Enhancing Cross-Project Learning

Sue Newell, Bentley College

Abstract: Organizations are increasingly using projects to conduct a wide range of activities. In the IT industry, in particular, projects are the basic way of working. Even in project-based organizations, there is often a problem of capturing the learning from projects so that it is available for use by other projects. Instead, each project tends to start from scratch, often making the same mistakes as others have made before. This happens even though most organizations have now instituted project reviews, which ensure that project team members capture what they have done on a particular project, codify these lessons in a written document of some kind, which is then stored on a database that others can search at a later point in time. The effectiveness of this information and communication technologies (ICT) approach to capturing and sharing project learning has not been found to be very effective. This is confirmed in the study that is reported in this article. More importantly, the author explores the reasons this approach is typically not very effective. Cross-project learning can be enhanced if project reviews focus on capturing lessons related to the processes and procedures that have been successfully used, and if these lessons are shared through social networks that project members can make use of when they need help with a problem that cannot be easily solved using the existing knowledge and expertise of team members.

Keywords: Project Learning, Knowledge Transfer, Cross-Project Learning, Knowledge Management

EMJ Focus Areas: Knowledge & Information Management, Program & Project Management

Organizations are making increasing use of temporary project teams to accomplish specific tasks (Rubery et al., 2002) and increase adaptability and flexibility (Ayas and Zeniuk, 2001), e.g., to develop new products or services, or to rollout an organizational change program. In the IT industry in particular, projects are the basic way of working, both in terms of developing the software and of implementing the software within an organization (Sauer et al., 2001). Such project teams are composed of individuals from different functions and backgrounds in order to include the various knowledge and expertise that will be needed (Dunn, 2001). Such cross-functional teams can be extremely productive (Wheelwright and Clark, 1992), but they can also fail to achieve their goals on time, fail to meet expectations, or exceed their budgets (e.g., Johnson, 1995; Hastings, 1993). While such project failures are, of course, a major concern for an organization, perhaps an even more widespread problem is that the learning achieved during a project is not available for use in other projects or other contexts. As a result, as each new project is started, there is a tendency to "reinvent the wheel" rather than learn from the experiences of previous projects, even though these previous experiences may be highly relevant in the new context (Prusak, 1997).

This problem of cross-project learning has been recognized in both the academic and practitioner literature, but there has been relatively little empirical research to date that attempts to understand the problems of sharing learning across projects. As Cooper et al. (2002, p. 213) note: "It is yet to be discerned how to systematically extract and disseminate management lessons when moving from project to project, and when executing portfolios of projects." The purpose of this article is to identify the problems of cross-project learning, with a view to suggesting ways that organizations can make better use of the learning that is achieved by individual project teams. This is especially relevant for those working in the IT industry, where, as already indicated, project working is extremely common. Moreover, as we will see in the next section, many of the suggested solutions to the problems of sharing learning across projects focus on utilizing ICT to capture, store, and share codified project-based learning lessons.

About the Author

Sue Newell is a Trustee Professor in the Department of Management at Bentley College, USA. She is also a Professor in the School of Management at Royal Holloway, University of London, UK. She completed her PhD in the psychological impact of unemployment at the University College Cardiff. She has held faculty positions at Portsmouth University, Birmingham University, Warwick University, and Nottingham Trent University. While at Warwick University she was one of the founding members of IKON (the Innovation, Knowledge and Organizational Networking research unit, based at Warwick), and she continues to focus on research that explores innovation processes using knowledge and organizational networking perspectives.

Contact: Dr. Sue Newell, Bentley College, Waltham, MA 02482, USA; snowell@bentley.edu

Refereed management tool manuscript. Accepted by special issue editor Hans Thamhain.
Theoretical Background

It is commonplace now for organizations to have established practices that are aimed at retaining what has been learned on a project so it can be leveraged by other projects (Raelin, 2000). These practices are aimed at exploiting knowledge so that learning is captured and retained for use by others (March, 1991). Typically these practices involve project reviews, where project members are asked to capture the learning that has taken place on the project. Most often these reviews are done at the end of the project (Kotnour, 1999). Once the learning has been captured through this project review process, the reviews are then stored in databases that other project team members can access by either the project title or keywords. These databases are typically computer-based and can be accessed by the corporate intranet. In this way, so the theory goes, project reinvention will be avoided through using ICT to capture, store, and distribute the learning and knowledge from different projects (or other organizational activities) (Sharp, 2003).

Such end-of-project learning review and capture practices are now common where project-based forms of work are used. Indeed, they could be considered to be “best practice,” because they are prescribed in most project management methodologies; however, evidence is accumulating that the practice is not very helpful (Von Zedtwitz, 2002). For example, Keegan and Turner (2001), studying 18 companies that used project-based work, found that all had this type of end-of-project review practice in place, demanding that project members capture their learning experiences. They also report, however, that, “in no single company did respondents express satisfaction with the process” (p. 90). These authors highlighted that the main problem was a lack of time. Given the pressure of work within these companies, project team members found themselves being assigned to new projects as soon as a current project had been completed. This meant there was not time to conduct a thorough review process, even though it was company policy to do so. This short-circuiting of the learning process has been noted by others (Kotnour, 1999) and clearly if no “lessons learned” are placed on the database because pressure of time precludes the review taking place, then the exploitation of learning will not occur as anticipated; however, it is also apparent that even when lessons-learned databases exist, filled with the reflective learning experiences from many projects, there are limits to the extent they are actually used. This suggests that it is not simply a question of time that prevents such databases from either being stocked or used. Instead, we need to consider problems with the actual practice. In particular, one issue that needs to be considered is the medium of transfer. Thus, there is accumulating evidence that the medium of capture and transfer—through ICT such as databases and corporate intranets—is limited in terms of how far such technology can actually facilitate knowledge sharing (e.g., Walsham, 2002).

Hansen et al. (1999) identify two strategies that can be used for sharing knowledge—what they call the personalization and the codification strategies. Their research suggests that the codification strategy, which relies on ICT to store knowledge and learning in databases, is appropriate for sharing explicit knowledge between experts who already have a common understanding in relation to the particular focus of the knowledge. On the other hand, the personalization strategy, which relies on conversations and face-to-face exchanges with only a minimum of ICT support, is more appropriate for the sharing of tacit knowledge between people from different backgrounds who do not necessarily have a common understanding. Similarly, Swan et al. (1999) distinguish between a cognitive and community model of knowledge management. The cognitive model, like the codification strategy, rests on using ICT to store and transfer knowledge across an organization and is seen to be appropriate where the knowledge transfer involves unambiguous information that is shared between people with similar backgrounds. The community model, like the personalization strategy, relies on participation in social networks for the sharing and creation of tacit knowledge. In other words, these approaches rest on people using their social capital (Nahapiet and Ghoshal, 1998) to seek out and learn from others.

Swan et al., therefore, identify different approaches to the sharing of project learning across an organization—the cognitive approach that predominantly utilizes IT, and the community model that relies on social networks. Both Swan et al. and Nahapiet and Ghoshal also suggest that the approach that is likely to be most appropriate depends upon the context and the type of learning that is being shared. In other words, this suggests a contingency approach to the sharing of project-based learning. ICT-based approaches are likely to be most effective for the sharing of lessons and knowledge that can be made easily explicit and for sharing between people who already have a high degree of common understanding, or knowledge redundancy in Nonaka’s (1994) terms. On the other hand, personal and social networks, a community approach, is likely to be more effective for sharing lessons and knowledge that has a high tacit content and for sharing between people with different backgrounds and experiences who are working in varied project contexts.

While such a contingency approach is suggested by this literature, as we have seen in practice, the empirical research on cross-project learning, albeit limited, has tended to conclude that the ICT-based approach to the sharing of project learning is not effective, even though it is extremely common practice. In this article, then, we consider why end of project learning reviews, capture, and storage in a database for the subsequent mining and use by others (i.e., the ICT-based approach to the sharing of cross-project learning) are not likely to achieve the significant exploitation of learning expected, even though they are now ubiquitous in terms of practice. In exploring this problem we draw on empirical case material from the experiences of a number of different projects in different companies. Through this analysis we identify the problems with this “best practice” of capturing and sharing project learning. We also make suggestions about how such learning exploitation may be made more effective and so add real value for organizations.

Method

The research described in this article uses a multiple case study methodology (Yin, 1984) with cases selected from different industries in order to look at diverse contexts. A case study explores phenomena in their natural setting and uses multiple methods to collect data. Such a method is appropriate where “the boundaries of the phenomenon are not clearly evident at the outset of the research and no experimental control or manipulation is used” (Benbasat et al., 1987, p. 370). Our aim, to explore the barriers and facilitators of cross-project learning, justifies the deployment of a case study method. This is both because of the need to take into account the natural setting in
making sense of these barriers and facilitators, and because of the limited prior research in this area (Cooper et al., 2002).

Multiple cases rather than a single case was elected to be used because this offers significant advantages to developing analytical insights, as others have recognized. For example, Robey et al. (2002, p. 23) note that "multiple cases offer greater analytical leverage because phenomena can be compared across cases. Although some richness of detail may be sacrificed with additional cases, the ability to compare phenomena across different contexts is enhanced." In addition, there are advantages of using cases from different industries, both because such cases will reflect diverse contexts and because there can be more collaboration between the companies themselves. In the research design used here, workshops were an important element where we would feed back results to our case companies and share our ideas with them. Past experience has taught us that this strategy works very well where it involves companies from different industries, but where there are companies from the same industry there are problems because the companies will be less open, fearing that their competitors will gain information that will be used against them.

Each case organization would be classified as a large organization with over 20,000 employees. Following the suggestion of Yin (1984) and Benbasat et al. (1987), multiple sources of data were collected in each company. Specifically, an in-depth analysis of a project team was undertaken in each company using qualitative methods. This included semi-structured interviews with key players, informal interviews during site visits, on-site observations, and documentation. This allowed us to triangulate the data and validate the findings (Denzin, 1988).

In this article, the qualitative empirical material collected from four project teams in four cases and from the workshops is used to develop a conceptual framework; however, given the limits of space, the projects are described only very briefly, focusing on particular aspects of each case. In other words, only vignettes that illustrate points were provided, rather than attempt to tell the case study story in its entirety. The particular cases selected were chosen because they are representative of the typology that is developed later in the article. The strategy of selecting "exemplar" cases has been used by others (e.g., Pettigrew, 1990; Orlikowski, 1993; Wastell, 1999).

**Brief Case Descriptions**

**BankCo.** BankCo is a large, high-street bank operating in over 70 countries worldwide and headquartered in the Netherlands. The bank is very decentralized, having grown via acquisition. Just prior to the start of this research project, the bank had lost a major, multi-national customer to a competitor. The stated reason the customer moved to a different bank was because, although BankCo marketed itself as a "global bank," it in fact operated very different services and procedures in the different countries where it operated. The customer wanted a common interface with its bank across its different locations. The response of BankCo was to initiate what it called a knowledge management pilot project. This was essentially an Intranet project aimed at exploring how useful such technology might be in supporting knowledge sharing. The pilot project involved a team of people from different functions and different geographical locations who experimented with setting up the infrastructure and designing the Intranet interface. Before this pilot Intranet project was completed, however, multiple Intranet projects were started by different groups and functions across the bank. Each of these individual projects had been stimulated by the pilot project, but was operating completely independently. The stated intent of the initial knowledge management Intranet project was to stimulate the sharing of best practices across the globally distributed bank network. The actual impact was the creation of a web of independent Intranet projects, each focused on developing a site for their own group.

In-depth exploration of two of these independent Intranet projects demonstrated clearly that there was no sharing across these projects, even though they were all developing similar software. The focus of these projects was to "put knowledge on" the Intranet site. There was no consideration of how this might be used and interviewees suggested that they, in fact, very seldom went to any of the Intranet sites to find information. Indeed, the only real example given of the use of these multiple Intranets, developed by different project groups, was to find the bus timetable. Moreover, in terms of project reviews, many of the myriad of Intranet projects started in the bank did conduct post-project reviews. These tended to focus on explaining what had been done. These were duly posted on the Intranet; however, none of the participants interviewed said they had looked to see what others had done before starting their own Intranet project. Rather, they gave many examples of where much time and energy had been devoted to developing an Intranet with particular functionality in one site, only to find sometime later that others had developed a very similar Intranet elsewhere with almost identical functionality and purpose. For example, one Dutch interviewee recounted the story where, having developed an Intranet site for tracking stock movements, she came to the U.S. to sell the idea to her counterparts. She demonstrated the Intranet site and the U.S. colleagues were very impressed—and then showed her a very similar site that they had developed themselves in their own Intranet project!

**HealthCo.** HealthCo is a Hospital Trust that is part of the National Health Service in the UK. It provides primary healthcare facilities for all people living within its geographical boundary in the Midlands region of England. One of the projects studied was a team redesigning the process for the diagnosis and treatment of cataracts. Traditionally, a patient suffering from cataracts had to make multiple visits to a variety of healthcare specialists starting with the high-street optician (who initially diagnosed the cataract problem but whose diagnosis was not accepted as a formal diagnosis), who referred the patient to his/her GP (who could not actually make the diagnosis because of a lack of specialist equipment), who then referred the patient to the specialist consultant at the hospital (who made the official diagnosis), who then sent the patient to the nurse (for a health-check), who then put the patient on the consultant's waiting list (so that finally the patient could have the operation once reaching the end of the waiting list). After the operation the patient was then referred back to the consultant (who checked that the operation had been successful), who then sent the patient back to the optician for new glasses (if needed). This whole process typically took a year.

A project team was put together consisting of representatives from the multiple professional groups involved in the process—opticians, doctors, consultants and nurses—and facilitated by an internal change consultant. This team met on several occasions
and gradually, through discussion and dialogue, managed to redesign the process. This redesign process was possible only after they had each learned and understood more about the respective roles and expertise of the others involved in the cataract diagnosis and treatment process. Through the interaction it emerged that, at the start, each had known and understood very little about what others did and what others were capable of doing. Based on this understanding of the total process and the capabilities of all the different parties they were able to relocate certain tasks to different groups so that the process was streamlined. In the new process, the patient is directly referred by the optician to the consultant for the operation. The optician, in fact, actually telephones the scheduling administrator and books the appointment. The patient then goes straight back to the optician for the final check and the new glasses, if required. The new process was seen as a success by all the parties involved. The team captured their learning in a document that described the new process as it now operated. Many healthcare professionals from other hospital authorities heard about the new process through various mass media publications and through the NHS intranet. They were interested in the new process as they recognized the inefficiency of their current processes (i.e., the traditional process involving multiple visits). They were sent the document setting out the new process. Unfortunately, these other healthcare authorities, on reading about the new process as redesigned by the project team in HealthCo, rejected it as "unworkable."

**CarCo.** CarCo is a US-owned car manufacturer based in the Midlands area of the UK, making family cars that are sold globally. It was originally a British company but has been sold several times to different parent companies. At the time of the research the company was in the process of changing hands from a European parent to the new American parent. One of the projects explored in-depth was the development of a new vehicle that was started under the European parent but was to be finished under the American parent. Given the change in ownership, effort was put into learning as much as possible about the product and the process from the outgoing parent company, which had essentially designed the vehicle and whose engine actually powered the vehicle. To achieve this, each CarCo engineer was partnered with an engineer from the outgoing European parent company. The CarCo engineer had to learn as much as possible from his counterpart before the final agreed date for separation. This was achieved fairly successfully, with personal networks being especially important in encouraging this sharing. Subsequently, however, under the new American parent company, a decision was made to replace the engine that had been developed by the old European parent with a new engine, so that reliance on the old parent was reduced. In this phase, a different group of engineers was working on the project.

At the end of the first project, the outgoing engineers had documented what they had done in relation to developing the original engine, including process and product information; however, this was not used by the new set of engineers as they developed the replacement engine. Indeed, during interviews they explicitly stated that this previous learning was not applicable to them because the new parent company had very different processes and procedures for new product development as compared to the old European parent. They saw both their own project and the previous project as unique—the new project because it was the first to use the new procedures from the new parent company, the previous project because it used procedures that were no longer applicable given the change in ownership. When probed a bit further during the interviews, many interviewees admitted that there was likely to have been some learning from the previous project that could have been useful. Nevertheless, they also said they had not sought out this learning because they saw the situations as so different.

**WaterCo.** WaterCo is a leading UK water and sewerage company serving the whole of the Midlands region of the UK. It is part of a European environmental services group providing water, waste, and utility services. The two projects studied in this case were both related to the replacement of filter beds with new activated sludge plant complete with new sludge treatment facilities at a sewage treatment works in the Midlands region of the UK. The first project was original in many respects. Although there were three other major sewerage treatment works reconstruction programs completed or nearing completion at the time of the project's inception, none of them was comparable in terms of the level of investment, timescale, dedicated staffing, and site organization. This project was unique, then, in a number of ways. First, as an estimated £60 million investment, the project was the largest capital scheme in the firm's development program—projects usually being around £500,000 to £2m in size. Second, the timescale was very demanding and the feasibility work, planning applications, assessment, and site investigations had to be done simultaneously rather than sequentially to meet the ambitious deadline set by one of the directors. Third, the core team was co-located on site together with the main contractor. This, together with the shared, extended responsibility over the final detailed design, gave the core team a certain amount of autonomy and independence from the main office, even though this office was situated just across the road from the site. Fourth, the project benefited from a specialist, dedicated team. Finally, the project was unique in its combination of civil engineering works with complex mechanical and electronic tasks supporting an improved water treatment process. Project activities were very varied, including building a bridge over a river, land remediation, developing additional infrastructures, and designing sophisticated software control systems. While the first project was thus unique within this organization, the second project was very similar. Again, it was a very large capital project that involved multiple contractors. In the first project, those involved had to design the facilities to meet new environmental expectations. The problems they encountered were largely technical in nature, e.g., to find ways to ensure tank water tightness. The project team knew that their learning in relation to these problems would be invaluable to others working on similar problems on subsequent projects so they were encouraged to reflect on what they had learned and were careful to document what they had done and how they had worked. The second project later used this learning when it encountered similar problems and was able to solve the problems much more efficiently than would have otherwise been the case. They did this by utilizing their social networks and talking to the engineers who had been involved in the first project, some of whom were also involved in the second project.

**Case Findings**

Three general findings emerged from the case analysis. First,
ICT-based sharing of project learning was not very effective. Second, learning occurred when there was a need to learn because there was a problem to solve that could not be solved by the existing knowledge and expertise within the project team. Finally, learning was much easier to share within a function than between different functions. Each of these issues is considered below.

ICT-Based Approaches and Network Approaches to Sharing Project-Learning. As a general finding, on all of the projects studied, project reviews and the documentation of learning were demanded by the organization. This document of learning was cataloged and then placed in an organizational database and so was available for others to search and learn from. Interviewees in all companies complained that the practice of documenting learning was very time-consuming. More importantly, interviewees also stated that the documents thus produced were typically not helpful. Examples were given of periods when massive effort had been put into documentation. This documented learning was then placed on the corporate intranet but was subsequently unused. A consistent story across the projects was that, yes, a document was produced on what was learned from the project and made available to others via ICT, but none could say what had subsequently happened to this document and no one really felt the documents were useful. Moreover, the project teams had made very little use of the documented learning from other projects on their own project.

Those examples where transfer of learning was effective were much more heavily dependent on social networks than on ICT. For example, in WaterCo, the social networks between the engineers on the two projects were regarded as much more important than the documents that had been developed. Engineers on the second project talked to engineers from the first project when they encountered a problem that they could not easily solve themselves. In CarCo, during the first project the pairing of engineers with departing parent company engineers was seen to be very effective in the transfer of learning.

In other words, learning from other projects occurred through a process of dialogue, and was only rarely mediated through ICT. Moreover, in both WaterCo and CarCo, the learning did not typically happen in one conversation. Rather, it occurred over time as the individual(s) learned something from someone else, went and started to apply what had been learned, and then went back to understand more about the experience. This was very dependent on having people who were co-located so they could engage in this dialogue in short bursts (especially given the time pressures everyone was under). On the other hand, where the emphasis was only on documentation and ICT transfer, as in BankCo, there was very little evidence of any sharing of project learning.

Learning in the Face of a Perceived Need. One of the most consistent findings that emerged from the different cases was that project team members sought out help from others only when they came across a problem that could not be solved based on the existing knowledge and expertise within the project team. In other words, project team members learned when they needed to; they did not randomly search out the learning experiences of others just on the off-chance that they would learn something that might be useful in their current project. This meant that the open provision of learning information via documents placed on an organizational intranet (the supply side of the equation) often went unused because there was no corresponding demand. Thus, in BankCo the provision of information on the different intranet sites was done in a vacuum, with no consideration of how this information would be used—and it was not. Similarly, in CarCo the original project team documented what they had learned but this was not subsequently used by the follow-up project because those involved felt it would not be relevant because of the changed context. One particular problem here is that, given that projects are all in different phases, the sharing of learning is problematic because people on other projects are not at the same stage of a project when they would want/need to learn from the other projects’ experiences. On the one hand, this is the advantage of a searchable database that has lessons learned from past projects stored in it that can be searched by other project team members at some point in the future; however, what appeared to happen in most cases, was that, rather than search out lessons in these databases, project team members more often sought out individuals whom they thought might have some answers to the problems they were currently facing. In other words, they used their personal networks as discussed above.

Learning Within Versus Across Functions. In all cases it was evident that it was much easier to share learning within a function or profession rather than across functions or professions. All the projects were multifunctional but some included more varied professional groups and functions than others. Learning across projects was easier the more homogenous were the teams across which the learning was being shared. So sharing learning was easier among the engineers in CarCo and WaterCo than between the different professional groups in HealthCo and across the different functions in BankCo. Thus, the engineers in the two projects in WaterCo could learn from each other and the engineers in the initial CarCo project could learn from their engineering counterparts in the departing European parent company. This is not to say there was no learning when multiple professional groups or functions were involved. Thus, it was possible to share learning within the project team in HealthCo after the project team had spent considerable energy discussing differences and developing a shared understanding of their respective skills and abilities. The problem here was that when they then attempted to share their learning with others who had not gone through this process of developing a common understanding, their experiences were dismissed as unworkable. In other words, other groups in other hospitals had very traditional attitudes about the respective skills and expertise of the various professional groups involved in the diagnosis and treatment of cataracts. Thus, when they were provided with information that appeared to contradict this existing knowledge they dismissed it and could not learn from it. In particular, giving opticians much more control over the diagnosis process contradicted their traditional view of an optician’s ability, and so was not considered to be credible knowledge.

Discussion
The first finding from the cases presented above demonstrates the limits of relying on ICT to capture and share learning and knowledge across projects. At the workshop when findings were being reported back to all the companies, the issue that emerged most strongly from each case was the tremendous effort and emphasis that was put on end-of-project learning reviews and the storage of this knowledge on databases of some kind that could
be searched by others. Yet, what also emerged from all cases was that, in relation to the projects that were examined, very little if any use was made of these databases in seeking suggestions either to improve what they were doing in their projects or to solve problems when they were experienced. Instead, the main finding was that people either relied on known acquaintances when seeking help or advice or solved the problems on their own through a process of trial-and-error or learning-by-doing. The finding that social networks are more important than databases has been similarly found by others (e.g., Keegan and Turner, 2001), as has the preference for learning-by-doing rather than learning from others, especially when these others are unknown (Raelin, 2000). These previous findings, together with the findings from the empirical material here, suggest that, in the context of the sharing of project-based learning, the community model (Swan et al., 1999) or personalization strategy (Hansen et al., 1999) of knowledge management is more useful than the cognitive, ICT-based model or codification strategy.

More importantly, the other two findings presented above give insight into this preference for the personalization strategy or community model of knowledge management over the ICT-based approach. In other words, they help to explain why so little use was made of the project review databases where learning from previous projects was stored. The first finding—that learning occurs in the face of a perceived need—suggests that there is an issue about the timeliness of the provision of knowledge. The second finding—that learning is easier within rather than across functions or professional boundaries—suggests that there is an issue about the content of knowledge. Exhibit 1 depicts these two dimensions of knowledge sharing that characterize the different approaches to cross-project learning observed in the cases. Each of these dimensions will be considered in turn, drawing upon the four case examples, which have been situated on the matrix in the figure, to illustrate each dimension.

**Exhibit 1. A Typology of the Dimensions Influencing the Effectiveness of Cross-Project Learning**

<table>
<thead>
<tr>
<th>Demand</th>
<th>Supply</th>
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<tr>
<td>Timeliness of Shared Knowledge</td>
<td>Content of Shared Knowledge</td>
</tr>
<tr>
<td>Wrong time &amp; wrong content e.g., BankCo</td>
<td>Wrong time but right content e.g., CarCo</td>
</tr>
<tr>
<td>Right time but wrong content e.g., HealthCo</td>
<td>Right time &amp; right content e.g., WaterCo</td>
</tr>
</tbody>
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The Timeliness of the Knowledge Sharing: Supply Versus Demand for Knowledge. This relates to whether the emphasis in cross-project learning initiatives is on either the supply of or demand for knowledge. As we have seen, project team members only look for help when they have a need (a problem they cannot easily solve using their own knowledge and expertise), and then they will only go and seek previous solutions from other projects if they believe they are likely to find experiences that are relevant to their own context. The problem is, in the context of projects there is a strong tendency to believe that each project is unique and so has nothing to learn from what has gone before. This was particularly the case in one of the CarCo projects, but participants in many of the other projects that were looked at also emphasized their uniqueness. One point to note was that, to some extent, this uniqueness was self-generated—by engineers wanting to make modifications that were not entirely necessary, by not having a good original specification, or by multiple projects spinning off from each other in an uncontrolled way. Nevertheless, the point is that where a project is seen as unique there is no attempt to look elsewhere for solutions—what is the point when no one has done anything like this before? Thus, the more a project is perceived as unique the less likely are teams to try and learn from others. For stored project lessons to be useful there must be a demand for these lessons from those engaged in current projects. In many projects there is no such demand and so the supply of lessons stored in an ICT database will go unexplored, however potentially relevant these lessons from the past may be.

Unfortunately, it appears that companies are ignoring this issue and so are exerting considerable effort on the supply side of project learning (getting project teams to capture and store their learning on ICT) but doing very little to stimulate the demand side (encouraging project teams to think about how there is some overlap between what they are doing and what others have done in the past). This is why the ICT-approach to the sharing of cross-project learning was seen to be so ineffective. The BankCo case was probably the most straightforward example of this tendency. The intranets that were being developed were all about the supply of information and knowledge. No consideration was given to who might use this information or how it might be used. The end result was that these intranets were not used, even by those projects that had as their main raison d'être, the sharing of knowledge across the banks—that is, the intranet projects themselves. These projects that were supposed to prevent reinvention across the bank, thus themselves spawned considerable reinvention!

On the other hand, in two of the projects there was demand for learning from the experience of others—WaterCo and HealthCo. First, in WaterCo the individuals were keen to learn from the experiences of those who had been engaged in the first project. The project here was a construction project. Keegan and Turner (2001) describe construction projects as tending toward conservatism. They suggest that this is the result of having prominent clients who discourage innovation and of the mass of rules that relate to safety that must be adhered to. In this environment, following standard procedures (which are essentially based on lessons from the past) is the norm so it is expected that each project will learn from what has gone before. Companies in industries that undertake this kind of large-scale construction or engineering project are thus more predisposed to learn from the past and to seek out ideas that will help in the current project. In some ways, this emphasis on learning from the past can lead to a different problem—it can drive out innovation because there is a tendency not to try out new ideas that have not been previously tested (Keegan and Turner, 2001). In relation to
the exploitation of knowledge, however, this willingness to learn from the past does make it more likely that project-reviews will provide information that will actually be used. It is important to note, however, that in WaterCo, the engineers in the second project did not go to a database to extract lessons but instead used their social networks to talk to the engineers who had been involved in the first project.

The other project where lessons were actively sought out by others was in HealthCo. Here, people in other health authorities heard about the cataract project and were provided with information on the new process at HealthCo. As seen, however, they rejected the new process as unworkable. To understand this we need to explore a second issue that helps to explain the lack of use of the ICT approach to the capture and storage of project learning. This relates to the content of what is captured and stored.

The Content of the Shared Knowledge: Product Versus Procedural Knowledge. Two people (or two project teams) can only share learning or knowledge when there is some common or overlapping knowledge between them. Nonaka (1994) refers to this as "knowledge redundancy." On a similar theme, Cohen and Levinthal (1990) talk about "absorptive capacity," i.e., the capacity of a recipient of knowledge to take in and use knowledge. Most importantly, absorptive capacity is a function of preexisting knowledge and practice. The problem is, in relation to cross-project learning, that projects are often unique in terms of their specific focus and context and involve individuals from diverse professional and functional backgrounds. In this context, there is likely to be limited knowledge redundancy so that knowledge from a project that relates to what was actually achieved, is not likely to be understood by those not involved in this project. This means that knowledge about what was actually done on a project—what is referred to as product knowledge in Exhibit 1—is likely to have a limited value to those in other projects because they do not have the capacity to absorb this knowledge. The HealthCo case illustrated this very nicely.

In the HealthCo case, the content of the new knowledge that was shared—explaining the new cataract process as now used in HealthCo—was not useful to others who had not been through the same learning experience as those in the project team. This product knowledge was therefore rejected as unworkable. However, there is likely to be a much higher likelihood that others will be able to absorb information about lessons that have been derived about the procedures or processes that were found to be helpful in solving particular types of problems or developing solutions. Such knowledge is likely to involve much less technical content and so will be easier for others to absorb, and learning from these procedures or processes may enable a team in another project to complete their own tasks more efficiently and effectively. Therefore, information about who was involved, how these people were selected, how conflict was overcome, how collaboration was achieved between potentially competing groups, etc. is potentially very useful to people on other projects. Indeed, even lessons about what not to do in procedural terms may be shared with others so they will not make the same mistakes. This "procedural learning" is likely, therefore, to have a much wider potential audience.

These results, therefore, suggest a contradiction: most projects spend time capturing learning in terms of what they have achieved, while a more useful type of learning for others is typically how these achievements have been made. Others have also emphasized the importance of capturing procedural knowledge for enhancing future project work (Neale and Homes, 1990). In the WaterCo case, where the team successfully transferred learning from one project to the next, it is important to note that they focused as much on capturing procedural knowledge as product knowledge. The problem is that typically the project milestones, where reflection on learning is explicitly encouraged, too often focus on what has been achieved rather than how it has been achieved, so that what is stored on the database is product rather than procedural knowledge. Garrick and Clegg (2001) refer to this as the problem of conflating project performance with project learning. They identify how the excessive emphasis on project performance detracts from a focus on the learning that has occurred.

The two issues of the timeliness of knowledge and the content of knowledge are clearly linked. Where a project sees its situation as unique, the content of learning in other projects is likely to be perceived as of very limited benefit—so there will be no demand. Moreover, focusing on sharing knowledge about what was done (product knowledge) ignores the fact that in other projects those involved will not have gone through the learning experience that those on the initial project have been through. The result is that those in other projects will not appreciate the relevance and importance of this product-type knowledge—so even if there is demand, what is supplied will be of little use, as in HealthCo. The project team members will not have the capacity to absorb this new knowledge from other teams (Cohen and Levinthal, 1990).

Lessons Derived from the Analysis: What Can Be Shared Across Projects. The problem appears to be that most attempts at cross-project learning focus on "pushing" (supplying) product knowledge through ICT onto a passive receiving audience who either has no demand for the knowledge and/or does not have the ability to absorb the knowledge. The example in BankCo was typical—all the effort went into putting the knowledge about the specific design of the software on the intranet but no one thought about how it was being used or whether others would find such knowledge useful. On the other hand, where learning is "pulled" by a particular project team because they are facing a problem they are currently unable to solve, then lessons from other projects about how they have solved this problem (procedural knowledge) can be helpful. This was the case in WaterCo, where the engineers involved in the second project went to the engineers from the first project to identify experiences that could help them learn how to solve the problems in their current situation.

This analysis indicates that there may be ways for managers to encourage more effective cross-project learning. First, the analysis suggests that much more effort needs to be placed on encouraging project team members to focus on how they have achieved their goals, not what they have achieved—that is, on procedural knowledge rather than product knowledge. This demands a change to the typical focus of project milestone reviews that generally ask project teams to capture only what they have achieved and do not encourage reflection on how.

Second, the analysis suggests that effort needs to be placed on encouraging teams to see how, despite their uniqueness, there is room for them to learn from the experiences of others, because others may have learned about procedures that will be useful to
them. In other words, it is important for managers to encourage project teams to think about what procedural-type problems they are likely to face and to recognize that other teams may have developed some useful ways of overcoming these problems, from which the team can learn. So, while the particular focus of the project may be unique, the processes that are needed are likely to share much in common with the processes used by other projects in the past. In this way, managers will be encouraging project team members to consider their demands for knowledge from past experience rather than simply concentrate on ensuring that project teams "supply" their knowledge at the end of the assignment.

Finally, there is the more general suggestion from the analysis that effort placed on developing personal networks (a community approach to facilitate cross-project learning) may be more effective than, or at least a necessary compliment to, setting up a database to capture codified lessons learned (an ICT approach to cross-project learning). Indeed, the literature on communities of practice (e.g., Brown and Duguid, 1991) demonstrates the power of such communities in the sharing of learning.

Conclusions
The four cases discussed in this article each appear to be an exemplar of one of the four quadrants of the typology that has been developed in this article, as depicted in Exhibit 1. The most effective sharing of learning across projects, then, was evident in WaterCo, because here those involved managed to focus on the appropriate content (procedural learning as well as product content) and provided this in a timely fashion because it was demanded by those in the second project team. In this context, the team members used their strong networks to gather the learning experiences from the members of the first project team. In the other three cases, the attempts at cross-project learning were inadequate because the sharing was either of an inappropriate type of knowledge (product knowledge rather than procedural knowledge) or provided at an inappropriate time—supplied to an audience without a consideration of whether there was any demand.

Unfortunately, our conclusion from the experiences of the project teams that we have studied is that a focus on the supply of knowledge is more promising than is a focus on demand, as is the focus on product knowledge more common than a focus on procedural knowledge. Most companies thus use what is described as an ICT approach that attempts to facilitate the capture and sharing of project learning through the supply of product knowledge. Project team members are encouraged (even demanded) to write down what they have achieved and place this on the intranet. Yet, our findings suggest that people prefer to use their social networks (their social capital—Nahapiet and Ghoshal, 1998) to find solutions to particular problems they are facing by asking people they know about how they have solved similar problems in the past.

In conclusion, the analyses of the empirical data on cross-project learning presented here suggests that companies need to reorient their current practice away from end of project reviews that capture lessons on what was achieved (product knowledge) and store them in a database—an ICT approach to cross-project learning. We have seen how this approach is typically ineffective and we have explored the reasons why this is the case in terms of the inappropriate timeliness and content of the knowledge thus provided. Instead, companies should focus on encouraging project teams to reflect about the processes and procedures they have gone through and how these have helped (or indeed hindered) them in the pursuit of their project goals. These lessons can then be shared through social networks, with project members seeking out these lessons using their networks when they face a particular need to learn from others because of a current work problem. This we have described as a community approach to cross-project learning. This approach to cross-project learning is likely to have much wider currency because even where project goals are somewhat different, the procedural learning can still be relevant and helpful. This suggests that, rather than spending resources on developing sophisticated databases that few people use, more worthwhile effort could be invested in developing the social networks that facilitate learning across projects. Managers need to think strategically about placing people on projects and organizing events that bring individuals from different projects together—not so much to specifically share learning and knowledge but to develop networks that can facilitate such sharing when the demand is activated by a particular project task. Our research and analysis suggest that such an emphasis on social capital (Nahapiet and Ghoshal, 1998) and community development (Brown and Duguid, 1991) rather than ICT capital development is likely to be more fruitful in the long-term even if it is more difficult to actually observe cross-project learning in the former. ICT capital development may have the semblance of encouraging cross project learning and look structured and manageable, but the messier community capital development is likely to be the more effective long-term solution. We suggest that this community approach to cross-project learning is likely to be more effective, because the typical project context involves tasks and goals that are unique and involves project team members from multiple professional and functional backgrounds, so that common understanding of content or product knowledge will be unlikely.

References