Building Knowledge – Developing a Grounded Theory of Knowledge Management for Construction

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Abstract: As part of an on-going doctoral study, a constructivist approach to grounded theory is being used to develop an integrated model of knowledge management (KM) for the leading Irish construction organisations. Using multiple data collection methods; employees in a number of these organisations have participated, from recent graduates through to senior managers. While the need to effectively manage knowledge within large construction organisations is well recognised, a gap exists between the theory of KM and its implementation in practice. This paper considers the research in terms of its philosophical position, the use of grounded theory and the research methods utilised, from theoretical and practical perspectives. Progress in the study thus far is presented and future directions considered in achieving theoretical saturation and a well developed model. It is anticipated that the study will contribute to the field of construction management where further empirical research into KM is required. Much previous research in the area of KM in construction has focussed solely on technological, cultural or strategic issues in the development of KM models. The developed integrated model will form the basis of education and guidance resources on KM for the leading Irish construction organisations. As a traditional and pragmatic industry, the rationale for using grounded theory is provided from the viewpoint that it requires researchers to focus upon developing theory which produces explanations that are recognisable to the subjects of the research. In order to ensure the credibility of the developed model, it will be evaluated by industry as part of a pilot KM education programme, with further refinement if necessary.

Keywords: Construction, constructivism, grounded theory, knowledge management, mixed methods.

1. Introduction

There are numerous challenges facing today's construction industry. These include economic swings, new markets emerging in the global economy, increasing competition, the impact of technology, new and increasing demands from clients, customers and society, and the requirement to maintain a highly skilled workforce at all levels. The industry is recognised as being poor at learning on a consistent basis and improving performance and is notoriously slow in adapting to progressive change. The project-based, fragmented and unstable nature of the industry has led to significant knowledge loss compared with other industries. Knowledge Management (KM) has been promoted as a means of harnessing and utilising intellectual resources to address these challenges, as well as improving innovation, business performance and client satisfaction. However there is uncertainty about how to devise and implement a viable and cost effective KM initiative. KM has received significant attention from the construction management academic community in recent years and this is evidenced in numerous recent publications and conferences (Walker, 2005). KM is considered to be in its infancy in the construction industry and is seen as a recent and evolving practice for construction organisations (Robinson et al., 2005). The lack of a working definition of knowledge within construction organisations and awareness of the importance and potential advantages of KM reflects an informal approach. It also indicates the need for further exploration of knowledge and KM-related issues (Robinson et al., 2005). There is a lack of empirical research and integrated KM models for construction, resulting in the continuing need for the development and testing of such models (Walker and Wilson, 2004). One such integrated KM model, the K-Adv model, was judged to be too difficult to implement by the organisations involved. A draft industry guidance document was produced and tested as part of the research. This was found to be conceptually too complex to understand, even by some KM specialists within the contributing organisations. Participants in the research indicated that a less complicated and shorter guidance document was preferable (Walker and Wilson 2004).

This paper reports upon an ongoing doctoral study the aim of which is to develop an integrated model of KM for the leading Irish construction organisations through grounded theory. In considering a study's research methodology, Schwandt (2001) highlights the need to discuss the philosophical stance of the research and the methods adopted. A theoretical discussion on the philosophical nature of research and the grounded theory methodology is presented, with a specific focus upon the challenges facing a novice researcher in positioning this methodology within a constructivist paradigm. To fit with the emergent nature of grounded theory, multiple data collection methods have been utilised including interviews, focus groups and questionnaires and their adoption is presented and discussed. In concluding, the paper reflects upon the rationale for the chosen methodology and how identified challenges have been overcome.

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2. Research philosophy and knowledge

In conducting research, Dainty (2007) emphasises the importance of constructing a philosophical position and orientation towards the inquiry. McCallin (2003) recommends reviewing the philosophical background and considering the paradigm of inquiry, early in the research process. A paradigm is defined as *"the basic belief system or worldview that guides the investigator, not only in choices of method but in ontologically and epistemologically fundamental ways (Guba and Lincoln, 1994: 105)."* The definition of research paradigms requires the consideration of ontology, epistemology and methodology. Ontology is concerned with the form and nature of reality, a theory of what exists and how it exists. Epistemology is concerned with the nature of knowledge and considers the relationship between the knower and what can be known (Guba and Lincoln, 1994; Schwandt, 2001). In terms of methodology, Clough and Nutbrown (2002: 31) view its task as uncovering and justifying *"research assumptions as far and as practicably as possible, and in doing so to locate the claims which the research makes within the traditions of enquiry which use it."* Ignoring such issues, according to Amaratunga and Baldry (2001) can have a detrimental effect on the quality of the research.

The study of knowledge has always been controversial throughout the history of philosophy and science, leading to a lack of clarity and numerous positions along a continuum with two extremes: knowledge is ascribed a purely objective or a purely subjective existence (Sousa and Hendriks, 2006). For the novice researcher, the adoption of a philosophical position can be a difficult task, with much of the literature focusing on the dichotomy between positivism and interpretivism. These two distinct paradigms have been the subject of a long-standing debate in science, with many authors aligning positivism with quantitative, and interpretivism with qualitative research (Dainty, 2007). This position, according to Guba and Lincoln (1994: 105) is somewhat misleading as *"both qualitative and quantitative methods may be used appropriately with any research paradigm."* Fundamentally positivism is concerned with explaining human behaviour, while interpretivism places emphasis on understanding it, although there is call to view these *"approaches as complementary rather than as two opposite extremes (Amaratunga and Baldry, 2001: 96)."* There have been extensions and additions to the 'basic' paradigms of positivism and interpretivism for social and business research including postpositivism, critical inquiry, symbolic interactionism, and constructivism (Guba and Lincoln, 1994; Schwandt, 1994)."

A relatively new field of enquiry, construction management is viewed by Dainty (2007) as being firmly rooted within the positivist tradition, leading him to question the ability of the construction management research community to provide a rich and nuanced understanding of industry practice. This view is reinforced by Guba and Lincoln (1994) who identify a number of critiques of positivism including: loss of context, exclusion of meaning and purpose, disjunction from local contexts, inapplicability of general data to individual cases and exclusion of the discovery dimension in inquiry. In order to redress the myopic approach to construction management research, Dainty (2007) proposes that methodological pluralism be embraced, whereby multiple theoretical models and methodologies are used to further knowledge. He states that *"a more expansive outlook towards mixing methodologies and research paradigms could yield deeper insights into, and understanding of, the way that practitioners 'do' management in the construction sector (Dainty, 2007: 9)."*

3. Grounded theory

The grounded theory methodology first appeared in the seminal text *The Discovery of Grounded Theory* (Glaser and Strauss, 1967). Through a set of highly developed procedures, the main aim of grounded theory is to produce formal, substantive theory about the behavioural patterns that shape social processes as people interact together in groups (Schwandt, 2001, McCallin, 2003). The philosophy of grounded theory lies in symbolic interactionism which posits that meaning is socially constructed, is negotiated and changes over time through the reflexive interaction of individuals (Mansourian, 2006, Goulding, 2005, Loosemore, 1999). With the passing of time the originators of grounded theory have adopted differing approaches to this methodology, leading to an ensuing academic debate over the characteristics and definition of grounded theory. The contrasts between and within the Glaserian and Straussian schools of grounded theory lie in their methodological procedures for coding data and developing categories, memoing and sampling, emergence, researcher distance and theory development (Jones and Noble, 2007; Mansourian, 2006). The main features of grounded theory include: using empirical research as its starting point; an iterative process of data collection and analysis; producing explanations that are recognisable to the subjects of the research; being geared to modest localised explanations based on the immediate evidence; an emergent design and being linked with qualitative research, exploratory investigations, small-scale studies and research focusing on human interaction in specific settings (Denscombe, 2003).

In terms of organisational research, grounded theory can be particularly useful in examining in exploring a wide range of issues about people, their behaviour, relationships and communications (Locke 2001, Goulding 2002). The focus on remaining grounded can be useful when dealing with the concept of knowledge management in organisations, particularly in conceptualising manager's practices and opinions (Sousa and Hendriks, 2006). The grounded theory approach is now proving popular within the construction management research domain, with a number of recent research projects being undertaken in the area of KM (Hunter et al., 2005).

3.1 Grounded theory and constructivism

Grounded theory has been adapted by researchers to fit with a variety of philosophical positions such as constructivism, feminism, critical thinking and postmodernism (Mills et al., 2006). A constructivist approach to grounded theory, which has been adopted in this study, posits that knowledge is constructed to make sense of experience and is continually modified and tested in light of new experiences (Schwandt, 1994). Despite its relatively recent popularity in the social sciences, the roots of constructivism can be traced back to the earliest philosophical arguments over a rational foundation for knowledge. Constructivism is discussed by Guba and Lincoln (1994: 110-111) in terms of ontology, epistemology and methodology as follows:

- Ontology: reality is constructed by individuals or groups "in the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature."
- Epistemology: the researcher and research participants interact "so that the 'findings' are literally created as the investigation proceeds."
- Methodology: through interaction and continuous refinement of the researcher's and participants individual constructions, the aim *"is to distil a consensus construction that is more informed and sophisticated than any of the predecessor constructions."*

In adopting a constructivist approach to grounded theory, Mills et al. (2006) discuss the need for a sense of reciprocity between the researcher and participants which facilitates the co-construction of meaning, leading to the use of participants stories framed within the written theory. Strauss and Corbin (1994) reinforce these considerations citing the importance of interplay between the researcher and the participants and the incorporation of multiple perspectives in writing the emerging theory. The inclusion of practitioner insights through a recursive sense-making process capitalises on a rich practitioner knowledge base (Leonard and McAdam, 2001). This has led Mills et al. (2006: 9) to remark that *"clearly, Strauss and Corbin's evolved grounded theory has some constructivist intent."*

3.2 Selecting a version of grounded theory

With more than one version of how researchers can go about implementing grounded theory, Chiovitti and Piran (2003) highlight the need for rigour in its use, with the process by which theory was generated being explained properly. Jones and Noble (2007) criticise the free-for-all manner in which grounded theory has been used citing the need for more discipline in the methodology. Goulding (2005) confirms this position, reporting that many research papers which purport to use grounded theory are nothing more than purposive sampling and interviews, lacking any level of theoretical sensitivity. In a review of empirical studies that have reported using grounded theory, Jones and Noble (2007) found a number had omitted theoretical sampling, leading to a theory lacking in density and variability. This may be due to researchers not understanding the important aspects of the methodology, concentrating only on coding (Strauss and Corbin, 1994). In attempting to restore integrity to grounded theory, Jones and Noble (2007) recommend that the researcher should clearly state the version of grounded theory they intend to use and adhere to its procedures. While Strauss and Corbin's version of grounded theory has been viewed as being too rigid by some, they counter that the *"suggested guidelines and procedures allow much latitude for ingenuity and are an aid to creativity (Strauss and Corbin, 1994: 273)."* Given the debate regarding integrity, the present study adopts the version of grounded theory developed by Strauss and Corbin (1998), a key feature of which are the detailed open, axial and selective coding procedures. In order to facilitate analysis of the data, the qualitative data analysis software, NVivo is being utilised as, *"the design of NVivo was strongly influenced by grounded theory and therefore the program gives good support for the method (Gibbs 2002: 165)."*

3.3 The novice researcher and grounded theory

There are significant challenges for a novice researcher in adopting this approach, which can prove to be quite frustrating (McCallin, 2003). In attempting to overcome anxiety of 'doing it right,' Mansourian (2006) recommends adherence to the key principles of constant comparison, theoretical sampling and emergence.

Based on his experience of Strauss and Corbin's method, Allan (2003) found the micro analysis to be very time consuming and confusing. However, he reports that *"confidence in the process of coding grew and uncertainty subsided with experience of the method (Allan, 2003:3)."*

There has been much debate about the level of a priori knowledge with which the researcher enters the field (Goulding 2002). While it is impossible to begin research with no preconceived ideas, Eisenhardt (1998) highlights the importance of being as close as possible to having no theory under consideration or hypotheses to test in order to reduce bias. However, it is accepted that some prior reading is required to identify initial ideas and concepts, with the extant literature being incorporated into the emerging theory as the research progresses (Denscombe 2003). The timing of the literature review in grounded theory can prove problematic for novice researchers. An initial literature review was conducted by McCallin (2003) as a base for comparison with emerging concepts. The identification of similarities between the grounded theory and the literature can help to improve the transferability, validity, and generalisability of the theory (Eisenhardt, 1989, Chiovitti and Piran, 2003). While conflicting literature can force the researcher *"into a more creative, framebreaking mode of thinking than they might otherwise be able to achieve (Eisenhardt, 1989: 544)."* Apart from literature Goulding (2005) cites the researcher's life experiences, research and scholarship as knowledge which cannot be erased prior to conducting their research.

There are two general strategies for selecting participants (such as people, organisations, locations etc.) in research; statistical or theoretical strategy. While a statistical strategy is concerned with sample sizes, theoretical sampling should focus on samples which are large enough to provide meaningful data of depth and quality (Leonard and McAdam, 2001, Birley and Moreland, 1998). With theoretical sampling it is essential to establish the criteria upon which the selection of participants will be based (Schwandt. 2001; Eisenhardt, 1989). In the case of grounded theory, Goulding (2005) suggests initially talking to informants who are most likely to provide information which may lead to provisional concepts and *"direct the researcher to further 'theoretically' identified samples, locations, and forms of data."* As concepts emerge from the initial field research, further sites are selected based upon developing categories and emerging theories (Goulding 2002). The rationale being that the selected sites best support the development of the theoretical framework (Locke 2001). In concluding the theory development, theoretical saturation should occur whereby additional analysis no longer contributes to discovering anything new about a category and is vital if a theory of substance is to be developed (Denscombe 2003, Locke 2001).

In writing grounded theory it is recommended that the style of presentation should move back and forward between extensive theoretical presentations and illustrative live excerpts from the research setting (Locke 2001). The use of diagrams can also aid the illustration of points being made (Goulding 2002). Once written, the proposed theory should be reviewed in terms of whether it is pragmatically useful and credible. To check the credibility of the developing theory, the researcher should return to the original informants and obtain their opinions (Goulding 2002).

4. Data collection

The chosen methodology, the scope of the study and type of information required will dictate the types of methods used (Clough and Nutbrown, 2002, Birley and Moreland, 1998). While Loosemore (1999) places emphasis upon developing grounded theory through qualitative data, Sousa and Hendriks (2006) view it as a fundamental distortion to argue that grounded theory is a qualitative research method. Indeed, Eisenhardt (1989) states that research focussed on theory building, will typically combine multiple data collection methods. The mixing of qualitative and quantitative methods can be viewed as complementary, echoing the call for methodological pluralism in construction management made by Dainty (2007). The use of multiple methods allows for triangulation, the purpose of which is to confirm findings through convergence of different perspectives, check the integrity of inferences drawn and ensure validity (Jack and Raturi, 2006; Schwandt, 2001). The following section provides an overview of the methods used for data collection in the research, moving from an initial literature review through the various stages of theoretical sampling that have been completed to-date. At all stages of the data collection and analysis, literature relevant to the emerging concepts has been reviewed.

4.1 Initial literature review

An initial literature review was performed which involved some general reading on KM in construction, which led to a working definition of KM, and the identification of strategic, technological and cultural issues as key concepts.

4.2 Survey of the twenty leading construction companies

A survey was then conducted concentrating on the leading twenty construction organisations in the Republic of Ireland, based on 2004 turnover. It was decided to send a questionnaire to both the Managing Director and ICT Manager, in order to explore the strategic and technological perspectives of KM.

4.3 Senior management interviews

Senior managers from ten of these organisations were then interviewed in order to get an overview of current approaches to managing knowledge from both strategic and operational perspectives. Based on the survey results and further review of literature, a number of key themes relating to KM formed the basis for the interview questions at individual, project and organisational levels. A number of concepts emerged as important to managing knowledge, including the development of a knowledge sharing culture, Continuing Professional Development (CPD), the level of experience and role of the individual, and the need to overcome geographical barriers to KM.

4.4 Case study 1

An interview with one of the senior managers, led to an opportunity to conduct further research within their organisation. The organisation's involvement in a CPD accreditation scheme had led them to considering the implementation of KM practices. The first part of the case study involved a questionnaire which was distributed to 180 professional and management staff based in the Dublin region, achieving a 36% response. The questionnaire sought to examine staff's attitudes towards CPD and KM activities within the organisation. Follow-up interviews were then conducted with thirteen staff members on a large commercial development project. Findings from the case study were presented to the company's CPD and KM team, with an unstructured focus group used to discuss and evaluate them. A number of recommendations were made regarding improving KM practices which have since been successfully implemented. Commitment of staff to their relevant professional bodies as opposed to the organisation emerged as being an important motivator for continually learning and acquiring knowledge.

4.5 Engineers Ireland CPD accreditation manager interview

With KM as part of their CPD accreditation scheme, the country's largest professional body, Engineers Ireland, was the next location considered for data collection. An unstructured interview was arranged and conducted with their CPD Accreditation Manager, to discuss KM in relation to construction organisations. With twelve of the top twenty organisations engaged in the accreditation process, it was found that they *"are struggling with the concept of KM."* The prospect of developing guidance documentation and training resources aimed specifically at construction organisations was discussed as a possibility of raising awareness and understanding of KM, and ultimately improving its implementation.

4.6 Case study 2

The opportunity emerged to conduct a second case study of another leading Irish construction organisation who had participated in earlier phases of the research. The focus was on addressing the need to share specialist knowledge between practising construction managers on geographically dispersed projects. Action research was adopted as the research strategy, as it is based on a collaborative approach between the researcher and the practitioner and is normally associated with 'hands-on', small-scale research projects where practitioners wish to use research to improve their practices (Denscombe, 2003). In order to identify common problems on the various projects, each of the six managers were initially interviewed on their own to consider their individual experiences. Following analysis of the interviews, a focus group comprising all six managers was used to share knowledge and build consensus. Subsequently, all participants were then given a questionnaire to complete in order to consolidate learning from the focus group and to evaluate the effectiveness and future potential of such a forum for sharing. A number of recommendations emerged from this phase of the study, including the need to review all construction projects upon their completion and document the good and bad experiences for future use. With the continuing collaboration of these practitioners, research is continuing into the adoption of lessons learned practices as the second phase of the action research.

4.7 CPD specialist interviews

Following the interview with Engineers Ireland CPD Accreditation Manager, and in parallel with Case Study 2, interviews were conducted with identified CPD specialists in five of the leading construction organisations

and five non-construction organisations. The purpose of which was to explore the role of CPD, particularly the Engineers Ireland scheme and how the KM criteria is being addressed. At the time of writing this paper, these interviews are being transcribed and will be incorporated into the emerging theory.

5. Discussion

With a recognised need for empirical research and KM models that are relevant to construction organisations, this paper has proposed the use of a constructivist approach to grounded theory. The adoption of such an approach will ensure that the developed model is recognisable to the research participants. Indeed, grounded theory has been shown to be useful for research focussed on interaction and human behaviour in specific settings, particularly in organisational settings and KM research. A constructivist approach to the research ensures that the research participants are actively involved in building the model at all stages, resulting in consensus on KM in construction. This is particularly evident in the two case studies where close collaboration and a sense of reciprocity are critical. From a novice researcher's perspective, using grounded theory can prove challenging and a poor understanding of its features can lead to a poorly developed theory. By selecting Strauss and Corbin's version and adhering to their guidelines on coding, prior knowledge, use of literature and sampling, integrity and rigour can be achieved. In terms of data collection, grounded theory transcends the debate surrounding positivism and interpretivism, allowing for the incorporation of multiple methods. The use of interviews, questionnaires and focus groups with differing participants such as senior managers, middle managers, engineers, quantity surveyors, CPD specialists and IT managers should provide deeper insights into and understanding of KM in construction organisations. Furthermore, the use of multiple methods facilitates triangulation, thus improving the integrity of research.

6. Conclusions

Having considered an on-going PhD study into KM within the leading Irish construction organisations, there are a number of conclusions which can be drawn:

- **There is a gap between the theory and practice of KM in construction.** While the adoption of KM is strategically important for construction organisations, much uncertainty exists surrounding its implementation.
- **A constructivist approach to grounded theory can facilitate the development of a KM model for construction that bridges the gap between theory and practice.** A focus on building knowledge of the novice researcher, participants and KM in construction can be achieved through the adoption of a constructivist approach to grounded theory.
- **The selection of, and adherence to, a specific version of grounded theory is important in ensuring rigour and integrity.** By selecting a specific version of grounded theory, adhering to its guidelines and being aware of the challenges involved, a well-developed theory can be achieved by a novice researcher.
- **Multiple data collection methods can contribute to a well-developed and credible grounded theory.** The use of multiple data collection methods within grounded theory facilitates triangulation and has the potential to gain deeper insights into and understanding of KM than would be possible in a single method study.

Upon completion of Case Study 2 and analysis of the CPD specialist interviews, it is anticipated that there will be a need to explore the technological aspect of KM. A number of IT managers from participating organisations have agreed to participate in either interviews or a focus group. Dependent on theoretical saturation being reached, further primary research may be required. Once the theory has been developed it will form the basis of a training programme which will be piloted with a number of the research participants to ensure that it is understandable and credible. The constructivist approach to developing a grounded theory of KM for construction should lead to improved awareness, understanding and implementation of KM within the leading Irish construction organisations, whilst contributing to the body of construction management knowledge.

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