LEARNING ACROSS BUSINESS SECTORS: CONTEXT, EMBEDDEDNESS AND CONCEPTUAL CHASMS

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While the construction industry is frequently encouraged to learn from other business sectors, the difficulties of transferring knowledge from one context to another are rarely acknowledged. The problematic nature of knowledge is addressed with particular emphasis on the concept of contextual embeddedness. From this point of view, the process of 'knowledge transfer' depends upon a prolonged process of socialization between actors from both the 'receiving' and 'sending' contexts networking. It is contended that a significant conceptual chasm exists between the exhortations of industry leaders to learn from other sectors and the theoretical complexities associated with knowledge transfer. An ongoing research project is described that seeks to facilitate knowledge sharing between construction and aerospace. A novel approach to knowledge sharing based upon soft systems methodology (SSM) (Mode 2) is described and justified. Initial findings from the first cycle of the research are discussed and used to highlight the importance of context in the implementation of supply chain management.

Keywords: embeddedness, knowledge sharing, supply chain, aerospace, soft systems methodology

INTRODUCTION

It seems logical and simple to presume that somewhere there exists someone who has the solution to your problems. We see this not only at a personal level but also at an organizational level with the introduction in the mid 1980s of benchmarking (Camp, 1989). More recently, the edict from Sir John Egan (DETR, 1998) to encourage the construction industry to look to manufacturing organizations as a source of knowledge to resolve their problems can also be viewed in the same vein. Indeed, the notion of learning from other industries is increasingly central to the construction best practice agenda. The underlying assumption is that the capture and transfer of knowledge between industrial contexts is unproblematic. In contrast, the emerging literature on knowledge management recognizes that managerial practices are invariably embedded within unique industrial and organizational contexts. In developing an approach to facilitate learning across business sectors it is initially necessary to challenge taken-for-granted assumptions regarding knowledge transfer and the extent to which it is possible to learn across business sectors.

INDUSTRIAL AND ORGANIZATIONAL CONTEXT

When comparing organizations from different sectors issues of context must not be overlooked Firstly, any investigation or comparison between managerial processes in different sectors must consider the political, economic, social, technological, legal,

environmental and structural factors inherent in each sector. Secondly, an organization itself is historically the product of its own politics, economics and social factors that contribute to the use of processes, practices and philosophies. It is precisely this understanding that leads Pettigrew (1997) to suggest an outer and inner context that collectively helps to determine the *features* of a process. He concedes that any analysis of organizational processes must be executed in full knowledge of the context within which the process is embedded. In fact he goes further in suggesting that context and managerial processes are inseparable.

The context within which a newly discovered process or practice would be implemented must also be understood. This context will shape and be shaped by the features of the new process or practice. The notion that a process or practice can be captured and transferred between industrial contexts is therefore considerably less straightforward than commonly acknowledged.

Even taking a snapshot in time of both context and process may be inadequate to provide a basis for understanding the nature of process. History will have played a part in shaping and developing both context and process and will be *carried forward in the human consciousness* (Pettigrew, 1997). Therefore an insight into the events that have shaped both context and process will reveal a better understanding of the current process and thus its transferability (or parts of it).

THE PROBLEMATIC NATURE OF KNOWLEDGE

Central to a theory of knowledge creation within organizations is the classification of two distinct components of human knowledge: explicit and tacit knowledge. Interaction between these constitutes an integral element of knowledge creation within an organization (Nonaka and Takeuchi, 1995). Explicit knowledge is described as knowledge that can easily be expressed or codified, whilst tacit knowledge is personal and context dependent and as such differs from explicit since it is very difficult to express, formalize or communicate. This distinction is captured in the phrase *we know more than we can tell* (Polanyi, 1966). Thus, it is that part of 'knowing' which is difficult to abstract that has become central to the discipline of knowledge management (Nonaka and Takeuchi, 1995; Collins, 1995; Pritchard, 2000; Hull, 2000; Egbu, 2000).

Problems of capturing explicit and tacit knowledge
One of the most common criticisms of the knowledge management literature seems to be the concentration on systems that seek to capture and manage only explicit knowledge (Whitley, 2000; Egbu and Sturges, 2001). In essence this seems to be more centred around the management of information rather than knowledge *per se.* The knowledge-as-information is historically grounded in the work of documentalists and special librarians (McInerney and LeFevre, 2000). Even within this narrower interpretation of knowledge management, ethical issues abound. If it is possible to codify and capture an individual's tacit knowledge then the question of how this destabilizes the individual's exchange value within the organization must be addressed. This brings to the fore a professional ethics issue surrounding who owns (and controls) that tacit knowledge inherent within individuals and forms one of the criticisms surrounding the notion of organizations' intellectual capital (Salzer-Morling, 1998; McInerney and LeFevre 2000). If criticisms of exploitation are to be avoided, it becomes necessary to consider how best to mobilize the tacit knowledge of individuals for mutual benefit within groups. The use of the term 'mobilize' is

deliberate here and used to differentiate between attempts to capture knowledge (if indeed the holistic concept of knowledge is tangible enough to be caught) and utilize knowledge for individual and collective benefit. The issue of trust between group members then becomes paramount.

KNOWLEDGE - SOCIALLY EMBEDDED IN CONTEXT

A central tenet of benchmarking concerns the benefits of knowledge sharing between organizations (Pickrell *et al.* 1997; Camp, 1989; Codling, 1992). Proponents of benchmarking suggest that organizational processes and their attendant knowledge can be transferred, shared or learned by other organizations in the cause of enhanced competitiveness. However, it appears that although these methodologies may have been successful in transferring information, they appear to have been less successful in the transfer of the human element of knowledge. It can be postulated that the reason for this lies in the lack of consideration for context. As Nonaka and Takeuchi (1995) argue, little sense can be made of information if it is abstracted from the associated emotions and specific contexts in which it is embedded.

Embeddedness
Embeddedness refers to the constraints of social relations when considering, exploring or analysing people-related concepts, such as behaviour, institutions, networks etc. (Granovetter, 1985). Linkages between actors or nodes create a shared social context, which ultimately affect economic actions and outcomes. Thus it follows that any process of knowledge sharing and creation is constrained by these networks, and the strength of the links between the actors.

These links or ties are considered to be the bridges by which knowledge sharing occurs between nodes. Furthermore, the strength or weakness of the tie determines what type of knowledge is transferred (Granovetter, 1973; Mariotti and Delbridge, 2001). Therefore strong ties, identified by high-trust, long-term and close relationships, are ideal for the transfer of tacit, complex knowledge. Weak ties, on the other hand, may limit the exchange of knowledge to that which is readily codifiable. However, it must also be conceded that the knowledge created by highly socialized groups is unlikely to be innovative. Nevertheless, through the concept of ties, the social context of knowledge and knowledge sharing becomes apparent.

Collins (1995) further extends the notion of contextual knowledge to include more subtle variants such as symbolic, embodied and encultured knowledge. These distinctions inevitably serve to introduce even more complexities. Symbolic knowledge is allegedly more transmittable than the contextually sensitive encultured knowledge (Egbu, 1999). This is arguably because encultured knowledge is learned through socialization (Collins, 1995) or through immersion in communities of social practice (Lave and Wenger, 1991). Therefore, encultured knowledge is inseparable from its context. To decontextualize it risks losing much of its richness.

Context and mental models
Notwithstanding the importance of the structural characteristics of context, it is also necessary to recognize that different industries may well possess different ways of thinking. Kuhn (1970) famously proposed that within science, each scientist views the world through the current paradigm, and that a paradigm shift will alter the view of the entities comprising the relevant universe. It can therefore be argued that tacit knowledge is *paradigm dependent*. Any knowledge created within a paradigm will

inevitably reflect the associated deep-seated rules and assumptions. If the paradigm is then viewed as a social model, or a *collective mindset*, the notion of generalisability to other networks becomes even more problematic.

It is often argued that the construction industry possesses as 'adversarial culture'. It is not necessary to accept this diagnosis entirely to concede that the beliefs and rules that govern the construction industry differ from those of other sectors. It follows that when presented with models of practice derived from elsewhere, the instinctive reaction of those that comprise the construction industry will be to analyse and explore it *in accordance with its own rules and methods of working.* Not only will the context in which it was developed be ignored, but so will the associated industry recipe. Thus the thinking behind the model as implemented within the other sector will be lost. This loss of *meaning* could all too easily result in the unsuccessful implementation of the model within the new context. We therefore can conclude that not only is the separation of knowledge from context possibly contributable to failed attempt to implement that knowledge in another context but that it can also bring with it more problems that it purports to solve.

Conceptual chasm
It is proposed that a conceptual chasm exists between the exhortations of industry leaders to learn from other sectors and the theoretical complexities outlined above. Whilst benchmarking methodologies may appear to suggest a simple process of transferring knowledge from one sector to another, there are significant complexities surrounding the extent to which knowledge is separable from context. Whilst the prospect of transferring practices from one sector to another remains attractive, it is naïve to suppose that any such transfer can be achieved in a simplistic manner. It is also clear that it is difficult to offer any generalization regarding knowledge management with any certainty. The challenge for researchers is to develop approaches to knowledge sharing that avoid the traps of over-simplicity whilst remaining meaningful to a given set of participants within a given context.

SHARING KNOWLEDGE BETWEEN AEROSPACE AND CONSTRUCTION

Project overview
The primary purpose of the research project is to develop and evaluate a participative approach to 'knowledge transfer' between the aerospace and construction sectors. The project is made especially timely by the emerging importance attached to prime contracting in the construction sector. Prime contracting provides a new approach to construction procurement based on supply chain integration, thereby reflecting long-standing practice within the aerospace sector.

There are numerous management practices within aerospace not currently used in construction. The aerospace sector also has significant experience of integrated supply chain management in the context of prime contracting. The research seeks to benefit both sectors by providing the opportunity for cross-contextual knowledge creation. The theoretical background described above has identified that business practices are invariably embedded within a broader organizational context and therefore not easily transferable. Given that many companies find it difficult to transfer knowledge between different departments, the challenges of transferring knowledge across

business sectors are considerable. It is clear that any attempt to address the complexities described above must consider:

The problem of context (outer and inner context) dependent knowledge

The principal knowledge domain (participants)

The socially embedded nature of human knowledge

The environment within which knowledge sharing occurs (shared context)

The need for understanding

The use of language

Soft Systems methodology (Mode 2)
The research team has piloted an approach for symbiotic two-way knowledge transfer between industrial sectors. The approach is based upon soft systems methodology (SSM) (Mode 2) (Checkland and Howell, 1998). SSM (Mode 2) follows the dictates of action research in that it 'aims to contribute both to the concerns of practitioners in a real situation and to the development of knowledge by joint collaboration within a mutually acceptable framework (Rapoport, 1970; Whyte, 1991; Stringer, 1996). An action research approach is compatible with the objectives of knowledge transfer and resonates with the contention that 'knowing' and 'doing' are context dependent and inseparable. SSM (Mode 2) provides a novel methodology for investigating the extent to which identified management practices are transferable between aerospace and construction. The methodology explicitly acknowledges the socially constructed and culturally embedded nature of participants' perceptions of problems and solutions. It thereby provides a structure to enable identified managerial practices from one sector to be re-conceptualized within the context of the other. The adopted methodology is characterized by a close collaboration between researchers and practitioners within the context of real problems. The methodology clearly depends upon equal levels of participation from aerospace and construction participants.

SSM has an established track record in facilitating learning and shared understanding amongst diverse participants (Checkland and Scholes, 1990; Checkland and Holwell, 1998). It gives full expression to the 'attribution of meaning' by social actors, thereby recognizing the complex and context dependent nature of knowledge. SSM was developed in response to the limitations of systems engineering when faced with dynamic, multi-perspective social problems (Checkland, 1981). Of particular importance within SSM is the conceptual distinction between the 'real world' and 'systems thinking about the real world'. Unlike the tradition of systems engineering, SSM makes no pretence that human activity systems (i.e. project processes) exist independently of human perception. SSM is intended to be used for the purposes of sense-making, rather than as a prescriptive guide to action. It is this emphasis on learning that makes the methodology especially applicable to knowledge sharing within complex, multi-perspective contexts.

Mode 2 SSM differs from Mode 1 SSM in that the approach becomes internalized as a 'way of thinking' rather than a sequence of distinct activities. The idea is that the researchers allow themselves to be immersed in the situation addressed, using SSM to facilitate the process. The various activities of SSM - rich pictures, root definitions, systems modelling - are not used to drive the study, but to make sense of the emerging experience (Checkland and Holwell, 1998). The adopted approach is therefore flexible

and light-footed. Specifically the methodology is loosely structured around the following inter-connected activities:

Identification of knowledge sharing opportunities.

Subject specific literature review.

Semi-structured interviews with practitioners.

Systems modelling.

Participatory workshops.

Dissemination seminars.

Each research cycle is likely to be highly iterative, exploring knowledge sharing opportunities with the expectation of not only achieving the goal of creating and sharing knowledge but also engendering a process of learning and reflection in the application of the methodology itself Checkland (1995). Future publications will report on the substantive findings of the research and the extent to which the derived methodology satisfies the aspirations of the industrial partners.

THE FIRST RESEARCH CYCLE: SUPPLY CHAIN MANAGEMENT

Process

Supply chain management is currently a topical subject within both industry sectors and was considered by the participants to be a useful opportunity and vehicle to initiate and pilot the knowledge sharing methodology described above. An exploration of the supply chain management literature enabled the generation of a theoretical understanding of the concept. Interviews with selected and targeted practitioners (ten from each sector) allowed an understanding of the *as is* approach to supply chain management in each sector. The interviews coupled with a review of the literature relating to the structural characteristics of the two sectors generated an understanding of the broader contextual influences.

The findings of the literature review and interviews, along with identified current and historical contextual issues, were presented to the project participants in a one-day workshop. The aim of this workshop was to generate mutual understanding (amongst the workshop participants) of approaches to supply chain management in each sector and the context within which they are embedded. Note the purpose here was to provide the workshop participants with a contextual understanding of supply chain management in their own sector.

Preliminary findings

A detailed report of the findings of the first cycle is beyond the scope of this paper. Detailed content analysis of the data is ongoing. However, it is clear that there are number of critical contextual factors that have shaped current approaches to supply chain management within each sector. Four of these are summarized below to corroborate our initial proposition regarding the contextual importance of sharing knowledge across business sectors.

Firstly, it was noted that the structures of the construction and aerospace sectors are characterized by important differences that have a significant impact on supply chain management approaches (Table 1).

Table 1: Sector comparison

UK Aerospace	UK Construction
£17.6 billion turnover	£56.9 bn turnover
154,400 employed	1,900,000 employed
1000 – 1200 SME's	160,000+ SME's
£1.9 bn R&D spend	> 0.5 bn spend
A single firm accounts for 60% of UK supplier output	Top 30 firms account for 17% of output

Notably, the UK aerospace sector is dominated by one large organization. As such, this large organization is in a position to strongly encourage its suppliers to embrace holistic concepts such as supply chain management. Conversely, in construction, no single player in the industry is in a position to influence its suppliers to adopt management concepts. What transpires is a unified and widespread approach to supply chain management in aerospace and a fragmented approach in construction. It follows that different methods are required to encourage suppliers to adopt and use supply chain management approaches in each sector. It also cannot be taken for granted that a unified approach to supply chain management can ever be developed within the construction industry given its fragmented structure. An example of this can be found in the use of information exchange mechanisms. As was pointed out during the course of the workshop, construction suffers from an absence of any unified approach to information exchange. In contrast, the aerospace sector has achieved a significant degree of standardization in mechanisms for information exchange. Those in construction commented on this achievement by noting that this is not possible in construction given the large numbers of players in the industry and their inability, opportunity or forum within which to debate and achieve this level of agreement.

Secondly, the domain within which the application of supply chain management occurred in each sector seemed to differ. Those in the aerospace sector viewed the development and application within the context of businesses working with other businesses at a strategic level outwith the context of projects. However, those in construction principally saw its application on projects. These views have consequences, which influence the ability to develop and maintain concepts such as supply chain management. The notion of long-term relationships can be more readily realized when based upon a more stable platform than projects. Short-termism is engendered through a project mentality and therefore opportunistic behaviour becomes more likely. Investment in research and development suffers since the focus is to make immediate profit and not on developing and learning for the next 20 projects.

Thirdly, the UK aerospace sector recently went through a significant financial crisis that forced it to radically review their management practices. This crisis was considered to have been the trigger for the adoption or development of a supply chain management approach, although the label 'supply chain management' came much later. From this we can deduce that supply chain management, as practiced in aerospace today, has been in development (and still is) for ten years and that it was initially triggered by a crisis. Do we need a similar crisis in construction to generate interest, commitment and leadership?

Finally, the number of 'players' in each market was viewed to influence both the nature of competition and base levels of trust inherent in each sector. It was noted that the consolidated nature of the aerospace sector is associated with high levels of collaboration, and is therefore characterized by a high level of trust between players.

Conversely, construction is a large market with a very high degree of competition, and is consequently characterized by low levels of trust. This statement has consequences for those seeking to transfer practices in aerospace that operate in this atmosphere of high levels of trust into one that is characterized by low levels of trust.

CONCLUSION

In this paper we have argued that the process of sharing knowledge between industry sectors is problematic due to the contextual embeddedness of knowledge. Our methodology for a contextually sensitive knowledge sharing mechanism has been proposed and initially tested within the first cycle of a two-year research project. Our initial findings support our assumption of the role context plays in the process of sharing knowledge across business sectors.

The methodology initially applied here will be reviewed and subject to further testing over another five research cycles. It is proposed that this insight will allow the generation and development of a robust knowledge sharing mechanism for use both across and within industry sectors.

ACKNOWLEDGEMENTS

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