanical and electrical partner to work with on the job, and they looked at the design and came up with some suggestions to save some money. So they might have come up with an alternative ventilation system to what the consultant specified, and that generated a saving of, say, £20,000. Now, the arrangement we had with our client, was that we shared savings, 50%/50%. So, if we went to the client, and said, “Look, we can change the ventilation system, Mr Client, there's a £20,000 saving.” And they say, “That's fine, that meets our performance criteria, we have – we'll take that saving now.” The client – our client retained £10,000 of that. We retained £10,000 of that, but then we shared our £10,000 with the subcontractor. So they got £5,000 of that, so there's an incentive for them to actually suggest

savings 'cause they obviously get some money out of it as well. So everybody – it's a, sort of, win/win situation really. **IN8 Line :272 Col 0**";

**Continuity of demand** "...It's really further work. I mean, that's the – the biggest incentive for our supply chain is if they perform well, they get more work from us. If they don't perform well, they won't get more work from us, so that's the biggest incentive and, you know, sort of, motivation, in some ways. On some jobs, where we're working on an open book basis with our clients, and we might have a shared savings situation with our clients, we pass that down through the supply chain. So sometimes we will have, sort of, a shared saving arrangement with subcontractors. Again, tends to be the bigger subcontractors, if they generate a design idea that saves some money, the client will get a share of it, we'd get a share of it, and the subcontractor would get a share of it as well. So that's another form of incentivisation that we. **IN8 Line :212 Col 0**"; and **League table contracting** "...Right, this is where we do quite well. What we do is we actually run, from here, a national database, where every person within XXXXXXXX, taps into this database to select their subcontractors for a particular contract. To incentivise certain of our subcontractors, we actually rank them in three levels... **IN6 Line :38 Col 61**".

### 5.3. CONTRACTUAL INTERFACE

It was easy spotting where each interviewee were on the construction supply chain. However, identifying points in the supply chain that incentivised innovative practices posed a huge challenge in the data analysis. In other words, there where no clear evidence of interfaces in the supply chain to ensure innovation is diffused down the chain "...So those are our preferred suppliers. We are planning to have no more than 1,000 preferred suppliers, sounds a lot, but if you've got nine main regional offices, and we've got Strategic Projects, and then we've got infrastructure that has, like, three parts to it, so that's less than 100 per region covering all trades, and there's at least 250 separate recognised trades within the building industry. So, it's only one or two in each trade for each region. ...we have what we call out Strategic Suppliers, these are the guys that we will take on a one to one basis, so if we're tendering a job we will select one of our – and it's got a large element, for instance, if we're building a road, one of the biggest elements will be the tarmacadam servicing, so we will take on, in partnership, a servicing contractor. We win it, they win it, and so as a result

*we are going to have no more than 100 strategic suppliers. So, the idea being that we go out, we actually interview all our preferred and strategic suppliers, so they can understand what our business plans are. They can get – we can understand how they operate, what additional services we can then generate. We don't guarantee them any work, but the way the database is set up it's always ranked in strategic suppliers, preferred, then registered and then in performance order, 'cause we've got a big – our performance monitoring system, so the higher – the better they're performance, the higher up the rank... IN6 Line :71 Col 4".*

Information diffusion is a commonplace *"If it's on a single stage competitive tender, they will send us an enquiry that we'll price. Maybe six months down the line, they've secured the job, and then they'll start talking to us. If it's a design and build job, and it's very early on in its development stage, you know, we might get asked a few quick fire questions, budget figures for this, that and the other, but more often than not, we don't get involved properly until two or three months before our work is actually meant to start. IN11 Line :183 Col 0".*

Interaction within the construction supply chain rarely goes beyond the first tier *"...Only if our supply chain clients get themselves involved in a framework agreement, if you know what I mean? We won't go out and pursue a framework agreement. We are on XXXXXXXX's supply chain, so, if you like, that's a form of framework agreement that we are going to do the projects that they secure in that particular geographical area. We are pursuing supply chains with other major suppliers at this moment in time, so, if you like, it's our form of framework agreement, but we don't get involved directly with a developer*

*that wants a framework agreement... IN11 Line :183 Col 0"* Well, as far as our supply chain agreements with – going up the ladder are concerned, in reality, we only really have a proper formal supply chain relationship with XXXXXX (1<sup>st</sup> tier), and I would say, generally speaking, that works pretty well. *IN11 Line :520 Col 69".*

#### 5.4. CONTRACTS

The role of contracts in the incentivisation of innovative practices is rare. No evidence of such a role was detected up and down the construction supply chain *"I think it's a bit naïve of – I've said it before in past, you know, "I'm not bothered about the contract." You know, it, sort of, sits in the drawer, but it is part of the relationship, and it's naïve to think that it's not part of it, it's because otherwise, when things do go wrong, and people look at the contract, if the contract isn't really fair, or isn't really how you'd want there to – it to be settled in terms of the relationship, you actually damage the long-term relationship by not thinking about it.*

*So you're better off, actually, addressing it upfront, understanding what you're agreeing to and, kind of, any awkward issues are best dealt with right at the beginning, aren't they? IN7*

***Line :59 Col 81***

*So we tend to use the – or the clients we work for tend to use the more standard forms of contract, the JCT suite of documents and such like, where there is a clear contract, a main and subcontract down the line. And that's the basis on which we, obviously, try to, as I say, pass down. So everybody should be clear in terms of how we go about it, if there is a dispute, what the mechanisms are for that. Hopefully, as I say, we're not in that position when we get to that, but if they are, it's all down there in writing, and not everybody's then quickly rushing through, and trying to think, "Oh, well did we agree? What did we say we're going to do?" Because of the short term, the long term effect is that that could affect the relationship, whereas if you're clear and precise in what you are going to do, and what their obligations are, and what you're going to do, if there's a problem, this is where we go to, then, you know, although, as much as you can, you're trying to take away the personal bit and just it's an issue, it's a problem? Well, we've got mechanisms to deal with it. We put it through there. The outcome will be the outcome, and then we move on, if you know what I mean, and try to learn from that maybe, even..... IN7 Line :87 Col 0".*

This is contrary to argument amongst commentators that tendering and contractual provision may be used to encourage innovative practices. However, there was evidence to suggest that current tendering and contractual provision are open to negative exploitation as the main contractor is able to wield the diluted power of the client.. *"And quite a lot of people, if they have to make a decision, will weaken and allow the contractor to put forward an alternative and that's where the thing falls apart because sadly, the main contractor isn't doing that for the good of your health, he is not, sadly, trying to give you – they say in Japan he is, he will try and give you something better than he tendered, but sadly, he's still here, whatever we say about Egan and everything else, he's still likely to put forward an alternative because it's going to make him money, and if he's going to give you something back, which is unlikely, he'll be giving you back 10% of what he's actually making IN4 Line :310 Col 8".*

## 5.5. THE FORMAL AND INFORMAL COMMUNICATION STRUCTURE

The informal communication was captured using SNA. SNA is particularly good for investigating issues as diverse as contractual relationships to capture a finite set or sets of actors and the relation or relations between them (Wasserman and Faust 1994). Each node depicts an actor in the construction supply chain. Nodes usually comprise of individuals or firms. In Figure 1 the relation (social ties) between nodes is expressed in one or more of the

following business transaction, lending or borrowing, information and knowledge share. Each of these nodes have a pattern of network communication relative to the construction supply chain that is somewhat disconnected from the client and the funding structure. A two way relation between actors is indicated by a double head arrow. The specialist contractor is seen to exhibit a unique pattern of network communication. A pattern that is innovative. The manufacturer's node is inactive. An inactive pattern inhibits innovative tendencies. Figure 2 captures the informal communication network without the redundant node. Figure 3 which is a transpose of Figure 2 depicts a rigid formal contractual structure.

## 6.0 CONCLUSION

Process and technological innovations are associated with operational roles and activities. The need to capture what this means in the language of construction industry actors cannot be overemphasized. Particularly when the role of contract in the incentivisation of innovative practices in construction supply chain is not well understood. Drawing on an exploratory, multi-method case study of an NHS-procured hospital. There is sufficient evidence to contend that client's perception of what innovation means – innovation as a replication and not as an invention - is skewed. The client's power to drive innovative practices down the supply chain is diluted. Interestingly, the specialist contractor is seen to be exhibiting innovative practices that should be incentivised at all phases of any procurement model. In other words, management and strategic thinking are heavily linked to control roles and activities. Actors are able to wield power in order to influence information flow within and across boundaries. Consequently, the link between its effectiveness and the diffusion of process innovation can be sustained by incentivising the institutionalization of informal communication networks. This includes a loosely coupled organisation, a client that is able to distinguish between replication and invention, a client that wields power past the first tier of the construction supply chain, a contract structure that integrates the pursuit of a common goal and a client that is prepared to understand the organisational structure and imbibe the innovative practices of the specialist contractor.

## REFERENCES

- Ball, R., Heafey, M. and King, D. (2001) Private Finance Initiative – A Good Deal for the Public Purse or a drain on Future Generation? *Policy and Politics*, 29, 95-108
- Banwell, H (1964) *The Placing and Management of Contracts for Building and Civil Engineering Work*. London: HMSO.
- Barlow, J. (2000) Innovation and Learning in Complex Offshore Construction Projects, *Research Policy*, 29, 973-989.
- Barlow, J. and Koberle-Gaiser, M. (2007) Projects Form as a Vehicle for Delivering Innovative, Adaptable Healthcare Facilities: Examples from the UK's PFI Hospital Programme. *IRNOP VIII Conference, Projects in Innovation, Innovation in Projects*.
- Barlow, J., and Burn, J. (2008) All Changes Please *Policy Exchange*.
- Barras, R (1989) Interactive Innovation in Financial and Business Services. The Vanguard of the Service Revolution, *Research Policy* 19, 215-237.
- Barras, R (1986) Towards a Theory of Innovation in Services, *Research Policy*, 15, 161- 173
- Barron, F. (1969) *Creative Person and Creative Process*. Holt, Rinehart and Winston
- Brandon, P. S., and Lu, S.-L. (2008). *Clients driving innovation*. Chichester, West Sussex, Wiley-Blackwell.
- Carrillo, P.M., Robinson, H. S., Anumba, C. J. and Bouchlaghem, N.S. (2006) A knowledge Transfer Framework: the PFI Context *Construction Management and Economics*, 24, 1045-1056.
- Clough, P. and Nutbrown, C. (2002) *A student's Guide to Methodology*. London: Sage.
- Crichton, C. (1966) *Interdependence and uncertainty – a study of the building industry*, London: Tavistock Publications.
- Dulaimi, M.F., Ling, F.Y.Y., Ofori, G. and De Silva, N. Enhancing Integration and Innovation in Construction. *Building Research and Information* 30 (4), 237-47



- Eaton, D., Akbiyikli, R. and Dickinson, M. (2006) An Evaluation of the Stimulants and Impediments to Innovation with PFI/PPP Projects, *Construction Innovation*, 6, 63-77
- Egan, J (1998) *Rethinking Construction: the report of the Construction Task Force to the Deputy Prime Minister, John Prescott, on the scope for improving the quality and Efficiency of UK construction*, London: Department of the Environment, Transport And the Regions Construction Task Force.
- Eisenhardt, K. M. (1989) Agency Theory: An Assessment and Review. *Academy of Management Review*. 14(1), 57-74
- Gann, D (1997) “*Technology and Industry Performance in Construction – Draft SPRU Paper*”, OECD Directorate for Science, Technology and Industry, University of Sussex, Brighton
- Gann, D.M. and Salter, A. (2000). Innovation in Project-based, Service-enhanced firms: The Construction of Complex Products and Systems. *Research Policy* 29 (7-8), 955-72
- Gann, D.M. (2003) Guest Editorial: Innovation in the Built Environment. *Construction Management and Economics*, 21, 553-555
- Gibson, E. J. (1982) Working with Performance Approach in Building. CIB Report Publication 64. Rotterdam, Netherlands. CIB (International Council for Research and Innovation in Building and Construction).
- Guilford, J.P. (1959). *Traits of Creativity*. In Anderson, H.H., Editor, Creativity and its Cultivation. Harpar.
- Higgins, G and Jessop, N (1965) *Communications in the building industry: the report of a pilot study*, London: Tavistock Publications.
- Hoag, D and Gunderson, N (2005) Contract Incentives and Design-Build: Rethinking Acquisition Strategies, Design-Build Institute of America (DBIA)
- Hoag, D (2008) Contract Incentives and the Pentagon Renovation Programme, Tenth Annual Lean Construction Congress, Boulder, CO

- Hughes, W., Hillebrandt, P., Greenwood, D and Kwawu, W (2006) *Procurement in the Construction Industry: The Impact and Cost of Alternative Market and Supply Processes*, London: Taylor and Francis.
- Hughes, W., Yohannes, I. and Hillig, J (2008). Incentives in Construction Contracts: Should We Pay For Performance? Conference: Knowledge and Information Management Through Life, held at the University of Reading.
- Latham, M (1994) *Constructing the team: final report of the government/industry review of procurement and contractual arrangements in the UK construction industry*, London: HMSO.
- Manley, K (2008) Implementation of Innovation by Manufacturers Subcontracting to Construction Projects. *Engineering, Construction, Architectural and Management*, 15 (3), 230-245
- Manley, K and Marceau, J (2002) Integrated Manufacturing-services Business in the Australian Building and Construction Sector” *Australian Journal of Construction Economics and Building*, 2 (1), 1-12
- Matteson, T and Ivancevich, J.M (1999) (Ed) *Management and Organizational Behaviour Classics*, 7 the ed. Irwin/McGraw Hill
- Richmond-Coggan, D (2001) *Construction Contract Incentive Contracting Schemes: Lessons from Experience (C554)*, London: Construction Industry Research and Information Association.
- Slaughter, S.E. (1998), Model of Construction Innovation. *Journal of Construction Innovation Engineering and Management*, 124, 226-31.
- Stein, M.I. (1991). Creativity in People. *Leadership in Organizational Development Journal* 12, 4-10
- Winch, G. (2003) 'How Innovative is Construction? Comparing Aggregated Data on Construction Innovation and Other Sectors - a Case of Apples and Pears', *Construction Management and Economics* , Vol.21, 6, 651-654.

## Appendix 1

- 1 INNOVATION
  - 1 Definition – actors' perception of what innovation is
    - a. Value engineering
      - i. Examples of innovation
  - 2 Client's role in driving innovation
    - a. Encouraging new ideas
      - i. Open book contracting agreements
      - ii. Performance
      - iii. Repeat business
      - iv. Framework agreements
    - b. Resistance to innovation
      - i. Client's as an inhibitor
        1. Contractual liability
      - ii. Cost and targets as inhibitors
      - iii. Funding requirement as inhibitor
      - iv. Quantifiable impacts as inhibitor
      - v. PFI as an inhibitor
      - vi. Risk as an inhibitor
  - 3 Incentivisation of Innovation (encouraging innovative practices)
    - a. Monetary
      - i. Payment
        1. Standard rates
    - b. Non-monetary
      - i. Penalty schemes
      - ii. Achieving Zero defects
    - c. Tendering
      - i. Two stage tendering
    - d. Continuity of demand
    - e. Prompt payments
  - 4 Innovative practices
    - a. Package Closeout Report (PCR)
    - b. Supply chain management
  - 5 Risks associated with innovation
    - a. Diffused through contractual liability
  - 6 Innovation diffusion

Appendix 1 – Contd...

4 ORGANISATIONAL BEHAVIOUR

13 Power

a. Decision

i. Policy decision

ii. Tactical decision

iii. Strategy decision

14 Leadership

15 Motivation

16 Structure of the organisation

5 CONSTRUCTION SUPPLY CHAINS (responsibility for management)

1 1<sup>ST</sup> Tier Customer (client)

a. Satisfaction

2 Focal Organisation (architects, service engineers, structural engineers, QS, design engineer)

3 1<sup>ST</sup> Tier Supplier

4 2<sup>ND</sup> Tier Supplier

5 3<sup>RD</sup> Tier Supplier

6 Last Customer (end user)

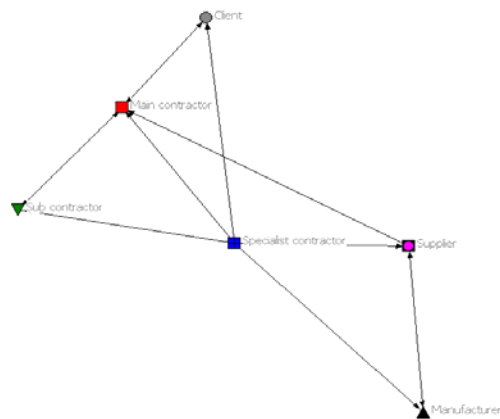


Figure 1: Informal communication networks

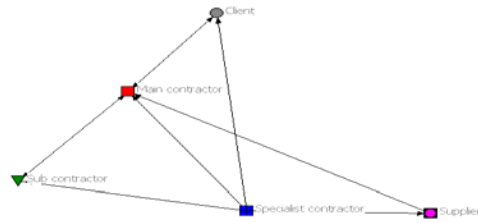


Figure 2: Informal communication networks: without redundancy

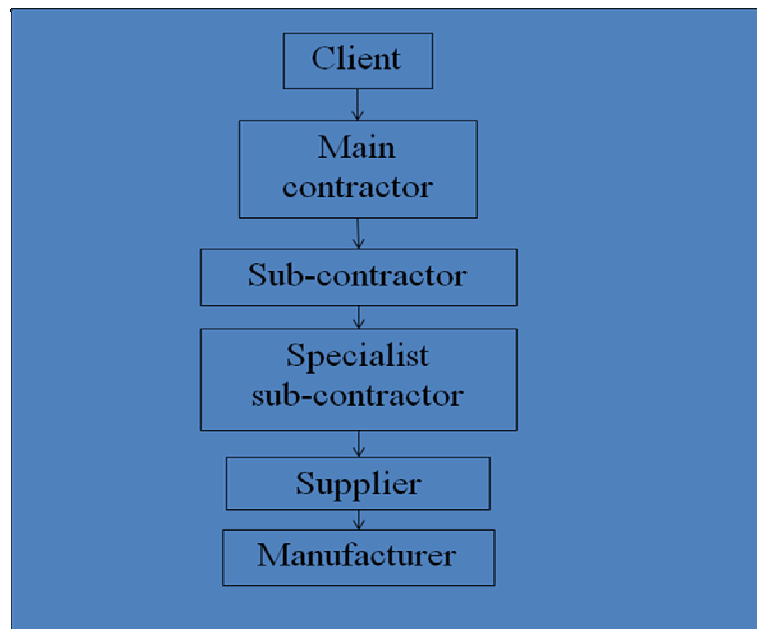


Figure 3: A transpose of the informal communication networks

# CHOOSING TO USE GLASERIAN GROUNDED THEORY RESEARCH METHODOLOGY: AN INFORMED DECISION

**Wendy Guthrie**

*Department of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire, LE 11 3TU, UK.*

[w.guthrie@lboro.ac.uk](mailto:w.guthrie@lboro.ac.uk)

Many researchers, academic and commercial, state that they have used Grounded Theory research methodology in their work. However, real world experience of both contexts leads the author to conclude that those who use the methodology from a well informed, applied perspective to deliver accomplished (insightful and technically sophisticated) grounded theory are, too often, in the minority. Since the origination of Grounded Theory a number of variants have become identifiable, leading to debates over authenticity and questions as to what should or should not legitimately use the GT title, and muddying the methodological waters along the way. This fact complicates things for those seeking to make appropriate decisions about how best to proceed with GT. Consequently it is now necessary to detail which 'brand' one is employing at the outset of any study. In general, there appears to be an over-reliance on the Strauss and Corbin version of GT. The author considers Glaserian GT to offer, as yet largely untapped, potential for researchers working in the construction management domain because of its emphasis on discovering latent patterns within the data, which reflect issues relevant to those in the field of study and which are not driven by pre-existing assumptions. This paper seeks to touch upon some of the reasons underpinning this assertion.\*\*

**Key words:** Grounded theory, Glaserian grounded theory, theory development, construction management

## **Introduction to Glaserian Grounded Theory**

In the academic world the feigned use of GT is as a cover-all for those who seek to legitimize research work through association, not scholarship. The Glaserian option is not an easy route

to mastery of qualitative data, it should be emphasized. Suddaby (2006) draws attention to a number of problematic issues he repeatedly encounters when reviewing GT manuscripts for the Academy of Management Journal. His observations that Grounded Theory is used by some as ‘rhetorical sleight of hand’ to avoid the ‘illumination of their methods’, and that ‘many authors hold some serious misconceptions about grounded theory’ resonate with the author’s experience. A methodology which is complex in itself, widely misunderstood, and frequently misused presents attendant challenges for those unfamiliar with the terrain. Under such circumstances it is worthwhile pinpointing common misapprehensions and clarifying some key elements of the research approach.

Notwithstanding the hauteur of the journal from which, and for which, Suddaby pens his counsel to aspiring GT authors, he should not be immune from legitimate criticism with respect to his own ‘misconceptions’ with respect to GT. For example his assertion that a ‘clear research question’ is a sine qua non for the conduct of ‘reasonable research’ reflects a misinterpretation of views expressed by Glaserian (sometimes also referred to as ‘classic’), Grounded Theory. Whilst it is true to say that, depending upon the circumstances, a researcher may approach the field of enquiry with pre-existing grounded theory in order to discover the degree of grounded ‘fit’ with respect to a different context and in this way to demonstrate the power and potential for transferability of conceptual theoretical understanding across contexts (cf. Lowe and Glaser, 1995); generally the advice is to remain as vague as is possible about what one is going to study in order to minimize preconception, at the outset.

Suddaby displays a fundamental flaw in his own understanding of Glaserian GT with respect to the aforementioned assertion. By apparently equating a lack of a specific research question to ‘Totally unstructured research’ he proceeds to then ‘logically’ correlate this with the production of ‘totally unstructured manuscripts’, which of course would not pass editorial muster with ‘any credible journal of social science’; seasoned GT campaigners are left with no other conclusion than these ‘misconceptions’ about the methodology are even more pervasive, and potentially insidious, than anticipated.

One of the key benefits of the methodology is without doubt the way in which the guiding procedures enable researchers to discover latent patterns from the messiness of raw data; and, critically, to do so without first formulating or assuming any particular research question to

be relevant. In doing Glaserian GT researchers are counseled to ‘suspend’ knowing in the service of discovering what the data reveal. Obviously is not always possible to avoid complying with institutional requirements for prescriptive ‘research questions’ in light of entrenched views about what doctoral research ‘should look like’ for example (see Lowe and Guthrie, forthcoming, for strategies to address this conflict in practice).

In other words the Glaserian GT process is driven by what emerges from the analysis of data, its ongoing conceptualization, employing the constant comparative method and memoing directing theoretical sampling (see Christiansen (2006a) for a comprehensive, yet concise summary of what is involved). Intimate interplay between data collection and analysis ensures the whole process is shaped by the emerging theory and as such displays supreme economy in terms of control of data collection. Debate regarding to what extent any researcher is capable of ‘suspending’ knowing in practice usually becomes rather circular; suffice to say that there are many who miss-read what is being recommended. ‘Suspension’ is a very different thing to ‘elimination’. However, Gummesson (1991, pp50-72) makes some useful commentary on the subject of pre-understanding. As far as this is concerned, a researcher who is new to a research context is advantaged by dint of their natural ‘naivety’ and therefore receptiveness to all possibilities about what may be discovered from the field. They are not steeped in ‘received’ theoretical wisdom from the substantive area; nor do they have to attempt to repeatedly off-load that specific baggage to prior to and during the research process.

Returning to the issue of ‘ill-structured writing’ raised by Suddaby (2006) earlier, and incidentally, possibly exemplified here; ill-structured writing exists; but to attribute such a quality issue *carte blanche*, to those who genuinely venture to discover theory from data untrammled by existing pre-conceptions, is unwise and clearly inaccurate in this instance. There are evidently many factors which could, with equal or possibly greater likelihood, influence outputs in terms of lack of structural finesse other than the absence of a definitive research question. Given the usual commentary about GT on account of its allegedly overly prescriptive procedures this particular censure seems all the more ironic.

In spite of the aforementioned criticism, Suddaby (*ibid*) does focus attention on a number of very worthwhile issues and associated pitfalls researchers should be aware of prior to selecting GT research methodology. Important among these is the caution to be mindful in



ensuring there is congruence between the aims of the research and the subsequent research design, as of course should be the case with the selection of any research methodology. Equally congruence between researcher and methodology is alluded to. That researchers must be able to deal with ambiguity is a familiar notion for more seasoned exponents of Glaserian GT. Indeed this fact may mean that Glaserian GT is not the best option for those who require 'control' over the research process, opening up the important question of 'methodological choice' in the doctoral process. Clearly given the complexity of going good GT those contemplating its use should accompany a high degree of commitment to the apprenticeship process on the part of the researcher because the experience is usually challenging in the extreme. The rewards are there, but they must be hard earned.

It could be said that GT, in common with other approaches to dealing with the challenges of qualitative analysis, has suffered from superficial readings and consequential assumed simplicity. In parallel with other students setting out on the qualitative odyssey, the GT neophyte may find themselves in hostile waters, swimming against a tide driven by the dominance and power of pre-established positivistic logic, and indeed other skeptics from many and varied camps. Antaki et al. (2003) point to a similar scenario whilst critiquing inadequate practice within the discourse analysis domain whereby students may have to contend with far from ideal conditions enduring isolating experiences of apprenticeships in inhospitable environments, 'in institutional settings characterized by incomprehension of, or even direct hostility to' such approaches. In light of the work of Betts and Lansley (1993) and the more recent insight into the extent of methodological pluralism together with telling snapshot revealing the relative paucity of publication of qualitative research (and those which involve theory development in particular) within the construction management context (Dainty, 2008), one can imagine the challenges ahead for new-to-GT researchers in the construction management setting. If viewed from a slightly different perspective, theory development would seem to be an activity ripe for exploitation, within the construction management domain, for skilled Glaserian GT practitioners and those beginning their apprenticeships alike. However, that said, it may be opportune to offer up the following caveat to those venturing into qualitative realms from quantitative origins: do not mistakenly believe that 'qual' analysis of this type is a comparative easy option, furthermore do not be tempted to think that it is an excuse for sloppy practice. There is more, much more, to doing good analysis than one might imagine at the outset of any research endeavour.

The fact that some of the early seminal texts which articulate the essence of the methodology (cf Glaser and Strauss, 1967; Glaser, 1978) are challenging to decipher for normal mortals adds to the complexity surrounding doing GT. This paper does not intend either to explore the schisms which exist, or to rehearse familiar debates regarding the very mixed interpretations of what it means to do Grounded Theory. Instead it is hoped to highlight some important issues which researchers in general and those working in the construction management context might find useful to consider when contemplating using Grounded Theory to better equip them as to whether or not to take the plunge. The author bases this working paper on reflecting upon her personal apprenticeship in, and experience of, using Glaserian GT over the course of numerous studies since 1991. This experience spans varied career levels (undergraduate, post-grad, doctoral researcher, academic and commercial consultant) and relates to diverse research contexts (such as exploring vaccine development for parasitic disease, client/professional interactions, child sexual abuse and latterly construction management).

As Christiansen (2006b) eloquently articulates, Grounded Theory is a methodology amongst many others, no better no worse, simply one among many. The first apparently simplistic point to appreciate is designed to clarify when it would be sensible to utilize and, when to select otherwise.

Where the researcher wishes to conduct exploratory research, perhaps where little is understood within a substantive area, then Glaserian GT would be an option to consider. The methodology is intended as a general approach for the discovery of theory from data. It is important to note that the usual dichotomies which revolve around ‘quant and qual’ can largely be ignored, because although the methodology is mostly used with qualitative data this need not be the case and data is simply viewed as ‘more data’ with the attendant biases inherent, to greater or lesser degrees.

### **Potential utility in the construction management context**

Given recent and less current debates about the need for theoretical understanding within the construction management context (Koskela and Vrijhoef, 2001), then a methodology whose purpose is to generate theory from data would appear to be worthy of serious consideration. However, even the issue about the nature and desirability of theory is not clear-cut within the construction management domain. Furthermore, turning the clock back to a previous

ARCOM doctoral seminar and its focus upon theory development in construction project management, there are evidently divergent perspectives on the issue of theory development in the context and indeed some differences over language and meaning. The work of Swarnadhipathi and Boyd (2008) seems of particular relevance to the current debate and their concern about producing theory that is relevant to practice. They state that the contractors in their study ‘do not theorise about the interdependent process between the construction industry, the construction company and the projects undertaken by that company’. This observation may serve to illustrate a number of useful points; one such is to highlight the important difference between Glaserian GT and other Qualitative-Data-Analysis methods, namely that what is generated is a conceptual level theory, abstracted from the people and places where the data were generated (Glaser, 2002). Understanding this point is critical to the process of choosing to do Glaserian GT from an appropriately informed perspective. Glaser (ibid) is unequivocal on the fundamental requirement for researchers to be able to conceptualize because, *“researchers who cannot conceptualize reach out for, and even need, the theory of participants, however particularistic and low level it may be. They forget that the participants are the data, NOT the theorists. The participants, while having great involvement in resolving their main concern, seldom have a conceptual perception of it as a GT theorist does.”*

In contrast many alternative approaches to analysis concentrate upon detailed description of the contexts in which the action occurs. Diversity of approach is important in the wider research landscape and the intention is not to elevate one amongst many. The aim is simply to lend clarity to the understanding of Glaserian GT and the aforementioned difference is critical to that process. Glaserian GT then offers a key to unlocking the conceptual understanding of practitioners; the theory originates from practice and thus relevance is guaranteed, as is its utility to varied audiences (practitioners amongst them).

Emergent grounded theories reflect the analytical training and interpretative aptitude of the researcher. Appropriate support during the process of learning how to use the methodology in practice is, under such conditions, an important factor in the quality of the output. The process of doing GT is experiential. It subsumes ‘academic’ (or other) agendas to those of concern to the participants in the field of study and has the tendency to challenge orthodox thinking in varied contexts. If one understands the research methodology it is entirely feasible to migrate across contexts and to uncover valuable substantive theoretical

understanding be that in construction management or in child protection for example, and in so doing enhance one's own 'theoretical sensitivity'. This fact means that Glaserian GT researchers might be unwelcome in some settings because academic careers are often built upon local expertise; such experts may not be open to infiltration of outsiders into 'their' territory.

## **Conclusion**

Given the fact that human interaction and concomitant dynamics are so influential within the construction management context, the author suggests that Glaserian GT research methodology is currently under represented, even within the relatively few contributions to theoretical advance within the field. If used properly this research methodology could deliver valuable substantive theories capable of providing handles on undeniable complexity. Furthermore, it offers the potential to significantly contribute to the development of more formal theory of wider relevance to management researchers per se, with likely applicability to audiences far and wide thus enhancing the credibility of the discipline of construction management itself.

*\*\*This paper is in the very early stages of formulation and should be read in that context. There are many additional points which the author intends to expand upon and others that due lack of time are necessarily currently omitted.*

## **References**

- Antaki, C. Billig, M., Edwards, D. and Potter, J. (2003) Discourse Analysis Means Doing Analysis: A Critique of Six Analytic Shortcomings. *Discourse Analysis Online*, 1:1[<http://www.shu.ac.uk/dao1/previous/v1/n1/index.htm>]
- Betts, M. and Lansley, P. (1993) Construction management and economics: A review of the first ten years, *Construction Management and Economics*, 11: 4, 221-245
- Christiansen, O. (2006a) Opportunizing: A classic grounded theory study on business and management. *Grounded Theory Review: An International Journal*, 6.1:109-133

Christiansen, O. (2006b) *“Opportunizing”*: *Shifting the paradigm of Business Management. A Glaserian Grounded Theory (GT) Approach*

Dainty, A.R.J. (2008) Methodological Pluralism in Construction Management Research. In *Advanced Research Methods for the Built Environment* (A Knight and L Ruddock Eds.), Oxford: Blackwell Publishing, pp1-12. ISBN: 978-1-4051-6110-7.

Fernie, S., Leiringer, R. and Thorpe, T. (2006) Rethinking change in construction: a critical perspective. *Building Research and Information*. 34:2, 91-103.

Glaser, B.G. (1978) *Advances in the Methodology of Grounded Theory: Theoretical Sensitivity*. Mill Valley, CA: Sociology Press

Glaser, B.G. (2002) Conceptualization: On Theory and Theorizing Using Grounded Theory. *International Journal of Qualitative Methods* 1:2 Article 3 [accessed 20.08.08, <http://www.ualberta.ca/~ijqm/>]

Glaser, B.G. and Strauss A. L. (1967) *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine

Gummesson, E. (1991) *Qualitative Methods in Management Research*. Newbury Park, CA: Sage Publications

Koskela, L. and Vrijhoef, R. (2001) Is the current theory of construction a hindrance to innovation? *Building Research & Information*, 29(3), 197–207

Lowe A. and Glaser, B.G. (1995) The potential of “grounded theory” for the development of relationship marketing theory. In (Glaser B.G. Ed.) *Grounded Theory: 1984-1994, Volume Two*. Mill Valley, CA: Sociology Press

Strauss, A.L. and Corbin, J. (1990) *Basics of Qualitative Research*. London: Sage Publications

Suddaby, R. (2006) From the editors: what grounded theory is not. *Academy of Management Journal*, 49:4:633-642

Swarnadhipathi, K. and Boyd, D. (2008) An Investigation into the use of the EFQM framework to establish contractor business performance, ARCOM Doctoral Workshop, University of Wolverhampton

# **SUBCONTRACTING VS HEALTH AND SAFETY: AN INVERSE RELATIONSHIP**

**PATRICK A. MANU<sup>2</sup>, NII A. ANKRAH, DAVID PROVERBS AND SUBASHINI SURESH**

*School of Engineering and the Built Environment, University of Wolverhampton, Wolverhampton, WV11SB, UK*

The construction industry has an unenviable reputation of being one of the worst industries in the UK in respect of health and safety (H&S) performance. Among other factors, research points to subcontracting as one of the factors influencing safety performance on construction sites. With about 80% of construction works in the UK being subcontracted, clearly it has become imperative to investigate this inverse subcontracting-H&S relationship. This situation is exacerbated by the increasing complexity of construction technologies which inevitably implies growth in specialisation, hence an increase in subcontracting. A critique of literature on H&S and subcontracting shows that this phenomenon is attributable *inter alia* to the lack of resources by small subcontractors to enable them invest in H&S, ambiguities about H&S responsibilities arising from complex subcontracting relationships, and the fierce level of competition for contracts among subcontractors resulting in economic survival being prioritised over H&S. Putting these factors in context, the main arguments giving justification for the need for further research into this phenomenon are indicated. The critical research questions, research aim and objectives are also highlighted, thus setting the premise for research work to expound on these factors and offer suggestions for mitigating this inverse relationship.

Keywords: construction industry, health and safety, subcontracting

## **INTRODUCTION**

Research literature indicates that subcontracting grew significantly over the 1970s and 1980s and continues to be practised in several industries (LFS, 2004; Mayhew and Quinlan, 2001). It is evident that, in spite of the numerous economic benefits, subcontracting has adverse industrial relations effects on wages, working conditions, bargaining and unions (Chiang, 2009). In highlighting the diminution of employment conditions arising from this practice,

---

<sup>2</sup> Patrick.Manu@wlv.ac.uk

researchers have identified a parallel link to occupational health and safety and the construction industry has not been left unscathed (Chiang, 2009; HSE, 2008; Ankrah, 2007).

This study begins by exploring the literature on subcontracting within and outside of the UK construction industry, the aim being to explore its evolution, the rationale for its practice and its association with adverse occupational health and safety outcomes. It then goes further to highlight from the literature the causes of the inverse subcontracting-H&S relationship within the UK construction industry and through a critique, points out the scope that still exists for further research by putting forth the critical research questions, research aim and objectives.

## **SUBCONTRACTING**

Over the last three decades labour markets of several countries including the United Kingdom have undergone significant changes. Notably, the traditional model of long term employment relationship between an employer and employee has been supplemented by a variety of forms such as self employment, casual/temporary, part-time and contract/subcontract employment (LFS, 2004; Mayhew and Quinlan, 2001; ILO, 1997).

According to Mayhew and Quinlan (1997a), neat and exclusive definitions about subcontracting are not possible because it entails a range of closely related forms of work organisations including self-employment, outsourcing, body-hire, independent contracting, and agency labour. The boundary between these employment categories is blurred and shifting terrain rather than a precise dividing line and the legal status of some workers is ambiguous and may even shift from one category to another and then back at different times (Vandenheuval and Wooden, 1995).

Also literature suggests that the terms contract services, contracting out and outsourcing are all inextricably linked and are in some cases used interchangeably ((Ascher, 1997; Blank *et al.*, 1995) cited in (HSL, 1999)). According to Ascher (1997) as cited by the HSL(1999), generally these terms are taken to describe the practice or situation where an organisation (public or private) enters into a formal agreement with another for the provision of a particular good or service, with the contractor then being considered as the supplier in the procurement process. Under these circumstances, contracting out takes one of two forms: contracting out for internal purposes (for example, window cleaning, data processing for the immediate client); contracting out for external purposes, where for example, the services of a contractor are required to undertake a public project (e.g. road building) (Ascher, 1997).

Mayhew and Quinlan (1997a) defined subcontracting as the process of subletting the performance of tasks which often affects the employment status of the workers doing the tasks as well as the manner in which those tasks are performed, the structure of control at the workplace and the patterns of regulation.

### **Growth in Subcontracting**

The growth in 'non-standard' or 'atypical' forms of work such as subcontracting was driven by a mixture of economic priorities, technological and regulatory shifts, and increased product market uncertainty which led to management requirements for a more flexible and inexpensive workforce (Hunter *et al.*, 1993; Goffee and Scase, 1985). This finding was



corroborated by Bielenski *et al.*(1999; 1993) who undertook a comprehensive assessment of new forms of work across eight European counties and found the same drivers of ‘atypical’ forms of work. More recently, research work by Chiang (2009) also highlights similar drivers of subcontracting. In the UK, the growth in self employment as shown in Figure 1 gives an indication of the growth in subcontracting even as the self-employed category embraces subcontractors (LFS, 2004).



Figure 1. Growth in self-employment in the UK

Source: Labour Force Survey (LFS) (2004)

In examining the rationales for the use of subcontracting, literature indicates that the main influencing factors are:

- the ability to fine-tune labour flexibility;
- the ability to rapidly meet changing product market demands;
- the ability to externalise less rewarding and dangerous activities;
- the ability to bargain down labour cost;
- to encourage quicker completion of tasks;
- the transference of financial risk; and
- the avoidance of workers’ compensation cost

((Chiang, 2009), (Wong and So, 2002), (Mayhew and Quinlan, 1997a), (Benson and Leronimo, 1996) cited in (HSL, 1999))

As can be noted, the above rationales are all market influences. The market, however, by itself is not a significant environmental level influence for stimulating positive construction H&S outcomes as indicated by the HSE (2007). Therefore, so long as subcontracting practice continues to be motivated by market influences such as the ability to externalise less rewarding and dangerous activities, subcontracting may continue to be a vehicle for adverse H&S outcomes unless such market drivers are well controlled/managed.

### **Subcontracting and Occupational Health and Safety (OHS)**

In spite of the economic benefits derived from subcontracting, the practice has negative consequences including weakening of bargaining power, non-payment of workers, the under-development of human resource skills within an organisation, overdependence on a large number of suppliers, and the difficulties and costs associated with co-ordinating a large number of subcontractors (Chiang, 2009; Mayhew and Quinlan, 1997a).

Markedly, subcontracting also has adverse effects on occupational health and safety (HSE, 2008; 2006a; 2003). Subcontracting is typically a payment-by-results system where payment is based on the amount of work completed rather than the period of time spent on the worksite. Thus returns are enhanced by the completion of tasks in the shortest possible time, leading to subcontractors pushing themselves hard, working excessive hours, or cutting corners in regard to safety where it impedes production (Mayhew and Quinlan, 1997a). Pressures to complete a job quickly may be increased where intense competition amongst subcontractors drives down the price of services performed. Work intensification results as the subcontractor's profit must be derived from working harder and longer resulting in OHS outcomes such as fatigue, stress, burn-out and failure or delays in seeking treatment for work-related injuries (Mayhew and Quinlan, 1997a).

In retrospect, evidence indicates that there was a high incidence of injuries and fatalities among subcontractors/self-employed. In Australia, a study of work-related fatalities by Harrison *et al.* (1989) found that three groups of occupations, namely mining and quarrying; transport and communications; and farming, fishing, hunting and lumbering had an incidence of fatalities far in excess of other occupations. Although the study did not distinguish employed and self-employed workers it was noted that, with the exception of mining and quarrying, the occupations were marked by a high level of self-employment. In another study by Harrison *et al.* (1993) carried in the road transport industry, it was found that there was an especially high incidence of fatality amongst drivers of semi trailers on long distance runs - an area where self-employment and subcontracting was particularly significant. These findings which link subcontracting with adverse OHS outcomes were subsequently corroborated by findings of Toscon and Windau (1994) and USBLS (1995), both in the USA, Blank *et al.* (1995) in Sweden, Mayhew and Quinlan (1997a; 2001) in Australia and Wong and So (2002) in Hong Kong. More recently research findings such as that reported by Chiang (2009) continue to link subcontracting to adverse OHS outcomes.

In the UK a similar situation exists. As illustrated in Table 1 from the Health and Safety Statistic 2007/08 (HSE, 2008) the rate of fatal injury to workers in the self-employed has, from 2000/01 to 2007/08, been approximately twice that of employee workers. This suggests that workers in the self-employed (a category embracing subcontractors) have a fatality rate of approximately twice that of employee workers. Evidently, this trend pervades the UK construction industry (HSE, 2006a, 2003; HSL, 1999).

Year	Employees		Self-employed		Workers	
	Number	Rate (a)	Number	Rate (b)	Number	Rate (c)
2000/01	213	0.9	79	2.4	292	1.0
2001/02	206	0.8	45	1.3	251	0.9
2002/03	183	0.7	44	1.3	227	0.8
2003/04	168	0.7	68	1.8	236	0.8
2004/05	172	0.7	51	1.3	223	0.8
2005/06	164	0.6	53	1.4	217	0.7
2006/07	191	0.7	56	1.4	247	0.8
2007/08p	179	0.7	50	1.2	229	0.8

(a) per 100 000 employees      (b) per 100 000 self-employed      (c) per 100 000 workers

Table 1. Number and rate of fatal injuries to workers

Source: *Health and Safety Statistics 2007/08* (HSE, 2008)

## SUBCONTRACTING IN THE CONSTRUCTION INDUSTRY

Subcontracting is an integral part of the construction industry. In construction, it usually is the subletting of the execution of a section(s) of an entire project(s) to a contractor(s) who in most cases is a specialist in those works to be executed. This generally takes the form of domestic subcontracting which is done by a principal/main contractor appointing a subcontractor(s), or nominated subcontracting which is done by the project client/clients' representatives appointing a subcontractor(s). In construction project procurement, subcontracting is also seen in management contracting (Harris *et al.*, 2006; Kwakye, 1997).

In the UK construction industry, evidence of growth in self-employment gives indication of the prevalence of subcontracting in the industry. This situation is marked to increase as construction technologies become more specialized and the organizations which carry out those technologies also specialize into subcontracting organizations. Construction employment trends in Great Britain (shown in Figure 2) (ONS, 2008) indicates a progressive increase in self-employment from 1998 to 2007. SMEs are as a result of self-employment and according to the Construction Statistic Annual:2008 Edition (ONS, 2008), SMEs constitute over 90% of construction companies, and majority of them obtain work as subcontractors, therefore forming an important group in the supply chain in the UK construction sector (Kheni *et al.*, 2005). Also, earlier research has indicated that 80% of construction work undertaken by UK main contractors is subcontracted ((Saad and Jones, 1998) cited in Thorpe *et al.*(2003) and Kheni *et al.* (2005))

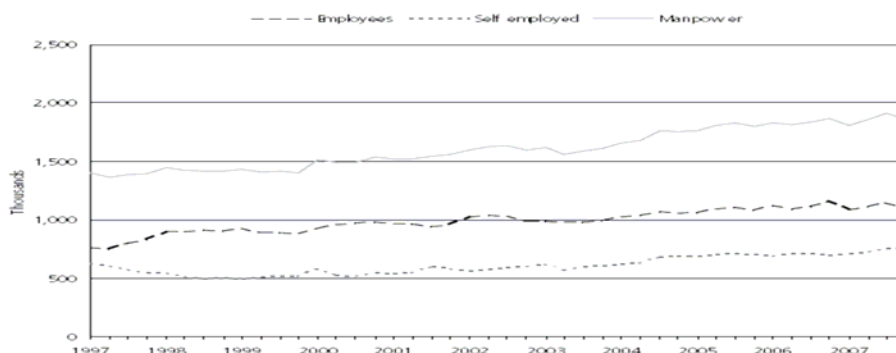


Figure 2. Trends in employment in the construction industry of Great Britain

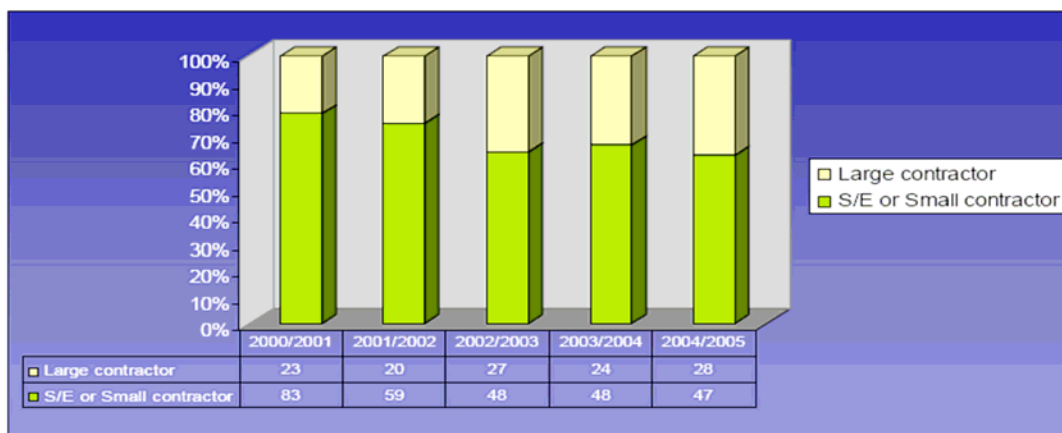
Source: Construction Statistic Annual: 2008 Edition (ONS, 2008)

### Subcontracting and Health and Safety in the Construction Industry

As previously mentioned, the construction industry has equally been plagued by the inverse subcontracting-H&S relationship. Subcontracting results in the proliferation of small production/employing units (SMEs) and as reported by McVitties *et al.*(1997) in the Canadian Construction industry, SMEs have a higher frequency of injury than large firms. This is corroborated by findings of Fabiano *et al* (2004) who studied the relationship between occupational injuries and firm size in the Italian industry. The findings of Fabiano *et*

al (2004) were also in agreement with the findings of Jannadi and Al-Sudairi (1998) who measured safety performance in the Saudi Arabian construction industry. They concluded that safety performance is best in larger construction firms. They also found that, the level of safety on a construction site was dependent on the project size: large projects, constructed by large international firms, have much better safety records than smaller ones (Jannadi and Assaf, 1998).

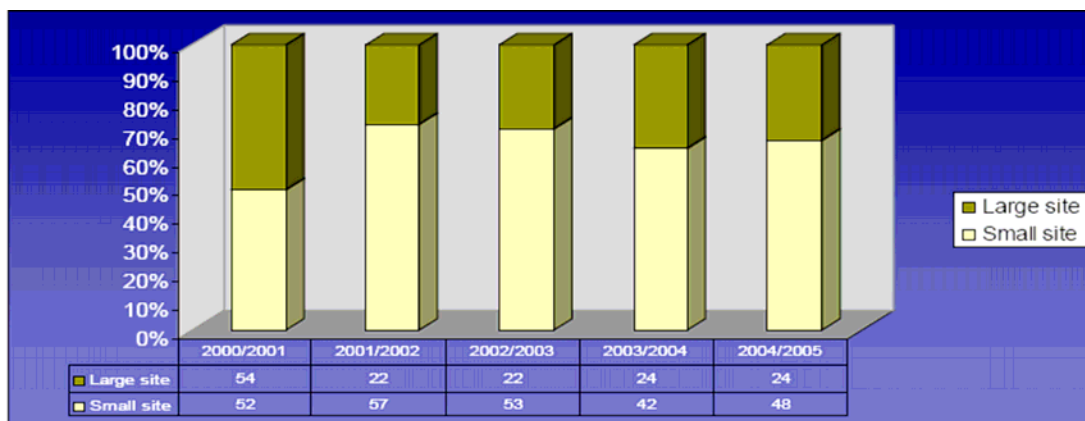
Statistics in the UK construction industry indicates a similar trend. Fatal accidents by employer size and site size (illustrated in Figure 3 and Figure 4) from 2000/01 to 2004/05 indicate that there are more fatalities among SME contractors and small sites-which are also dominated by SME contractors (HSE, 2006a).



For the purposes of these tables, a large contractor is defined as one with more than 15 workers.

Figure 3. Fatal accidents by Employer Size

Source: Construction Intelligence Report (HSE, 2006a)



For the purposes of these tables, a large site is defined as one with more than 15 workers.

Figure 4. Fatal accidents by Site Size

Source: Construction Intelligence Report (HSE, 2006a)

Research works by Mayhew and Quinlan (1997b) in the UK and Australian construction industries, HSL (1999), HSE (2003) and Ankrah *et al.* (2007) also acknowledge the adverse H&S outcomes due to subcontracting in the UK construction industry.

### **Causes of the inverse Subcontracting-H&S Relationship**

In order to redress the inverse subcontracting-H&S relationship, it is critical to understand the causative factors. In examining the causes/reasons for the inverse subcontracting-H&S relationship in the UK construction sector, literature indicates the following enumerated factors:

1. Subcontracting results in the proliferation of smaller production/employing units which lack the resources to invest in Occupational Health and Safety hence resulting in adverse H&S outcomes on projects where they are engaged (HSL, 1999; Mayhew and Quinlan, 1997b). This is corroborated by Fibiano *et al.* (2004), Champoux *et al.* (2003) and McVitties *et al.* (1997) in their studies of firm size and occupational health and safety outcomes. Research by Chiang (2009) also highlights this factor.
2. Fierce competition for contracts among subcontractors resulting in unreasonable cost minimisation in order to win contracts at the expense of due consideration to H&S (HSE, 2003; HSL, 1999; Mayhew and Quinlan, 1997b). Fabiano *et al.* (2004) in their study also mentioned that small firms often make the saving on safety measures one factor of competition and survival on the market.
3. Ambiguity about responsibilities and unclear work relationships arising from complex subcontracting relationships on site (HSE, 2003; HSL, 1999; Mayhew and Quinlan, 1997b).
4. Inadequate communication and teamwork and the intense competition among contractors arising from fragmentation of the workforce on site (HSE, 2003; HSL, 1999; Mayhew and Quinlan, 1997b).
5. Inadequate regulatory control: for instance the underperformance of the CDM 1994. (HSE, 2007; HSL, 1999; Mayhew and Quinlan, 1997b).
6. Less familiarity of subcontract personnel with the inherent safety issues of all site activities ((Hill and Ainsworth, 2001), (Maurno, 1992) cited in (HSL, 1999)). This situation is exacerbated by the transient nature of construction projects and even more so by the brief periods spent by subcontractors on site within those transient project durations.
7. Differences in safety cultures between main contractors and subcontractors (Ankrah, 2007; HSE, 2003). The HSE (2003) highlights that subcontractors have a poor safety culture thus accounting for poor safety performance on projects where they are engaged.

The factors listed above and the sources from which they have been extracted clearly demonstrate that the inverse subcontracting-H&S relationship has been the subject of much

research. More importantly, they provide an opportunity to critically evaluate the measures that have been developed to address this relationship so as to establish their effectiveness in responding to these underlying causative factors.

### **Mitigating the adverse H&S outcomes of Subcontracting**

As has been indicated by the HSE (2007), regulatory influence is the most significant environmental level influence on construction health and safety. Generally since the beginning of the 20<sup>th</sup> century, regulations have been put in place to control activities and address specific problems on construction sites (HSL, 1999). The construction regulations of 1961 and 1966 which followed from earlier regulatory provisions were intended to be used primarily to control activities rather than to provide guidance on management of health and safety (HSL, 1999). The Construction (Design and Management) Regulations 1994 (CDM 1994), which was introduced against the background of high incidence rate during the 1980's (the period around which subcontracting also grew significantly) rather sought to provide a framework for the management of health and safety activities, through the team work approach by creating specific roles for clients, planning supervisors, designers, principal contractors, employees and the self employed, all with the common aim of achieving adequate levels of health and safety during construction (HSE, 1996). The CDM 1994 however underperformed in terms of competence assessment, fostering team work, and clarification of duties ( HSE, 2007; HSE, 2006b; Wright, 2003); all of which are issues pertinent to subcontracting and have H&S implications. A critical consideration of the above mentioned causative factors clearly reveals a link between the factors and the areas of underperformance of the CDM 1994. In 2007, the underperformance of the CDM 1994 finally yielded the CDM 2007 which seeks to address the shortfalls of the CDM 1994 so as to achieve improved levels of Health and Safety in Construction.

Also, as a complement to the regulatory framework, the HSL (1999) in a study of the impact of procurement and contracting on health and safety in the construction industry and other industries, developed a generic model for the management of contractors. The model highlights the following points as necessary in the management function:

- the need for the health and safety policies of both the host employer and contractor together with the work method statement to form the basis for a site specific framework for management;
- effective co-ordination and communication;
- the need for the assurance of competence;
- training and induction particularly in the case of unfamiliarity with the site or process and also where the contractor is being used for the first time by the employer;
- delineation of responsibility and empowerment of individuals; and
- continuous audits and reviews of measures.

### **Implications for Further Research**

It is startling to note that in spite of all the regulations and the development of a H&S management model to support effective H&S management, the reports of this inverse relationship have persisted over the years (see for instance HSE (2006b; 2003) and Ankrah *et*

al. (2007)) . Anecdotal evidence, recent statistics and research reports continue to link subcontracting to adverse H&S outcomes. Although recent statistics (Table 2) show improvement in construction H&S, safety experts have also been quick to point out that the improvement could be linked to the recession which has resulted in a downturn in construction activity (Hoyle, 2009). Notwithstanding this disputable improvement, it is significant to note that fatal injury figures (Table 2) for self-employed (a category embracing subcontractors and also dominated by small and medium size construction firms) for 2007/08 and 2008/09 have remained almost the same. It should even be noted that the 2008/09 figure covers up to the 3<sup>rd</sup> Quarter and therefore may eventually exceed that of 2007/2008.

	2006/07 (1/04/2006 to 31/03/2007)	2007/08p (1/04/2007 to 31/03/2008)	2008/09p (1/04/2008 to 31/12/2008)
Employees	54	54	29
Self employed	25	18	17
<b>Workers*</b>	<b>79</b>	<b>72</b>	<b>46</b>
Members of the public	7	3	2
<b>Total fatalities</b>	<b>86</b>	<b>75</b>	<b>48</b>

p = provisional

\* The term 'workers' includes employees and the self-employed combined.

Table 2. Number of Fatal Injuries in the Construction Industry

Source: <http://www.hse.gov.uk/statistics/fatalinjuries.htm>

Although these do not necessarily point to a failure of the H&S management model and the CDM 2007 which also embodies the requirements of the model, justifiably, questions regarding the level of awareness of such models and the CDM 2007 together with its requirements (particularly at the SME level), the extent of use/implementation of the model and the CDM 2007 in industry, and their actual/practical effectiveness in redressing this inverse relationship could be raised.

Given that the regulatory framework is the most significant environmental level influence on construction health and safety (HSE, 2007) it is particularly imperative to dwell on the CDM 2007 in raising these questions. A fundamental research question arising from the above context which this research will seek to answer is the question of the extent to which the CDM 2007 provisions translate practically on projects to address this inverse relationship, particularly projects where complex subcontracting relationships exist and projects where the supply chain is constituted in the main by SMEs. The aim of the study is thus to investigate the effectiveness of the CDM 2007 in addressing the underlying causes of the inverse subcontracting-H&S relationship on construction projects and offer suggestions for improved H&S outcomes. To achieve this, the research will pursue the following objectives:

- undertake a detailed review of H&S literature to reveal the evolution of the CDM Regulations, particularly highlighting the limitations of the CDM 1994 in addressing the inverse subcontracting-H&S relationship and the improvements/changes reflected in the CDM 2007 to address the inverse relationship ;
- examine the extent to which the provisions in the CDM 2007 respond to/ mitigate the causative factors of the inverse relationship;

- undertake a critical evaluation of the on-site/practical effectiveness of the CDM2007 provisions in addressing the causative factors of the inverse relationship ; and
- offer suggestions for achieving improved H&S outcomes of subcontracting on projects.

Indeed other causative factors may emerge through this investigation which may facilitate a better understanding of this phenomenon and what would constitute an effective response to it. Clearly, such an investigation carried out through an applied industrial research, as suggested by Gilbertson (2008) in his assessment of the CDM 2007, will be very helpful in that, even as the CDM 2007 is still in its early periods of implementation, the research will before long aid in identifying possible limitations of the CDM 2007 in addressing the H&S problems associated with subcontracting.

## CONCLUSIONS

The consensus of research findings and statistics, identified through the review of subcontracting and H&S indicates that subcontracting results in adverse H&S outcomes: a situation which also prevails in the UK construction industry with severe ramifications.

Beyond highlighting the existence of this relationship in the UK construction industry, the causes/reasons for the relationship have been put forth by researchers and efforts also made to address it. However, unfortunately, the tide has generally remained unturned as this relationship continues to linger in the UK construction industry.

It will blatantly be a great disservice to the UK construction industry if it is assumed that the CDM 2007 is definitely up to its task and therefore ignore the urgency and need to conduct industrial research to assess the extent to which the CDM 2007 addresses this relationship, as on paper and practically on projects.

The emerging research questions from the critique are clear indications of the knowledge gaps which form substantial justification for the need for further industrial research to fill the gaps thereby addressing this inverse relationship. Such research will help significantly in the quest to improve H&S performance in the UK construction industry and even beyond.

## REFERENCES

- ANKRAH, N. A. (2007) An investigation into the impact of culture on construction project performance. *PhD Thesis, School of Engineering and the Built Environment.*, University of Wolverhampton, Wolverhampton.
- ANKRAH, N. A., PROVERBS, D. & DEBRAH, Y. (2007) Improving satisfaction with construction projects outcomes: the role of culture. *Construction Management and Economics 25th Anniversary Conference.* Reading, UK, Construction Management and Economics
- ASCHER, K. (1997) *The Politics of privatisation: Contracting out public services*, London, Macmillan Press.
- BENSON, J. & LERONIMO, N. (1996) Outsourcing decisions: Evidence from Australia-based enterprises. *International Labour Review*, 135, 59-73.



- BIELENSKI, H. (1999) New patterns of employment in Europe. IN FERRIE, J., MARMOT, M., GRIFFITHS, J. & ZIGLIO, E. (Eds.) *Labour Market Changes and Job Insecurity: A challenge for Social Welfare and Health Promotion*. Denmark, WHO.
- BIELENSKI, H., ALALUF, M., ATKINSON, J., BELLINI, R., CASTILLO, J., DONATI, P., GRAVERSEN, G., HUYGEN, F. & WICKHAM, J. (1993) *New forms of Work and Activity: Survey of Experience at Establishment Level in Eight European Countries*, Dublin, European Foundation for the Improvement of Living and Working Conditions.
- BLANK, V., ANDERSON, R., LINDEN, A. & NILSSON, B. (1995) Hidden accident rates and patterns in the Swedish mining industry due to the involvement of contract workers. *Safety Science*, 21, 23-35.
- CHAMPOUX, D. & BRUN, J.-P. (2003) Occupational Health and Safety Management in small size enterprises: an overview of the situation and avenues for intervention and research. *Safety Science*, 41, 301-318.
- CHIANG, Y. (2009) Subcontracting and its ramifications: A survey of the building industry in Hong Kong. *International Journal of Project Management*, 27, 80-88.
- FABIANO, B., CURRO, F. & PASTORINO, R. (2004) A study of the relationship between occupational injuries and firm size and type in the Italian industry. *Safety Science*, 42, 587-600.
- GILBERTSON, A. (2008) CDM 2007 – after the first year. Construction Industry Research and Information Association (CIRIA).
- GOFFEE, R. & SCASE, R. (1985) Some functions of 'quasi-organic' management systems. *Journal of Management Studies*, 22, 63-68.
- HARRIS, F., MCCAFFER & EDUM-FOTWE, F. (2006) *Modern construction management* Oxford, Blackwell.
- HARRISON, J. E., FROMMER, M. S. & MANDRYK, J. A. (1993) Work-related road fatalities in Australia. *Accident analysis and Prevention*, 25, 443-451.
- HARRISON, J. E., FROMMER, M. S., RUCK, E. A. & BLYTH, F. M. (1989) Deaths as a result of work-related injury in Australia. *Medical journal of Australia*, 150, 118-125.
- HILL, C. & AINSWORTH, A. (2001) Health and safety: Academic research and practical applications. IN AKINTOYE, A. (Ed.) *17th Annual ARCOM Conference*. University of Salford, Association of Researchers in Construction Management.
- HOYLE, R. (2009) Are we safer than we were a year ago? *Construction News* ([www.cnplus.co.uk/hot-topics/safety/blog-are-we-safer-than-we-were-a-year-ago/?/5200251.article](http://www.cnplus.co.uk/hot-topics/safety/blog-are-we-safer-than-we-were-a-year-ago/?/5200251.article)).
- HSE (1996) *CDM Regulations: How the Regulations Affect You*, Suffolk, HSE.
- HSE (2003) Causal factors in construction accidents. *Research Report 156*. HSE.
- HSE (2006a) Construction intelligence report. HSE.

- HSE (2006b) Position paper on the revision of the Construction (Design and Management) Regulations (CDM) 1994 and the Construction (Health, Safety and Welfare) (CHSW) Regulations 1996. *Paper Number: M1/2006/1*. HSE.
- HSE (2007) Improving the effectiveness of the Construction (Design and Management) Regulations 1994. *Research Report :538*. HSE.
- HSE (2008) Health and Safety Statistics 2007/08. HSE.
- HSL (1999) The impact of procurement and contracting practices on health and safety - A review of literature. *Report: RAS/99/02*. HSL.
- HUNTER, L., MCGREGOR, A. & SPROULL, A. (1993) The flexible firm: strategy and segmentation. *British Journal of Industrial Relations*, 31, 383-407.
- ILO (1997) Report of the Committee on Contract Labour. *International Labour Conference, Eighty-fifth Session*. Geneva, ILO.
- JANNADI, M. O. & ASSAF, S. (1998) Safety assessment in the built environment of Saudi Arabia. *Safety Science*, 29, 15-24.
- KHENI, N. A., DAINTY, A. R. J. & GIBB, A. G. F. (2005) Health and safety management practices of small subcontractors. IN KHOSROSHASHI, F. (Ed.) *21st Annual ARCOM Conference*. SOAS, University of London, Association of Researchers in Construction Management.
- KWAKYE, A. A. (1997) *Construction Project Administration in Practice*, Harlow Longman (co-published with) the Chartered Institute of Building.
- LFS (2004) Number of people self-employed; United Kingdom; 1985 to 2003. Office for National Statistics.
- MAURNO, D. (1992) Working with Contractors. *Record*, 69, 3-10.
- MAYHEW, C. & QUINLAN, M. (1997a) The effects of subcontracting/outsourcing on occupational health and safety: Survey evidence from four Australian industries. *Safety Science*, 25, 163-178.
- MAYHEW, C. & QUINLAN, M. (1997b) Subcontracting and occupational health and safety in the residential building industry. *Industrial Relations Journal*, 28, 192-205.
- MAYHEW, C. & QUINLAN, M. (2001) Effects of changing patterns of employment on reporting occupational injuries and making worker' compensation claims. *Safety Science*, 5.
- MCVITTIE, D., BANIKIN, H. & BROCKLEBANK, W. (1997) The effect of firm size on injury frequency in construction. *Safety Science*, 27, 19-23.
- ONS (2008) Construction Statistic Annual: 2008 Edition. ONS.
- SAAD, M. & JONES, M. (1998) Unlocking specialist potential. *Reading Construction Forum*.

- THORPE, A., DAINTY, A. R. J. & HATFIELD, H. (2003) The reality of being preferred: Specialist subcontractor perspectives on restricted tender list membership. *Journal of construction procurement*, 9, 47-55.
- TOSCON, G. & WINDAU, J. (1994) The changing character of fatal injuries. *Monthly Labour Review*, 17, 17-27.
- USBLS (1995) National Census for Fatal Occupational Injuries. Department of Labour, Washington.
- VANDENHEUVAL, A. & WOODEN, M. (1995) Self employed contractors in Australia: How many and who are they? *Journal of Industrial Relations*, 37, 263-280.
- WONG, F. & SO, L. (2002) Restriction of the Multi-Layers Subcontracting Practice in Hong Kong - Is it an Effective Tool to Improve Safety Performance of the Construction Industry? *3rd International Conference of CIB Working Commission 099 - Implementation of Safety and Health on Construction Sites: One Country - Two Systems*. Hong Kong, CIB.
- WRIGHT, S. (2003) Proposed Revision of the Construction (Design and Management) Regulations 1994 and the Construction (Health, Safety and Welfare) Regulations 1996. *Paper Number: HSC/03/93*. Health and Safety Commission.

# **Research Methodology in Doctoral Research: Understanding the Meaning of Conducting Qualitative Research**

**Dr Monty Sutrisna**

Director of PGR Training and Outreach  
Research Institute for the Built and Human Environment,  
University of Salford, Salford, M5 4WT,  
United Kingdom

*Email: [M.Sutrisna@salford.ac.uk](mailto:M.Sutrisna@salford.ac.uk)*

## **Abstract:**

Qualitative research has been considered capable of studying complex situation, yielding rich findings and particularly suitable when involving human subject. This has contributed to its raise in popularity in the built environmental research. Influenced by ‘success stories’ in applying qualitative methods, many doctoral students and researchers in the built environment have been self-convinced to apply qualitative methods in their research and quickly declaring themselves as qualitative researchers. However, it turns out that conducting qualitative research may not be easy after all. There are inherent potential difficulties that may be encountered by researchers in applying qualitative research. In light of this, the working paper aims to shed a light on the matter by discussing relevant issues, namely the nature of doctoral research, research methodology including the research philosophies, the reasoning of research and research on the data level. The final part of the discussion revisits the issues of credibility of research findings. The discussion presented in this working paper is expected to inspire doctoral students and researchers adapting (or intending to adapt) qualitative methods in their research to ensure robust understanding of these relevant aspects and can benefit from the discussions presented here in conducting their research.

## **Keywords:**

Qualitative methods, research methodology, research philosophy, research reasoning

## **INTRODUCTION**

Over the years, researchers in the built environment have witnessed the popularity increase of qualitative research and their application including in doctoral research. Originating from social sciences, qualitative research is understandably a preferable choice in conducting research involving human subjects. Qualitative methods have been considered capable of studying complex situation and yielding rich findings whilst acknowledging the researchers’ influence in ‘shaping’ the research findings (Sutrisna and Barrett, 2007). Influenced by various ‘success stories’ in applying qualitative methods, many doctoral students and researchers in the built environment have been self-convinced to apply qualitative methods in their research and quickly declaring themselves as qualitative researchers.

However, conducting qualitative research may not be easy after all. Denzin and Lincoln, (2008) warned that a complex, interconnected family of terms, concepts, and assumptions surround the term ‘qualitative research’. Miles (1979) even termed qualitative data/research as an ‘attractive nuisance’. The ‘nuisance’ refers to the legal doctrine that if you leave an attractive object, such as an unlocked car, where children can play with it, you may be liable for any injuries they sustain. This analogy was not intended to show any kind of disrespect towards novice researchers and doctoral students, but should be perceived as a friendly advice on the potential difficulties that may be encountered by less experienced researchers in conducting their investigations.

In light of the ongoing discussion, this working paper aims to discuss about the issues from the very beginning in the context of doctoral research, i.e. what does it mean to conduct qualitative research, where does it come from, what is required to conduct qualitative research properly and what does choosing qualitative research entail. The paper starts by discussing the nature of conducting doctoral research, followed by research methodology including the research philosophies, the reasoning of research and research on the data level. The final part of the discussion revisits the issues of credibility of research findings. The discussion presented in this working paper is expected to inspire doctoral students and researchers intending to adapt qualitative methods in their research, particularly in the built environment.

## **CONDUCTING DOCTORAL RESEARCH**

This section intends to discuss the nature of conducting doctoral research. The first question any doctoral student should ask him/herself in the beginning of their ‘journey’ should be the meaning of the doctoral (title) to him/her and what needs to be done to achieve it. Typical answers include popular phrases such as ‘original contribution to knowledge’, ‘significant achievement in the discipline’, ‘satisfying all requirements and successfully defending thesis in a viva’, and so on. In the UK, the Quality Assurance Agency in Higher Education (QAA) is the governing body in determining the requirement for different degrees in the UK higher education sector. Figure 1 presents the generic description of QAA’s latest official grade descriptors of doctoral degree.

### **Descriptor for a higher education qualification at level 8: Doctoral degree**

The descriptor provided for this level of the FHEQ is for any doctoral degree which should meet the descriptor in full. This qualification descriptor can also be used as a reference point for other level 8 qualifications.

#### **Doctoral degrees are awarded to students who have demonstrated:**

- the creation and interpretation of new knowledge, through original research or other advanced scholarship, of a quality to satisfy peer review, extend the forefront of the discipline, and merit publication

- a systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of an academic discipline or area of professional practice
- the general ability to conceptualise, design and implement a project for the generation of new knowledge, applications or understanding at the forefront of the discipline, and to adjust the project design in the light of unforeseen problems
- a detailed understanding of applicable techniques for research and advanced academic enquiry.

**Typically, holders of the qualification will be able to:**

- make informed judgements on complex issues in specialist fields, often in the absence of complete data, and be able to communicate their ideas and conclusions clearly and effectively to specialist and non-specialist audiences
- continue to undertake pure and/or applied research and development at an advanced level, contributing substantially to the development of new techniques, ideas or approaches.

**And holders will have:**

- the qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex and unpredictable situations, in professional or equivalent environments.

Figure 1. Doctoral Degree Descriptor (Source: QAA, 2008)

Furthermore, scholars such as Grix (2001) advocated that undertaking a doctoral research (PhD) should be seen as a learning process, an apprenticeship in the art of research in which candidates will learn to reflect on the origins of theories and concepts, how to theorise, how to ‘mesh’ theory with practice, and how to organise vast quantity of materials in a limited time period.

From the doctoral grade descriptors and the more contemporary perception of the doctoral (PhD) process, there seems to be ‘requirements’ for ‘conducting and designing original research’, ‘understanding techniques for research and advanced academic enquiry and undertake pure and/or applied research and development at an advanced level’, ‘contributing substantially to the development of new techniques, ideas, or approaches’. All of these pointing to one direction and one direction only, the demonstration of mastery of research methodology in conducting research on the highest level. The doctoral thesis, in fact, can be considered the tangible product of such demonstration of mastery which will be verified through the viva.

## RESEARCH METHODOLOGY

Acknowledging the importance of research methodology in conducting research on the doctoral level as demonstrated in the previous section, this section is dedicated to discussion on research methodology. However, before doing so, it is necessary to clarify the terminology used in this paper. Research methodology refers to the principles and procedures of logical thought processes which are applied to a scientific investigation (Fellows and Liu, 1997). Thus research methodology can be considered the overall strategy to achieve the aim and objectives of the research. Research methods, on the other hand, are merely tools. Thus within a research methodology, different research methods (i.e. tools) may be used to achieve the aim and objectives of the research.

In discussing research methodology, there are three major dimensions that need to be considered, namely the research philosophy, reasoning of the research, and data. The philosophical stance of the researcher will strongly influence the reasoning of the research and both will influence the data required by the research and analysis of the data. In conducting doctoral research, particularly PhD, there is a need to justify the philosophical stance of the researcher. After all, the title to be awarded is “Doctor of Philosophy in (a specific field or topic)”. Even though it is not “Doctor in Philosophy” in which case will require the candidates to conduct doctoral research in the field of Philosophy, the inclusion of the word “Philosophy” within the title requires the candidates to demonstrate sound understanding of philosophical issues in conducting research in the specific fields/topics chosen.

### 3.1 Research Philosophy

From various philosophical branches, in discussing research methodology there are two of the most prevalent branches, namely the ontology and epistemology. Ontology logically precedes epistemology whilst epistemology precedes methodology. Many researchers discuss the ontology and epistemology only within the specific context of their research. However, ontology and epistemology are actually portraying a bigger picture, i.e. how the researcher perceives reality in his/her live that will certainly influence the way he/she is doing the research rather than how reality is perceived in one particular research. Thus, the danger of adopting the later approach is that the researcher will become inconsistent (and even a hypocrite) as he/she will simply change his/her belief about reality from one research project to another. This is not to say that researchers are not allowed to change their philosophical stances as they conduct further study and deeper understanding in the research philosophy arena. However, changing ontological and epistemological stances should not be taken lightly as this will mean changes in their ways of understanding reality of their being and their lives. Thus, it the intention of this working paper to encourage researchers in becoming “truthful” to their own beliefs in the sense that they are conducting research in-line with their beliefs about the nature of reality and how researcher should make sense of the assumed reality.

Ontology discusses the ‘claims’ and assumptions that are made about the nature of reality, claims about what exist, what it looks like, what units make it up, and how these units interact with each other (Guba and Lincoln, 1994). A researcher’s ontological position is his/her answer to the question to the nature of the reality (to be investigated). The most popular example of ontological positions is objectivism vs. constructivism. Objectivism is an

ontological position that asserts that phenomena and their meanings have an existence that is independent from the actors. Constructivism is an alternative ontological position that asserts that phenomena and their meanings are continually being accomplished by the actors (not only produced through interaction but they are in a constant state of revision). Thus, an objectivist believes that there is one objective reality experienced the same way by each and every of us whilst a constructivist believes that reality is ‘constructed’ by each and every of us differently.

Epistemology concerns with the claims of what is assumed to exist can be known by the ‘knower or to-be-knower (Guba and Lincoln, 1994). Epistemology looks at the theory of knowledge, especially with regard to its methods, ‘validation’ and the possible ways of gaining knowledge in the assumed reality. The most commonly used example of epistemological positions is positivism vs. interpretivism. Positivism is an epistemological position that advocates the application of methods of natural science to the study of reality and beyond, the “truth” is out there to be discovered (by the researcher). Interpretivism is an epistemological position that separate the objects of natural science from the actors, the researchers/observers somehow construct their own “truth” in viewing the world. Thus, a positivist believes that the reality can be observed, studied and even ‘modelled’ whilst an interpretivist believes that the reality can only be interpreted.

From the brief discussion above, the link between ontology and epistemology is inevitable. Positivism mainly takes Objectivism as the basis of understanding the reality that there is only one objective reality experienced by us all, therefore the job of the researchers is to discover that one objective reality and model it. Interpretivism, on the other hand, mainly takes Constructivism as the basis of understanding the reality that constructed individually and interpreted differently. This link is manifested in the so-called “continuum” and presented in Figure 2. In presenting this continuum, the author acknowledges the complexity of the issues. Thus, ‘projecting’ Objectivism and Constructivism or Positivism and Interpretivism into two dimensional continuum is a hyper-simplification as each of them can be considered multi-dimensional. The intention here is to highlight the similarities (and hence the two dimensional plane) to enable a discussion for the purpose of this paper. The author also acknowledges the terminology used in the “continuum” is a version of compromise as they may be labelled and termed differently in other literatures.



Figure 2. The “continuum” in research methodology



### 3.2. The Reasoning of the Research

Following the philosophy, the discussion is continued to the next level of the research methodology, i.e. the reasoning of the research that is influenced by the philosophical stance of the researcher. Again, the author acknowledges the simplification in this discussion for the purpose of discussion in this paper. From various ways of reasoning, two of them are selected here, namely deductive and inductive to provide a continuation to the discussion on the previous sub-section. Reasoning of the research refers to the logic of the research, the role of existing body of knowledge gathered in the literature study, the way researchers utilise the data collection and subsequent data analysis.

A deductive research entails the development of a conceptual and theoretical structure prior to its testing through empirical observation (Loose, 1993). Thus, a deductive research conventionally commences by analysing the literature, i.e. studying existing works in the field providing the context for the research, continues by identifying and stating a single selected problem leading to the isolation of the major research question(s) in which the existing knowledge may be inadequate (could be identified gaps between existing theories or evidence, contradictions to be explored, or new contexts for applying previous findings). This is typically followed by formulating a hypothesis which can be accompanied by a series of sub-hypothesis. The hypothesis may be in the form of a conceptual model and was proposed to tackle the identified problem(s) with proposed set of further steps to test the hypothesis. The subsequent data collection using the proposed data collection methodology followed by the analysis resulting in the findings closely linked to the existing knowledge found earlier.

Inductive research intends to learn about the phenomena in question by applying a “less-structured” methodology to gain richer and deeper information. Instead of formulating a hypothesis, inductive research try to keep their minds open for any possible results (no pre-supposition) whilst proposing a set of further step for data collection in attempt to answer the phenomena in question. In certain methodologies, such as the grounded theory methodology, the literature review is not even recommended in the early phases to minimise any influence the researcher resulting in presupposition (Glaser, 1978). Explanations and theories are then developed from this observation i.e. based on the data collected.

The main difference between Deductive and Inductive research lies on the use of current body of knowledge and the role of their data collection. Researchers performing Deductive research compose hypothesis based on the current body of knowledge and then conduct data collection and data analysis to test the hypothesis. Researchers performing Inductive research, on the other hand, conduct data collection and data analysis to come up with findings whilst using the current body of knowledge to inform their data analysis when they see appropriate. Deductive research can be considered in-line with Objectivism and Positivism due to its reliance on the current body of knowledge in composing the hypothesis. Thus, because there is only one objective truth, researchers can base their investigation on the existing body of knowledge as they have been scientifically proven and therefore, must represent the one objective truth. In order to better understand the matter, an analogy to

completing a jigsaw puzzle can be used. A Deductive researcher will use existing pieces of the jigsaw puzzle and then deduce the missing pieces to complete the picture. An Inductive researcher simply rejects the other pieces of the puzzles as correctly representing the truth acknowledging that the other pieces of the puzzles are products of different construction and interpretation of reality that are not necessarily compatible. Figure 3 shows the positioning of Deductive and Inductive reasoning of the research within the extended version of the original “continuum” of research methodology presented earlier.

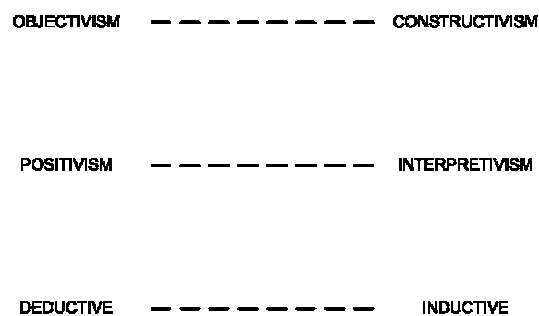


Figure 3. The extended “continuum” in research methodology

### 3.3 The Data

On the data level, the collected data based on the characteristics can be generally grouped into quantitative and qualitative data. As a general rule of thumb, quantitative data requires quantitative methods and qualitative data requires qualitative methods in the collection and subsequent analysis. Quantitative approaches seek to gather factual data and to study relationships between facts. Analyses of quantitative data yield quantified results and conclusions derived from evaluation of the results in the light of the theory and literature (Fellows and Liu, 1997). Quantitative methods are also known as the scientific methods, positioning the researchers as neutral observers of the phenomena (necessary to maintain distance or objectivity from the subject of the research). Quantitative methods are based on positivistic ideal coined by the 17<sup>th</sup> century philosophers who advocated that mathematics is the perfect tool to understand God’s worldly creation. Numerical methods and mathematics are considered a supra-human language of description and the only appropriate method for attaining facts scientifically. Quantitative approaches assumed to be repeatable and capable of isolation from reality without compromising the cause and effect being researched.

Qualitative methods afford a means of providing distinct data and evaluation of theorising problems and approaches (McKie, 2002). Qualitative methods are focusing on the qualities of phenomena being investigated rather than their numeric measurement. Qualitative researchers believe that real-world phenomena need to be assessed from within the context of that reality, taking into account the subjective dimension of reality. Naturally emerged from the Constructivism and Interpretivism side of the “continuum”, qualitative methods are based on

the assumption that there is no singular objective reality and hence the observed reality will be related to the researchers' interaction with the phenomenon. The main strength of qualitative methods is the potential of qualitative research to yield rich but complex data which certainly was not a product of isolation within a single reality or generalisable quantified relationships among the variables. Qualitative methods are inductive by nature and may yield unanticipated findings based on the evidence gathered along with the explanations of its dynamics.

Following the discussions above, it is clear that quantitative methods emerged from positivism and objectivism stance whilst qualitative methods from interpretivism and constructivism. In order to complete the picture, another continuum depicting quantitative and qualitative methods can be added to the continuum discussed in the previous sub-sections as presented in Figure 4.

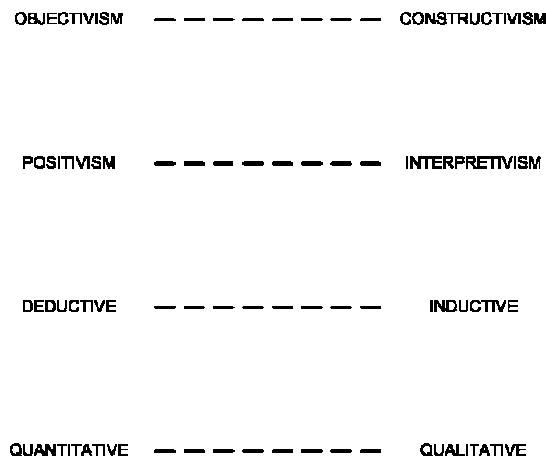


Figure 4. The complete “continuum” in research methodology

## CREDIBILITY OF RESEARCH FINDINGS

Last but not least, researchers conducting research, no matter quantitative or qualitative ones, will need to demonstrate the credibility of their findings. It is considered good practice for a research project to provide sufficient information on the methods used and the justification for their use in order to demonstrate the credibility of its findings (Robson, 2004). Different research approaches have different inherent strengths and weaknesses, which need to be taken into account in relation to the goals of the research. In evaluating the credibility of the research methodology in deriving its findings, validity and reliability are commonly used as the evaluation criteria (Gill and Johnson, 1997; Saunders *et al*, 2000).

Using definitions from quantitative research, validity refers to whether the identified inputs within their attributes actually produce the expected output as well as the extent to which any

research findings can be generalised or extrapolated beyond the immediate research sample or setting in which the research took place (Robson, 2004). Reliability refers to the consistency of results obtained in the research, i.e. the reliability of the method of collecting evidence (McNeill, 1990). Owing to its scientific background, validity and reliability 'measure' in quantitative methods have been very well defined and include construct, content related and criterion related in demonstrating validity whilst scoring agreement, test-retest, equivalent forms and internal consistency in demonstrating reliability.

Validity and reliability are perceived differently in qualitative research. Many qualitative researchers are even refusing to use the terminology. As there is no clear and accepted single set of convention for analysis corresponding to those observed with quantitative methods (Robson, 2004), demonstrating credibility in qualitative research is commonly addressing issues about the quality of the data and the appropriateness of the methods used in carrying the research project. These are important particularly in the social sciences due to different philosophical and methodological approaches in studying human activity. The credibility of the findings in qualitative research is typically demonstrated through rigour, thoroughness, the appropriateness of the method adapted to tackle the research question, representativeness, demonstrating that the research subject are in position to corroborate or disapprove the researcher's interpretation on the matters being discussed. In demonstrating the quality of qualitative data, it is not uncommon to demonstrate 'triangulation' of various data source thus providing results from different angles (Miles and Huberman, 1994).

Finally, ethical issues can also be considered an essential component in demonstrating the credibility of the research findings. Ethical issues of research concern the appropriateness of the researchers' behaviours in relation to the rights of those subjects of the research or who are affected by the research (Saunders *et al*, 2000). Evidence of ethical issues consideration and evaluation in an early stage, through an in-depth discussion of the research proposal have been considered one of the main criteria for a research project to continue (Cooper and Schindler, 1998; Marshal and Rossman, 1999).

## **SUMMARY**

Qualitative methods have been considered capable of studying complex situations, particularly involving human being and therefore yielding rich findings. This has resulted in the increase of their popularity, particularly in the built environment. Many doctoral students and researchers in the built environment were 'persuaded' to apply qualitative methods in their research and self-proclaiming themselves as qualitative researchers. However, various issues and difficulties have been associated with applying qualitative methods. There is a potential danger to these researchers in conducting their research such as facing difficulties or overwhelmed by the rich data collected that may lead to an ineffective application of qualitative methods to achieve the aim and objectives of their research.

Aiming to shed a light on this matter, this working paper discusses about conducting research on doctoral level, particularly qualitative research. The discussion was started by revisiting the meaning of conducting doctoral research. This has revealed the necessity to have a robust understanding in research methodology. When looking at research methodology, discussions were structure into its three main components, namely the research philosophies, the reasoning of research and research on the data level. A simplified "research methodology

continuum” emerged from the discussions and proved central to the paper. The final part of the paper discussed the credibility of research findings including ethical issues. This working paper is expected to inspire built environment doctoral students and researchers adapting (or intending to adapt) qualitative methods in their research to ensure a thorough consideration on the issues discussed here and exploit the full potential of qualitative methods in their research..

## REFERENCES

- Cooper, D. R. and Schindler, P. S. (1998), *Business Research Methods*, 6<sup>th</sup> ed., Irwin McGraw-Hill, Boston.
- Denzin, N. K. and Lincoln, Y. S. (2008), *The Landscape of Qualitative Research*, 3<sup>rd</sup> ed., Sage Publications, Thousand Oaks.
- Fellows, R. and Liu, A. (1997), *Research Methods for Construction*, Blackwell Science Ltd., Oxford.
- Gill, J. and Johnson, P. (1997), *Research methods for Managers*, 2<sup>nd</sup> ed., Paul Chapman Publishing Ltd., London
- Glaser, B. G. (1978), *Theoretical Sensitivity: Advances in the methodology of grounded theory*, Sociology Press, Mill Valley, California.
- Grix, J. (2001), *Demystifying Postgraduate Research: From MA to PhD*, University of Birmingham Press, Birmingham.
- Guba, E. G. and Lincoln, Y. S. (1994), ‘Competing Paradigms in Qualitative Research’, *In: Denzin, N. K., and Lincoln, Y. S. (Eds.), Handbook of Qualitative Research*, Sage, London, pp. 105-117.
- Loose, J. (1993), *A Historical Introduction to the Philosophy of Science*, 3<sup>rd</sup> ed., Opus, Oxford.
- Marshall, C. and Rossman, G. (1999), *Designing Qualitative Research*, 3<sup>rd</sup> ed., Sage Publication, Thousand Oaks
- McKie, L. (2002), ‘Engagement and Evaluation in Qualitative Inquiry’, *In: May, T. (Ed.), Qualitative Research in Action*, Sage, London.
- McNeill, P. (1995), *Research Methods*, 2<sup>nd</sup> ed., Routledge, New York.
- Miles, M. B. (1979), ‘Qualitative data as an attractive nuisance: the problem of analysis’, *Administrative Science Quarterly*, 24, pp. 590-601.
- Miles, M. B. and Huberman, A. M. (1994), *Qualitative Data Analysis: An Expanded Sourcebook*, 2<sup>nd</sup> ed., Sage, Thousand Oaks.
- QAA (2008), *The framework for higher education qualifications in England, Wales and Northern Ireland*, The Quality Assurance Agency for Higher Education, Mansfield.
- Robson, C. (2004), *Real World Research*, 2<sup>nd</sup> ed., Blackwell Publishing, Oxford.
- Saunders, M., Lewis, P. and Thornhill, A. (2000), *Research methods for Business Students*, Pearson Education Limited, Harlow.
- Sutrisna, M. and Barrett, P. (2007), ‘Applying rich picture diagrams to model case studies of construction projects’, *Engineering Construction and Architectural Management*, 14(2), pp. 164-179.

# IDENTIFYING KEY CHARACTERISTICS OF DISTRIBUTED DESIGN AND ENGINEERING WORK THROUGH EXPLORATORY RESEARCH

Vedran Zerjav<sup>3</sup> and Amy Javernick-Will<sup>4</sup>

*1* Doctoral Student, Institute of Interdisciplinary Construction Process Management, Vienna University of Technology, Karlsplatz 13/234-2, A-1040 Vienna, Austria.

*2* Assistant Professor, Dept of Civil, Environmental & Architectural Engineering, University of Colorado at Boulder, ECOT 441, 428 UCB, Boulder, CO 80309-0428, USA

In today's global economy, multinational organizations face a diverse array of complexities and opportunities to exploit. The globalization of organizations that design and construct infrastructure and building projects allows them to operate subsidiary offices around the world. At the same time, new collaboration technologies allow organizations to distribute work and tasks virtually for projects, allowing them to staff projects with employees from various geographic offices. These advances are rapidly changing traditional work environments for companies in the design and engineering sector. A firm can benefit from these advanced technologies by decomposing work tasks and distributing them to diverse locations for rapid and efficient execution. This exploratory research uses a series of qualitative case studies to investigate key characteristics of worksharing practices in project-based global design and engineering companies. It will investigate the motivations, success factors and barriers for worksharing within multinational design and engineering companies. This research also aims to better understand the process of work distribution in international design and engineering companies and to extend existing knowledge with an empirical insight to this problem.

*This is an early version of a paper that will be submitted to the LEAD 2009 ASCE conference in Lake Tahoe in November 2009. Please do not cite this paper without prior notification of the authors.*

**Keywords: Worksharing, Global Projects, Engineering Organizations, Case Studies**

## MOTIVATING ENGINEERING AND BUSINESS PROBLEM

Globalization and rapid technological advancements are continually forcing businesses to change their traditional practices and routines (Friedman 2005). These processes also influence working environments, allowing companies to distribute work tasks geographically.

---

<sup>3</sup> [e0828400@student.tuwien.ac.at](mailto:e0828400@student.tuwien.ac.at)

<sup>4</sup> [Amy.Javernick@Colorado.edu](mailto:Amy.Javernick@Colorado.edu); [ajwill@stanford.edu](mailto:ajwill@stanford.edu)

For example, new collaboration technologies allow the possibility of teaming project participants virtually to distribute work (Charoenngam *et al.* 2004).

Architectural and engineering companies can now benefit from advantages of the Information Age by decomposing work tasks and distributing them to diverse locations for rapid and efficient execution. Nevertheless, many companies are still facing serious problems with the development of structures and processes to enable collaborative work across dispersed offices.

In order to understand and evolve work distribution practices within architectural and engineering firms, this research seeks to:

- Identify the reasons organizations distribute work
- Understand how an organization distributes design and engineering tasks (project phase, processes, etc.)
- Understand the challenges and risks from work distribution that lead to problems (schedule, design alignment, etc.)
- Explore the processes and strategies that participants indicate are effective to share tasks between offices to begin to identify best practices for distributing work.

This research attempts to respond to the practical question of how and why design and engineering companies distribute work. Thus, the authors have chosen to use an exploratory approach for this research. The first step in bridging the gap between the current and desired state of knowledge in work distribution is to identify the limitations and success factors that appear to allow engineering and architectural firms to distribute work.

## **THEORETICAL AND PRACTICAL POINTS OF DEPARTURE**

In his famous book – *The World is Flat*, Thomas Friedman argues that during the last two decades, a specific series of events and forces caused the emergence of an entirely new global business environment. The new economy is characterized by the growing division between economic power and political power, hyper-competition, rapid technological changes, and shorter product life cycles (Friedman 2005). Businesses are increasingly global, leading to changes in work practices.

Of course, these challenges are pushing companies to innovate. The construction sector is particularly sensitive to those challenges because of its bottom up innovation system and the fragmented structure of the sector. UK's National Endowment for Science, Technology and Arts published a report in 2007 entitled *Hidden Innovation*. This report identifies the construction industry as a low innovation sector and argues that in the construction sector, innovation happens “through sector - wide partnerships and project- level interaction with clients” (National Endowment for Science 2007). Organisational innovations such as partnerships and collaborations elaborated in the *AIA Integrated Project Delivery Guide* (AIA 2007), or defined by corresponding contracts are closely related to the subject of distributed work sharing in design and engineering companies because the distribution of liability within such projects is problematic and subject to debate.

A brief historical perspective on the subject reveals that the issue of work distribution in virtual organizations is actually far from modern. Two millennia ago, the Roman Empire spanned a considerable part of the globe requiring tremendous efforts of coordination. Several centuries later, the Catholic Church was repeating this practice. During the colonial times, companies were engaged in the same issues today's international companies are facing: Maintaining control and trust (O'Leary, Orlikowski and Yates 2002, Hinds and Bailey 2003). In its essence, virtual work often leads to conflicts within teams and these conflicts have always had the same consequence – lack of trust - but for a different set of reasons: Different disciplinary perspectives, different regional or national cultures, and the lack of face-to-face interaction (Zolin *et al.* 2004).

In recent years there has been a growing volume of research and publication discussing the phenomenon of distributed work and the explanations of why and how it exists (Hinds and Kiesler 2002). The trigger for the majority of research efforts in this direction is the emergence of open-source communities and their effective organizational structures. The most famous case is the Linux operating system and the Internet as a project for itself. These examples demonstrate how distributed teams of project contributors are capable of producing high quality products collaboratively (Moon *et al.* 2002).

Research in the Architecture-Engineering-Construction (AEC) community showed that different collaborative technologies employed by virtual design teams, such as face-to-face meetings, whiteboards and 3D virtual worlds, caused them to operate significantly different (Sher *et al.* 2009). Such differences in teamwork are identified as shared situational awareness skills, decision making skills, and task management skills.

Other research on multinational firms in the Architecture-Engineering-Construction (AEC) sector found that, in addition to standard project knowledge, international projects require a complex set of additional institutional knowledge regarding the local project environment (Javernick-Will, Levitt and Scott 2008). Because distributed design and engineering work often crosses geographical borders, this local institutional knowledge is likely also important for work sharing. For example, if an international company chooses to distribute design and engineering work for a project to offices in three different countries, the project team will be required to distribute the local knowledge for the project to these different teams in order to create a design that is sustainable within the project environment.

In summary, construction design and engineering companies must be able to apply their knowledge effectively to local project conditions and vice versa – subsidiary offices must be able to engage in design and engineering activities at an equal level of competence. When these projects become global, they utilize collaboration technologies in diverse cultural settings to support their goals.

## **RESEARCH METHOD**

The topic of distributed design and engineering in construction projects is very broad and the corresponding gaps in the literature we explored so far are large. This is mostly due to the fact that this phenomenon spans several organizational levels and theoretical streams and each of the involved disciplines tends to explain this topic from its own perspective. Therefore, according to our current literature review and the preliminary data about the topic of international work sharing in design and engineering, we have decided to adopt an open-





ended exploratory approach in order to grasp the underlying concepts of such a complex issue.

Furthermore, since the phenomenon of distributed work exists in the context of realistic projects, the case-based method is best suited to inform this exploratory research because the object under study is not readily distinguishable from its context (Eisenhardt 1989, Yin 2003). These case studies are consisting of mostly qualitative evidence because their final goal is theory-building.

[AJWI] Data collection consists primarily of open-ended ethnographic interviews with key informants—the practitioners engaged in work sharing practices within international projects. Following ethnographic interviewing techniques proposed by Spradley (1979), these interviews will ask open-ended questions across several categories in an attempt to uncover work sharing practices that were successful or encountered problems. Many informants may not be able to directly communicate the motivations, success factors and barriers for work sharing; however, they often possess much of this knowledge. Encouraging them to answer open-ended questions through storytelling can unveil a host of information and data from specific project circumstances. This can then be compared across informants to reveal frequent occurrences. To uncover this, informants will be asked about the corporate level strategies as well as specific project examples. To enrich the interviews, we will ask informants to provide additional documents, such as organizational processes for work sharing or other project specific documents.

## **Coding Structure**

The interviews will ask questions in four areas, which will serve as the four primary categories of analysis within work sharing: motivations, organizational processes, barriers and success factors. Because these questions are open-ended, interview responses will be coded into various sub-categories that emerge from the ethnographic interviews that will later be placed into these four larger categories. Due to the exploratory nature of this research, additional macro categories may materialize during the data collection and analysis.

### *Motivations*

These are the characteristics providing an answer to the ethnographic open ended interview question of: “*Why does your company work share?*” or “*What specific project circumstances would motivate your company to engage in work sharing on a project?*”

### *Organizational Strategies and Processes*

This research tackles this important information by asking informants questions related to the general question of: “*How does your company work share?*”. *If the organization has standard practices for distributing and aligning the work and tasks across offices, we will*

*request this documentation. Similarly, we will request meeting minutes or other documentation from specific projects.*

### *Success Factors*

These characteristics are held responsible for the success of work sharing within projects. The goal is to identify project processes that the majority of informants feel are important for distributing work successfully. Some of these factors are related to technologies employed on projects, organisational structures, project locations, etc. To uncover these processes, informants are asked: “*In which situations would you be willing to work share, according to your previous experience?*” and “*What processes and strategies have you found are critically important when engaging on a work sharing project?*” Here it is important that the informant speaks from the perspective of her/his experience.

### *Barriers*

Barriers are the factors that prohibit work sharing, or in other words if they are present, a work sharing project is most likely to fail. Examples of these may include differences in regulatory frameworks and cultures that most international projects are facing throughout various stages of their lifecycles. In order to uncover some of those barriers, this research asks the informants an ethnographic question similar to: “*Could you name some of the situations where you would really be reluctant to work share in a project?*” or “*What situations have you faced where a project experienced difficulties when work sharing?*”

## **CONCLUSIONS**

This paper summarizes a plan for exploratory research aiming to provide insight on how and why international design and engineering companies within the AEC community work share. In addition, it aims to uncover challenges and strategies for work sharing based upon participants experiences and responses. Managers of companies and projects can benefit from the research by enabling them to understand the key risks and successful practices for distributing work across offices.

As a contribution to theory, this study will extend existing knowledge on distributed work in construction design and engineering through an empirical study of the practice of work sharing within companies, and by integrating the theoretical streams of organizational science, project management and software engineering to explain this topic.

## **REFERENCES**

- AIA (2007) *Integrated Project Delivery: A Guide* Sacramento, CA: The American Institute of Architects, AIA California Council.
- Charoenngam, C, Ogunlana, S, Ning-Fu, K and Dey, P (2004) Re-engineering construction communication in distance management framework. *Business Process Management Journal*, **10**, 645-72.
- Eisenhardt, K M (1989) Building Theories from Case Study Research. *Academy of Management Review*, **14**(4), 532-50.

- Friedman, T L (2005) *The World is Flat: A Brief History of the Twenty-First Century*. New York: Farrar, Straus and Giroux.
- Hinds, P and Kiesler, S (2002) *Distributed Work*. MIT Press.
- Hinds, P J and Bailey, D E (2003) Out of Sight, Out of Sync: Understanding Conflict in Distributed Teams. *Organization Science*, **14**(6), 615–32.
- Javernick-Will, A, Levitt, R and Scott, W R (2008) Mobilizing Institutional Knowledge for International Projects. In: *2008 Specialty Conference Leadership and Management in Construction Lake Tahoe*.
- Moon, J Y, Sproull, L, Aoki, K, Darkwa, O K, Eskow, S, Forbes, J L and Cisler, S (2002) Essence of Distributed Work: The Case of the Linux Kernel. *Distributed Work*, 381-404.
- National Endowment for Science, Technology, and the Arts (2007) *Hidden innovation: How innovation happens in six 'low innovation' sectors.*, London: NESTA.
- O'Leary, M, Orlikowski, W and Yates, J (2002) Distributed work over the centuries: Trust and control in the Hudson's Bay Company, 1670–1826. *Distributed Work*, 27–54.
- Sher, W, Sherratt, S, Williams, A and Game, R (2009) HEADING INTO NEW VIRTUAL ENVIRONMENTS: WHAT SKILLS DO DESIGN TEAM MEMBERS NEED? *Journal of Information Technology in Construction*(14), 17-29.
- Yin, R K (2003) *Applications of Case Study Research*. Sage Publications.
- Zolin, R, Hinds, P J, Fruchter, R and Levitt, R E (2004) Interpersonal trust in cross-functional, geographically distributed work: A longitudinal study. *Information and Organization*, **14**(1), 1-26.

ISBN 978-0-9562633-0-8