139. Understanding Dynamic Knowledge and Organisational Learning in Supply Chain Integration: The Case of Organisation W

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Abstract

This paper examines the experience of dynamic knowledge transfer in supply chain integration during a project undertaken by the Bejing consulting arm of a multinational computer company. Various challenges during knowledge transfer in the team undertaking the project are described This paper explores those challenges, how the organisation culture influenced knowledge sharing, and the organisational learning that occurred. A Knowledge Creation Life Cycle is presented and discussed. It was found that both single and double loop learning occurred within a unique Knowledge Creation Life Cycle.

Keywords: Knowledge transfer, dynamic knowledge, single and double loop learning

Introduction

In today's highly competitive and increasingly dynamic business environment, a strong focus is placed on ongoing renewal of existing knowledge and the creation of new knowledge. (Holsapple 2003, p367). While the knowledge management literature abounds with conceptual frameworks and theories, the experience of knowledge transfer in companies is rarely reported and even less understood. Managing these knowledge transfer practices is critical to realizing organisational goals (Huysman and Wit 2002).

The learning organisation is an important concept that appears with knowledge management (Huber, 1991, Senge, 1990, Spiegler 2000). There is a growing realisation that knowledge management is an enabler of innovation and learning (Malhotra 2003). Ciborra (2002) maintains that it is innovative, situated knowledge that maintains competitive advantage, so how individuals learn and create knowledge in their situated organisational practices is of supreme importance.

Organisational knowledge creation is a dynamic and ongoing process for companies to engage in (Roth, 2003), and is also situated in the practices between people. It takes place when individuals and groups within a firm and between firms share tacit and explicit knowledge (Raven and Prasser, 1996, in Lee & Choi, 2003). Some writers argue that a strong focus of knowledge management research should be placed on knowledge transfer and creation, rather than studying 'knowledge' itself. Knowledge management is about 'action'— knowledge can only add value to a firm when it is actually created and applied for specific activities, tasks and purposes within the real business context (Holsapple, 2003, p274). There are few examples in the literature that bridge the gap between knowledge and knowledge application (Roth, 2003). Even fewer question or explore the role of knowledge as it connects with action (Holsapple, 2003).

This paper explores how individuals learned, created and transferred knowledge about business process reengineering, in a particular organisational setting in China Given the purpose and background to this research, the research problem was initially defined broadly, with its general focus the question:

What were the major knowledge and organisational learning challenges encountered by Organisation W in it's BPR project for Client F?

The next section briefly reviews some key literature: we discuss debates on explicit and tacit knowledge, and dynamic knowledge in organisations; we also discuss the role of organisational learning in knowledge creation. We then outline our research methodology for studying the situation at Organisation W. We present some findings to answer the research question: we identify both a knowledge creation life cycle in Organisation W, and discuss the role of single and double loop learning with respect with explicit and tacit knowledge in Organisation W. We then discuss the possible contributions of our findings to the literature of knowledge management and organisational learning.

Literature Review

Debates on Explicit and Tacit Knowledge

Recent debates in information systems have criticised an unthinking application of tacit knowledge and explicit knowledge as a dichotomy (Thompson and Walsham 2004). Essentially, they argue that tacit knowledge cannot be codified in KM systems. Some tacit knowledge however, can be embedded in organisational routines. Polyani's (1966) definition of tacit knowledge is knowledge that is 'personal, context-specific and thus, not easily visible or expressible – not easy to formalise and communicate to others (Kakabadse, Kouzmin & Kakabadse, 2001). Explicit knowledge is defined as formal knowledge including forms such as journals, databases and any other recorded information (Carey 2003). Polyani (1966, in Kakabadse et al 2001) states that there is no sharp distinction between tacit and explicit knowledge and that all knowledge comes from tacit knowledge. Thus they are intertwined. Firestone and McElroy (2003) further suggest that Nonaka and Takeuchi's interpretation of Polyani is too simple, and propose a third category of knowledge – that of implicit knowledge, which contains implicit beliefs that may be surfaced and made explicit.

Given that knowledge is intimately connected to action, Orlikowski (2002) talks of *knowing in practice*. Rather than the strict distinctions between tacit and explicit knowledge, the idea of '*knowledge as a process and close to action'* fundamentally addresses the dynamic nature of knowledge. Huber (2000) stresses the importance of taking *effective* action through looking for systemic knowledge effectively surrounding o*rganisation contexts*. He argues, 'some supposedly tacit knowledge may appear tacit because it is not in the minds of people at all, but in the systems in which they belong and work' (Huber 2000).

Dynamic Knowledge

Nonaka and Takeuchi (1995) depict organisational knowledge creation as a never-ending, interactive process. It is the *dynamic* process of knowledge creation within the organisation that builds up the cornerstone of innovation activities. This dynamic process produces two different kinds of knowledge spirals shown in Figure 1. The first spiral takes place at the *epistemological dimension* across the four models of knowledge conversion - socialization, externalization, combination, and internalization. It is the knowledge interaction between tacit knowledge and explicit knowledge that takes place at the epistemological dimension in the processes of knowledge conversion.

Another knowledge creation spiral takes place at the ontological dimension, where knowledge created at the individual level is transformed into knowledge at the group and organisational levels. So it is firmly maintained that knowledge creation takes place at three levels: the individual, the group, and the organisational levels— 'the levels of knowledge

creation' is carried out through the intensive interaction between the individual and the organisation (ibid p.57).
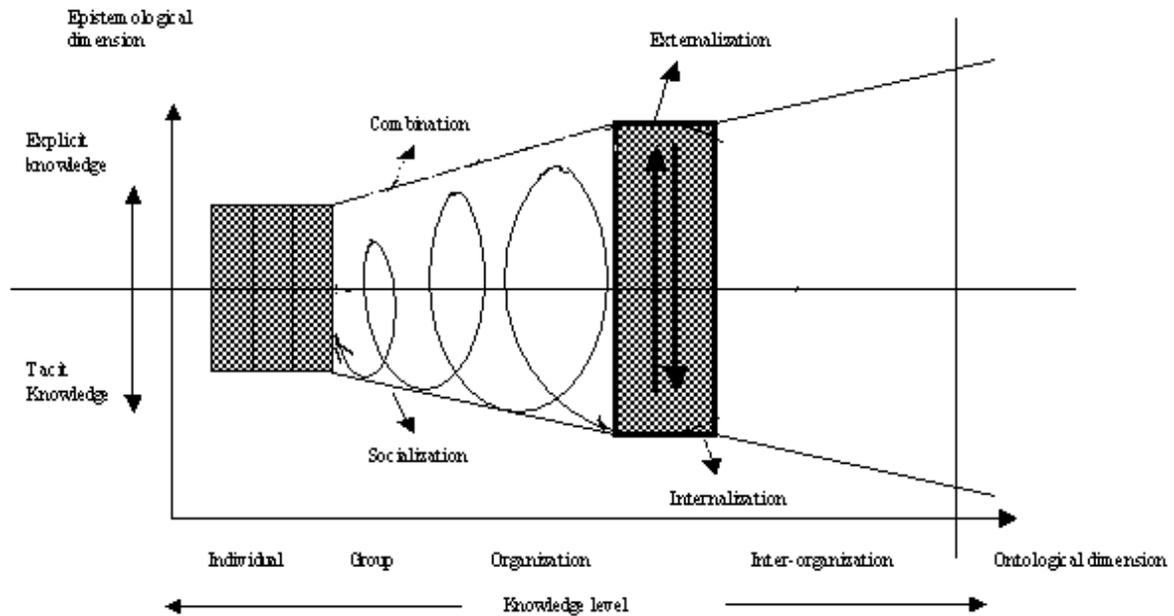
Epistemological dimension

Externalization

Explicit knowledge

Combination

Tacit Knowledge

Socialization

Internalization

Individual   Group   Organization   Inter-organization   Ontological dimension

Knowledge level

Figure 1. Spiral Model of Dynamic Knowledge Creation (Nonaka and Takeuchi 1995)

Organizational Culture

 It is said that a large part of organisational knowledge (70%) is tacit and exists in the minds of employees, while only 30% of organisational knowledge exists in externalised forms (Carey, 2003). It is also argued that even though organisational tacit knowledge has been gathered completely and made available through externalised forms (files, databases, etc), if few people know how to access these resources or put them into use, information is of little use. Therefore, a culture of encouraging 'problem seeking and problem solving' is critical to facilitate the interplay of tacit and explicit knowledge. This is why culture is believed to be an enabler of knowledge transfer and creation (Goh, 2002).

It is people who are at the heart of creating organisational knowledge, rather than technology (Fahey and Prusak 2003). Motivating people to be willing to create and share knowledge is important (Lee and Choi, 2003). A caring relationship characterised by high levels of trust, empathy, and sense of justice towards other organisational members fosters higher levels of knowledge sharing activities (Holsapple, 2003, p245). Knowledge transfer and creation is a '*socially constructed*' process that takes place over time largely through '*informal human networks*' (Holsapple 2003, p242). Schein (1985, p7, in Nonaka and Takeuchi, 1995) states that '*There has to have been enough shared experience to have led to a shared view, and this shared view has to have worked for long enough to have come to be taken for granted and to have dropped out of awareness. Culture, in this sense, is a learned product of group experience*'.

In 'excellent companies', a variety of efforts have been made to produce a shared meanings and belief system among organisational members, and each excellent company has developed its own unique corporate culture that determines '*how a company thinks and behaves*' (Nonaka and Takeuchi, 1995). Hence, with regard to the cultural aspect of an organisation,

which has been considered as an epistemological system—'organisation, as a shared meaning system, can learn, change itself, and evolve over time through the social interaction among its members and between itself and the environment' (Nonaka and Takeuchi, 1995, p42).

Organisational Learning

Learning and knowledge go hand in hand, because what we know is what we have learned. Organisational learning has long been regarded as a 'beneficial environment' for knowledge creation. Learning occurs when knowledge is transferred from one part of an organisation to other parts and used to resolve problems or provide new viewpoints and creative insights (Goh, 2002). It is the organisational learning capability that determines '*what it knows—how it uses what it knows—and how fast it can know something new*' (Prusak, 1997 in Goh, 2002). Nonaka and Takeuchi (1995) believe that the new knowledge is created through the interaction between single loop learning (where explicit knowledge is put into practice) and double loop learning (where our fundamental assumptions are questioned) forming a kind of dynamic spiral. Most organisations seem to engage mainly in single-loop learning, while not engaging in double-loop learning—they do not question and rebuild existing perspectives, frameworks, or decision premises. It is difficult for organisations to implement double-loop learning by themselves. This is due to the incongruity between what people say (espoused theory) and what they practice (theory in use) —the human tendency towards self-protection may prevent reflection (Wenger and Snyder, 2001). Furthermore, SLL is concerned with 'accepting change without questioning underlying assumptions and core beliefs', while DLL emphasises 'why and how to change the organisation'—SLL may prevent DLL from taking place (Holspple 2003, p442).

Organisational core competency is eventually developed when an organisation's learning capability becomes embedded within its organisational culture (Cavusgil et al, 2003). This core competency is more likely to be unique, rare, and difficult for rivals to replicate (Cavusgil et al, 2003), as it rests as much in the 'relationships, the spirit among the knowledge workers, and in the sum of each worker's knowledge' (Holsapple 2003).

Project Background

Organisation W is the China division of a large multinational computer company. Organisation W manufactures and sells computers, and also has a consultancy arm. The case study concerns a project undertaken by the Supply Chain Specialised Working Group (SCSWG) for Client F, who wanted Business Process Reengineering (BPR) applied to their supply chain. One interesting aspect of both the project and the company is that all documentation and spoken communication occurs in English rather than Chinese. It is company practice that all communication is in English. It is also important to note that all employees of Organisation W are Chinese people, and there are no Westerners in the company. Even though the cost of the BPR project was considerable, benefits outweighed the costs. The client was very satisfied with the significant business gains from the first BPR phase so eagerly went ahead with IT implementation as a second phase. The lead consultant of the project quoted his client as saying:

"Our client said that it was their only successful project in their business history with great business profits gained, which were far more than what they paid for the project and such significant business values were even obtained before the accomplishment of the project and the contract fulfilled…"

Although the project was successful, implementers encountered many challenges related to knowledge transfer and learning, such as how to effectively convince the client, and how to

use an appropriate methodology to approach the project. In the end, a seven step process was applied where the business practices of Client F were first investigated by survey, then followed by interviews with contact persons from Client F. An analysis report was written, and then the project team helped the organisation design business models based on the investigation and best business practice. The consultants at Organisation W then helped Client F define key performance indicators, roles and responsibilities, and concluded by assisting them with the design of the business processes.

Methodology
Research Approach
The research problem presented in the introduction - *What were the knowledge management and transfer challenges in a BPR exercise in organisation-W?* - points an interpretive philosophy, and an interpretive case study methodology was followed (Walsham 1995).

Data Collection and Analysis
Interviews were the primary vehicle for the case study. Other sources included field notes made by the first author, and project documentation. The first author also made analytic memos while in the field. Details of the interviewees and their roles are contained in Table 1. All interviewees were members of the Supply Chain Specialised Working Group (SCSWG) who participated in the BPR consulting project for Client F.

Table 1. Interviewee's role and background

Interviewee	Role	Individual Background
Implementer-A	Supply Chain Manager. (Consulting group Leader)	*Education*: Computer science & management double major High Potential Manager award in 2001. Over eight years in the business function of service parts supply chain.
Implementer-B	Inventory Manager (Consulting group Member)	*Education*: Management Major Over eight years management experience at Organisation-W regarding logistics operation and in the project. Mainly responsible for inventory management.
Implementer-C	Logistic Planner (Consulting group Member)	*Education*: International Business Major The Best Employee award in 2001. Over six years in the logistics planning section. Was responsible for logistics planning in the project.

The interviews were analysed using analytic framework techniques (Miles and Huberman 1994) where the analytic themes come from two sources – the data itself and the literature. The challenges were identified as major themes from the transcripts, and then those challenges were examined in more detail to see how issues of knowledge transfer and learning manifested themselves in those challenges.

The Knowledge Creation Life Cycle in Organisation W
Challenge 1 - Effectively convincing the client of business value
When asked about major challenges that implementers experienced in the project, Implementer A thought a long while and answered.

It was not an easy job to show the real value of our best business practice effectively to those top managers [of the client] and it was pretty hard to obtain support and trust from them as well…"

Implementer A explained that, in the eyes of their client, *Organisation W's* best business practice should be strongly supported by theoretical knowledge. However, Implementer A was concerned that his knowledge was largely practical gained during his previous operation management role. His knowledge about supply chain was obtained through learning-by-doing rather than theoretical knowledge gained from books.

"It was a fact that we were experts in the field of service parts supply chain because our best business practice was undoubtedly in the leading position in this field in China. But what we learned from business practice was not mastered systematically and we lacked top-level methodology of supply chain, and we struggled to find the best way to go about a BPR project at the beginning. We felt very challenged when we were frequently asked 'why' in terms of our best business practice in the project…"

Challenge 2 - Learning and acquiring knowledge within the real business environment

Implementer A frequently commented that carrying out a BPR project for the first time, across-industry and across-knowledge domains was a real challenge for the consulting team. He identified their learning from the BPR project were consultancy skills, BPR skills and effective conduct of fieldwork effectively. They had also gained a methodology and theoretical knowledge associated with their best business practice**.**

When asked how his working group overcame challenges, he said that the only way, and the best way was to 'learn'. He gave some examples of learning: observations of other professional consultants, studying how to conduct fieldwork as a consultant, accessing books for consultant methodologies and theoretical knowledge of supply chain, learning from the Internet, and studying all prior relevant supply chain knowledge resources of Organisation-*W*. He frequently expressed his appreciation of the excellent learning and teamwork spirit of the consulting team.

"In the project all working groups worked together and learned together. Each individual was equally important to the project. To be honest, I do not know everything about supply chain, as I am not God. Knowing everything is impossible for anyone. The different group members had different roles and responsibilities in the project and my role was to dispatch tasks and collect results. …"

Challenge 3 - Providing the client with theoretical aspects of best business practice

Implementer A was responsible for transferring their best business practice to the top managers of Client-F. From his point of view, the this transfer of best business practice was extremely important. Theoretical knowledge related to their practice was also important, and was what their client really wanted to know.

". Our client was eager to know how Organisation-W did business, our best business practice in supply chain and our successful industry experiences. But they wanted to know the whole picture of it, not part of it. In the eyes of our client best business practice should be supported by its theoretical knowledge. Best business practice was certainly our core competence, but we struggled to provide our client the theoretical aspect of business practice…"

Challenge 4 - Learning together within the real business environment
Before the project Implementer-B did not have an overall understanding of the entire supply chain. His previous role had relevance only to a part of the entire supply chain. It was the BPR project that shaped his viewpoint of the entire supply chain. He said that *Organisation-W's* best business practice in terms of service spare parts supply chain integration was created and developed through twenty-five years industry experience. They held the leading position in the field. It was a challenge job for them to build concepts together to provide the theoretical evidence required by the client.

" ...At the very beginning of the project all working groups spent at least three days working together in order to find methodology to support our business practice. Our knowledge had to be delivered and transferred to the client logically and our business practice needed to have scientific evidence. Our supply chain in terms of service parts integration management was different from manufacturers supply chain and it was very advanced in this specific area. The client wanted to understand our knowledge from general to detail, from concepts to real cases, from theory to practice step by step in a top-down manner."

Implementer-B felt that the key to overcoming challenges was *learning, teamwork and brainstorming ideas together*. He recalled that period in the project.

"Every one of us went to sleep late during that period, and we spent a huge amount of time in writing down a lot of thoughts about supply chain every night. We studied books and also summarised what we had learned from business practice, our reflection, as well as our own understanding of trade knowledge. We tried to present our knowledge and create concepts on paper, and we worked very hard. I believed that each person shaped his/ her view of the entire supply chain through learning and working together in the project ..."

He said that discussing different points of view of group members were extremely important to project success. He stated that the quality of the work delivered to the client was improved daily through brainstorming ideas and team members working together:

Challenge 5 - Using SCOR (Supply Chain Operations Reference-model) creatively
Implementer B said that although the group learning delivered a lot of concepts and business models, learning results were hard to integrate. Then they discovered the SCOR (Supply Chain Operations Reference) model, a standardized process reference model designed for effective communication among supply chain partners. It was easier to map and examine their knowledge according to this model.

"SCOR was designed for manufacturing supply chain. But we creatively used that model to serve our service spare parts integration management, and we were happy that our business practice could be supported by this industry standard. We invited an expert of SCOR community with the help of AP (Asia-Pacific division) of our company. The expert helped on the introduction of the SCOR, and he stayed a few days and then left. The client was quite happy when they found that our experience and practice could be supported by SCOR, this industry standard..."

SCOR was initially developed by Supply-Chain Council *"an independent not-for-profit corporation formed in 1996 as a grassroots initiative to develop a supply chain*

implementation model" (Bolstorff and Rosenbaum, 2003). *Organisation-W's* twenty-five year history best business practice had in fact started much earlier than SCOR.

Challenge 6 - Applying knowledge in real time across knowledge domains
Implementer B emphasized that where SCOR facilitated effective communication with the client, their 'Quick Win' strategy dramatically improved customer satisfaction, and built up Client-F's confidence. Implementer B explained that high priority was given to Client-F's ineffective business processes. Specifically, they helped Client-F examine systems and departments' linkages in order to improve those processes. For instance, they taught the client how to use the concepts of service level to reduce inventory and transportation costs, and to achieve better customer satisfaction. They shared their resources with the client by introducing their long-term business partnerships to the client. A detailed example was given by Implementer B:

"In the case of parts issue the administration needed to collect parts in the stock. All of their order lists were directly printed out from the system: if Customer A needed five parts (two A parts, one B parts and two C parts); Customer B needed six parts (three A parts, three B parts)... Administration had to return to the same place many times in the stock in order to collect all issue parts by following different order lists. We showed them how to design a business report by using systems to create one order list that listed all issue parts sorted by 'Bin location' or 'Part-number'. Not only administration's workload was dramatically reduced, but also better quality of work life was obtained."

Challenge 7 - Providing more detailed quantitative data for the client
Implementer B commented that quantitative data was strongly required by the client in the project. He said that before Phase 2 was implemented, a detailed quantitative comparison between Client F's business practices and *Organisation-W's* best business practice was produced for the client. They offered the client effective recommendations regarding how to annually reduce the distance between these two practices, and how to improve supply chain performance through long-term efforts. He commented:

"Frankly, it was not easy for us to provide client more detailed information using quantitative data (financial report after improvements etc) in the project, although we had provided the client quantitative data when doing the comparison between two practices. I think that our client had been offered a direction, a roadmap, as well as an attractive, but an achievable future. This also included the new ways of thinking about business, new business model and solutions."

Challenge 8 – Answering the 'Why' question
Implementer C commented that their project investigation was strongly supported by the top managers of Client F. She said that Implementer A and her other colleagues did an excellent job of presenting their knowledge to the top managers of their client. Implementer C experienced the challenge of answering '*Why*' regarding the entire supply chain. She explained that:

"In the fieldwork, I was often asked 'why'. Some questions could be answered easily, but some questions were very hard. Sometimes, I asked myself 'do you really understand this? Do you have such knowledge anyway and be able to answer? ' When I was challenged by these questions, I needed to learn quickly through consulting other colleagues as well as studying all relevant resources of our company, till answers were provided."

Implementer-C was also concerned that she did not know the entire supply chain before carrying out the project, because her focus on the job in *Organisation-W* was logistics planning. When Implementer C explained new business processes to the client contact person, she felt challenged to answer '*why*'. She emphasised that to convince the client it was important to answer these questions using theoretical knowledge rather than experience.

Discussion

We compared the challenges across interviews to see what knowledge and learning issues were seen as most difficult by participants. Given the nature of the project – a consulting project that applied BPR to a client organisation – it is perhaps not surprising that knowledge transfer was a common theme. Difficulties in knowledge transfer ranged from convincing the client of business value and also theoretical aspects of BPR, learning the client's organisational processes, understanding the SCOR reference model, and following a 'quick win' model of consulting.

In many instances, the knowledge creation issues were intertwined with those of knowledge transfer – gaining a group understanding of the SCOR reference model falls into this category. These knowledge creation issues were in some cases also linked to learning and reflection, such as understanding the organisation's supply chain and coming to grips with the SCOR model. Challenge 5 also included a variant of knowledge transfer, the mapping of the SCOR model on to the organisations supply chain. Application issues can be seen in Challenge 5 and 6, where the notion of 'quick win' consulting methodology was applied.

Table 2. Categorising the Challenges

Challenge	Acquisition	Creation	Transfer	Learning-in-action	Reflection-in-action	Application	Mapping
1 – Convincing the Client			✓				
2 – Acquiring the knowledge	✓	✓	✓	✓			
3- Theoretical Aspects of Best Practice	✓	✓	✓				
4 – Learning together		✓	✓	✓	✓		
5 – Using SCOR	✓	✓	✓	✓	✓	✓	✓
6 - Applying knowledge in real time		✓	✓			✓	
7 – Detailed quantitative data		✓	✓				
8 – Answering the Why? Question	✓	✓	✓	✓	✓		

It is also helpful to see the knowledge challenges experienced in the project as relating to tacit knowledge and organisational context. For instance, Challenge 8 where 'Why' was asked frequently about the supply chain, and the team's emphasis both on acquiring new knowledge (eg explicit knowledge such as the SCOR reference model) and fieldwork and qualitative data (tacit knowledge). Our view of the whole project Knowledge Life Cycle, applying Nonaka and Takeuchi's (1995) model of externalization, socialization, combination and internalization, is shown in Figure 2.

The challenges as experienced by the project team at Organisation W also showed a real concern with learning, action and reflection. The organisational culture was very much one of innovation and shared learning, as exemplified by this quote from the training manual of Organisation W.

'Work quickly, keep the tools unlocked, work whenever, know when to work alone and when to work together. Share tools, ideas, trust your colleagues. No politics, the customer defines a job well done. Radical ideas are not bad ideas, invent different ways of working, make a contribution every day, and believe that together we can do anything...'— (Organisational-W's working manual, 1998)

Huysman and DeWitt (2002) suggest that collective acceptance of knowledge sharing occurs when knowledge processes are ratified through endorsement of dominant coalitions in the organisation – the training manual can be seen as one such endorsement.

Figure 3 shows our view of the single and double loop learning that occurred in the project. Most of the knowledge workers in the project started their job from operation management where their roles and responsibilities was execution rather than research. Consequently, these knowledge workers' normal working practice in Organisation-W had shaped their ways of thinking of the enterprise, as well as their perception, expectation and viewpoint of those business tasks usually carried out in day-to-day business practice. Single loop learning occurred when the workers put explicit knowledge into practice in order to shape ways of thinking and behaviour (learning by doing), practice, trial, and often through errors. Learning by doing often triggers internalization (Nonaka & Takeuchi 1995).

This extremely challenging consulting project drove implementers' thinking, caused them to question underlying assumptions and core beliefs—the fundamental ways of thinking of the enterprise, the underlying knowledge of their day-to-day practice, the tacit knowledge of their normal routines, as well as the ways of thinking role and responsibilities as defined by the job. Double loop learning occurred and was a process of externalisation.

"My important learning in the project was 'how to think', 'how to summary think', 'how to think about routines', and having a perception of 'care why' and 'keep aware' ..." (Implementer-C)

We can see clearly the single loop and double loop learning that occurred in the project when we consider Argyris and Schon's (1996) view that learning new routines is a single loop process, and that restructuring a context implies double loop learning. It was the innovation and redesign of Client F's business process that proved the most challenging, because the implementers had to come to grips with the organisational context of Client F. The fact that the project was such a resounding success is a tribute to the double learning capacities of the

workers in Organisation W, and their culture of collaborative learning and collaborative reflection-in-action.

This research also shows that the inconsistency between 'what we practice' (theory in use) and 'what we say' (espoused theory), derives from the dynamic nature of knowledge—knowledge is constantly changing through experience and learning, and theories in use become less valued over time—whenever we learn and apply what we know. This can be seen how challenged implementers felt when dealing with the dynamic knowledge and carrying out DLL in the project. So it is essential, as Nonaka and Takeuchi (1995) state, that 'the capacity for double-loop learning be built into the knowledge-creating organisation without the *unrealistic assumption* of the existence of a '*right*' answer.
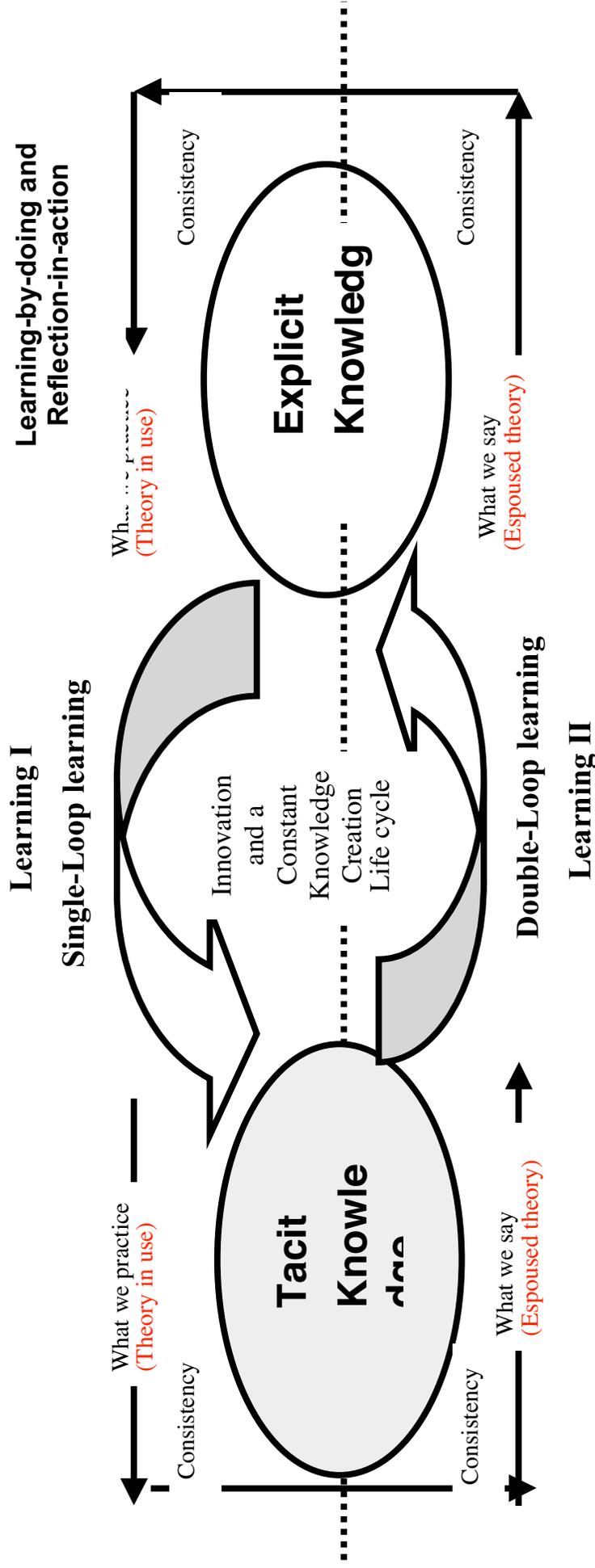
Conclusion

This paper has described the challenges of knowledge creation and transfer that occurred in a major Chinese organisation while undertaking a BPR project for a client. One of the issues we would like to draw attention to is that for this organisation, knowledge creation and transfer were very closely intertwined with organisational learning. Huysman and deWit (2002) point out that organisational learning can only occur when there is a collective acceptance and collective use of the results of knowledge sharing between individuals. This seems to have occurred in this case.

We showed how explicit and tacit knowledge interacted in the project in a dynamic fashion, and also how Nonaka and Takeuchi's (1995) processes of socialization, internalization, externalization and combination operated in the project. We then explained how single and double loop learning occurred in the project and how this related to internalization and externalization. The interplay of tacit and explicit knowledge was brought about by the interaction of single-loop and double-loop learning to constantly create new knowledge. In other words, what we practice (theory in use) could be consistent with what we say (espoused theory) when both single-loop and double-loop were undertaken through learning-by-doing by reflection-in-action. We also speculated that the distinctive knowledge sharing and collaborative organisational culture observed in Organisation W aided double loop learning and the success of the project.

Walsham (1995) states that there are four possible generalisations that can be made from interpretive case studies: development of concepts, generation of theory, drawing of specific implications and contribution of rich insight. We have contributed rich insight into the processes of knowledge creation and sharing in a BPR project. We have developed some concepts in the form of challenges encountered in knowledge sharing. We have drawn some specific implications for practitioners and academics by demonstrating how Nonaka and Takeuchi's (1995) processes of socialization, internalization, externalization and combination played out in the BPR project. We have also generated some tentative steps in a theory of how tacit and explicit knowledge may relate to theories of single and double loop learning. One of the most important empirical lessons of the experience of practitioners in Organisation W, is how their experience of knowledge processes was deeply intertwined with learning. From a theoretical perspective, it was also instructive that the knowledge processes put forward by Nonaka and Takeuchi (1995) seemed to have direct application in this situation, possibly because this organisation seemed to have many characteristics of the 'learning organisation'.

Figure 2. . The Knowledge Lifecycle at Organisation W

Learning by doing & by putting knowledge into practice

Learning-by-doing and Reflection-in-action

Learning I
Single-Loop learning

Double-Loop learning
Learning II

What we practice (Theory in use)

What we say (Espoused theory)

Consistency

Consistency

Explicit Knowledge

Tacit Knowledge

Innovation and a Constant Knowledge Creation Life cycle

What we practice (Theory in use)

Consistency

What we say (Espoused theory)

Consistency

'Destroying the existing knowledge system' and then 'Innovating new ways of thinking and doing things' *(Nonaka and Takeuchi, p50, 1995)—Theoretical knowledge acquisition and restructuring a context*

Cooperation of individuals in collaborative endeavours within a culture of openness, trust and respect (unstructured).

Thinking, self-reflection, self-examination, self-understanding, self-awareness, self-detection and self-correction

Having a perception of 'one why' and 'keep aware'

Figure 3 Knowledge and its relation to Single-Loop and Double-Loop learning

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