Transferring ERP's best practices: an organizational memory mismatch approach

Eveline van Stijn[a] and Anthony Wensley[b]

[a] School of Business, Public Administration and Technology / department of Business Information Systems
University of Twente, The Netherlands
eveline_van_stijn@yahoo.com

[b] J.L. Rotman School of Management
University of Toronto, Canada
anthony@wensley.ca

Abstract

The thread we develop in this paper is that best practices cannot simply be transferred. Organizational memory mismatches form the core of our metaphorical lens to surface understandings of what goes wrong with such transfer and how people negotiate solutions. We provide an understanding of the ways in which the creation and implementation of ERP systems result in both mismatches between existing knowledge and knowledge embedded in ERP systems and a failure to represent knowledge 'in context'. We also utilize this approach to reason about the etiology of a variety of types of misunderstanding and approaches that may be adopted to respond to mismatches and to improve the variety of contextual information made available to individuals interacting with ERP systems. Illustrations are primarily drawn from a case study at a Dutch SME. The overall thrust of the paper is to identify a variety of concerns, intriguing questions and avenues for future research.

Keywords: best practices; organizational routines; organizational memory mismatches; Enterprise Resource Planning systems.

Suggested track:
The importance of knowledge management in IT design, implementation and use

1. Introduction

A key premise underlying Enterprise Resource Planning (ERP) systems is that they bring with them a set of best practices or preferred ways of doing business, as developed by suppliers such as SAP and sometimes ERP consultants, and particularly embodied in their reference models (Davenport, 1998; Kumar & Van Hillegersberg, 2000; Markus & Tanis, 2000). Reference models are process models (often in broad

sense, including function, data, and organization models) that are available from third parties (Scheer, 1998). These best practices are primarily based on benchmarked clients who have already implemented ERP systems (Kumar & Van Hillegersberg, 2000; Scheer, 1998). They are characterized by standard blueprints and reference models as well as automated ways of working. Vendors argue that the adoption of these best practices simplifies the configuration task - thus reducing the cost of implementing the system - and is likely to bring about improvements in organizational processes. Consequently, organizations face pressure to conform to these best practices (Gosain, 2004).

The thread we develop in this paper is that best practices cannot simply be transferred (Orlikowski, 2002; Szulanski, 1996). In her discussion of knowing-in-practice, Orlikowski (2000) articulates why she finds the notion of "best practices" and their simple transfer quite a problematic one. "When practices are defined as the situated recurrent activities of human agents, they cannot simply be spread around as if they were fixed and static objects. Rather, competence generation may be seen to be a process of developing people's capacity to enact what we may term "useful practices"- with usefulness seen to be a necessarily contextual and provisional aspect of situated organizational activity (Orlikowski, 2000, p. 253)." This capacity to enact useful practice to a great extent depends on individuals' knowledge (or knowing) and the organizational memory with which individual memories are mingled.

Our paper provides an understanding of the ways in which the creation and implementation of ERP systems result in both mismatches between existing knowledge and knowledge embedded in ERP systems and a failure to represent knowledge 'in context'. We also propose a number of actions that organizations can take to respond to mismatches and to improve the variety of contextual information made available to individuals interacting with ERP systems. Our concern is that relatively little attention has been paid to these mismatches both initially and, more importantly, as the organization and the ERP system evolve and co-evolve (Van Stijn & Wensley, 2001).

Throughout our discussion we will primarily make reference to the case of Electro (a pseudonym). Electro is an SME (about 100 employees) located in the Netherlands which produces emergency lighting as well as printed circuit boards (PCBs) and Customer Specific Products (CSPs). The revenues of Electro total about €13 million annually. The current CEO took over from his father about 3 years ago, subsequently introducing a variety of major changes to the organization. One of these changes

involves the introduction of an ERP system that started June 2000, with the system going live in December 2001. This study of Electro's ERP introduction took place October 2002. After an initial interview with the chief of operations, all project documentation was made available and arrangements for interviews - with 10 of the 28 current users - were made. Electro's case material allows for an enrichment of our narrative.

The remainder of the paper is composed of four sections. In the next section, section two, we further establish the idea of ERP's best practices and their transfer, and conceptualize the linkage to organizational routines and memory. In section three we both explain and elaborate on the metaphorical lens that lies at the core of this paper – the organizational memory mismatch approach. Section four presents an extended discussion of some of the insights that our approach enables to make and provides linkages between these insights and a variety of related research traditions. Finally, section five is used to draw conclusions and provide a summary of some of the key themes set out in the paper.

2. Transferring ERP's best practices: routines and memory

Best practices may be considered to be representations of standard practice. Standardization is meant to provide a common ground for understanding practices and for performing them, within and across organizations (as the benchmarked processes are often intended as industry standards) (Kallinikos, 2004) in a seamless and efficient manner. However, some will argue that if all companies were to adapt to the same standardized best practices, there would be no competitive advantage (Bearda & Sumner, 2004). This leads to a consideration of the uniqueness, or otherwise, of best practices. In this light, it is important to consider that best practices are often not implemented exactly as the supplier intends, because they can be configured, in particular to better "fit" the organization. Swan et al. (2000) maintain that such configuration will differ substantial among individual organizations as well as on a national level. Some best practices will fit better with cultural norms and values in one country versus another, or, because the companies view themselves as rather unique, customization will be regarded more acceptable. Some ERP package suppliers may not be very supportive of customization, but there is a trend to make enterprise systems more flexible through different modeling tools, component-based and more open, and easier to (technically) integrate software. However, for smaller companies this type of 'explicit' customization may be more difficult to achieve as it can still be very

costly. Pollock and Cornford (2004) exemplify this discussion nicely in the context of a British university.

However, regardless of whether an organization makes use of 'explicit' customization, it will end up with a customized system. In support of this we follow Gosain (2004) – in suggesting that each company essentially constructs its own unique instantiation of the technology that is configured and customized to fit (to a certain extent) with the new organizational situation, and does so in a more-or-less unique manner. This suggests that there is an essential incoherence in the concept of standardized "best practice" as each organization uniquely interprets these practices during the implementation and use of the ERP system. As such, adoptions of standardized practices are subject to "interpretative flexibility" (Swan et al., 2000). "This view is in keeping with other research which suggests that information systems in general have features that are malleable, uncertain and subjective, and therefore are inherently sensitive to social shaping (Swan et al., 2000, p. 28)." In addition, in line with Orlikowski's (2000) previously quoted remark, we note that practices themselves are open for improvisations, flexibility, and change, when they are performed and evolving (Feldman & Pentland, 2003). As Wagner and Newell (2005) interestingly note: "Somewhat ironically, even in the site where the so-called 'best practice' was developed, the university eventually resorted to modifying the standard in order to ensure that the faculty actually co-operated in the system use. In other words, using the vanilla organization-wide system was not adhered to, even in the site where the 'best practice' was initially defined. The likelihood that this 'best practice' will be adopted as standard across other sites is perhaps even less likely (Wagner & Newell, 2005, p. 22)."

Central to our argument, we consider ERP's best practices as a particular form of organizational routines. Organizational routines are typically characterized as "… a repetitive, recognizable pattern of interdependent actions, involving multiple actors. (Feldman & Pentland, 2003, p. 96)" or in other words, "… multi-actor, interlocking, reciprocally-triggered sequences of actions (Cohen & Bacdayan, 1994, p. 554)." A key element of organizational routines is that they have multiple participants. In the context of ERP systems, a range of actors who participate in the implementation and use of the system may be identified (Somers & Nelson, 2004). For example, at Electro, the three key groups of participants consisted of members of the steering committee (top management), key-users (project group), and end-users. The project was essentially run by the first two groups, and the end-users were largely neglected. It is also important to recognize the involvement of the individuals at suppliers such as SAP,

who primarily develop and sell the ERP packages, and the numerous consultants who are active in the enterprise system field. For example, throughout the implementation phase at Electro, consultants from three firms were directly involved, one of which, PCCons (a pseudonym), was both an implementation partner as well as the SAP R/3 software application host.

Organizational routines derive their meaning from the interactions of multiple individuals mediating through organizational networks. "Users will often have only a partial understanding ("fuzzy image") of these alternatives [for technology & implementation] and that this understanding is shaped by the networking activities in which they engage. Importantly, the framework depicts users, not as a passive receivers of new ideas, but as actively engaging in inter-organizational networks through a variety of activities that allow them to span the boundaries of their organization (Swan et al., 2000, p. 31)." In particular, such organizational networks provide access to individual and organizational memories which are necessary for the interpretation of organizational routines. People may interact differently in different parts of the extensive network, or inside the organization, accessing different knowledge. Thus, in implementing the organizational routines, this may introduce interpretive flexibility and ambiguity. Further, if we have incomplete knowledge about the network that developed the practice, it may be difficult or even impossible to implement that practice in another network in a similar way (Newell *et al.*, 2003). Surrounding knowledge that one wants to replicate in order to copy the practice may be particularly unavailable in the context of ERP best practice, where the source is often rather obscure (cf. Winter & Szulanski, 2001). Inconsistencies in interpretations of the organizational routines are bound to arise in this case because of the differences in the networks and knowledge available for interpreting the organizational routines.

One of the other - often ignored - consequences of multiple actors enacting and interpreting best practice routines is that in doing so, individuals can and do change the routines. Different actors will (re-) interpret the routines as they encounter them and they also always have a choice (through agency) to enact them differently or, indeed, to resist acting altogether. Such (re-) interpretations, actions and re-actions provide for the improvisational character of routines, opening the way for flexibility and change (Feldman & Pentland, 2003; Moorman & Miner, 1998).

Varied interpretations and enactments of processes (organizational routines) are likely to lead to memory mismatches to the extent that much of the knowledge required for

interpreting processes is often "stored" as organizational memory. Organizational memory may be defined as "stored information from an organization's history that can be brought to bear on present decisions (Walsh & Ungson, 1991, p.61)." It should be noted that a large variety of taxonomies of memory exists (Cohen & Bacdayan, 1994; Rose, 2003). Van Stijn and Wensley (2001) distinguish for instance between information, knowledge, paradigms and skills. In the analysis presented in this paper we also make use of the distinction between declarative and procedural memories. This distinction is often associated with individual memory and has been extensively developed by researchers in the field of artificial intelligence (Moorman & Miner, 1998). Declarative memories refer to memories that have factual content whereas procedural memories refer to the memories about the performance of actions (Cohen & Bacdayan, 1994; Moorman & Miner, 1998).

Memory contents may be thought of as being stored at different locations and in different media (Walsh & Ungson, 1991; Wijnhoven, 1999). Table 1 provides an overview of the various types of content and media.

Table 1. Retention media and memory contents (Wijnhoven, 1999, p. 160)

Memory medium	Memory content
Individual	Professional skills; evaluation criteria and results; explanation of procedures, decision rules; personal ethics and beliefs, performance criteria; individual routines
Culture	Schemes; stories; external communications; cultural routines; norms base
Transformation	Tasks; experiences; rules; procedures and technology; patents
Structure	Task divisions; hierarchy; social structure; formal structure; communication structure
Ecology	Layout of shop floor; building architecture
External	Client and market characteristics; competition profiles; list of "memory-able" people and organizations; technology of competitors
Information Systems	Planning and decision systems; process control systems; GroupWare; computer aided design systems, memory-based systems; administrative systems

Routines themselves may be considered to be a key repository of organizational memory (Becker, 2004; Cohen & Bacdayan, 1994; Moorman & Miner, 1998). We can elaborate on this notion by observing that some process knowledge is embedded in the way the activities that constitute processes are structured both temporally and spatially. Other knowledge may be recorded in process manuals that may record 'ideal' type processes as well as details of the functioning of processes on a regular basis. Yet other knowledge may reside in the heads of individuals who work directly with the processes themselves or in automated activities or sub-processes of the process as

represented in software and in particular ERP packages. In addition ERP packages typically provide for the formal representation of much of the knowledge of the organization as it relates to organizational strategy, structure, and processes. Thus ERP packages may be seen as contributors both to the capture and management of knowledge in general and process knowledge in particular (Van Stijn & Wensley, 2001).

It is important to know that when ERP systems are implemented, they inevitably change the static structure and content of organizational memory. This in itself may lead to memory mismatches where contents of different media are conflicting. In addition, when ERP systems are used to perform organizational routines, they are likely to privilege certain types of knowledge and organizational memory and obscure other aspects of organizational memory. That may also give rise to mismatches.

As we have already referred to memory mismatches we now propose to provide a more extensive examination of the organizational memory mismatch perspective. This perspective provides us with a metaphorical lens with which to study ERP's best practices in novel ways. In organizational settings, we naturally talk of 'organizational memory' as if it were a reasonably precise analogue of individual memory. We do not take such a metaphoric transposing of memory properties to organizations literally, though! However, this perspective helps to remind us of the value of starting from the individual cognitive level when looking at such concepts as knowledge, knowledge management, and indeed organizational memory itself. Though our discussion of organizational memory here relies heavily on the dominant information-processing metaphor of memory, it should be noted that we do not exclude the use other memory metaphors, as they are likely to be equally instructive (Ackerman & Halverson, 2004; Rose, 2003). For instance, memory may be seen as a fluid assemblage: "From a social psychological perspective, memory is less a structure than an ever-moving assemblage of memory fragments that are reconfigured and reconstructed by different actors in a multitude of ways to serve a multitude of purposes (Corbett, 2000, p. 288)." This quote is itself tantalizing since it provides a picture of technology-assisted process enactments that are constantly being configured and reconfigured. This draws for us a fundamentally different picture than that of standard processes being enacted in an essentially routine and repetitive way.

3. An organizational memory mismatch approach

It is our central thesis that organizational memory mismatches are likely to exist between the memory contents associated with ERP's best practices and memory contents relating to such processes in other media (Van Stijn & Wensley, 2001). For instance, as the steering committee (October 2002) at Electro recollected: "We have lost about €200,000 because of the way inventory is referred to in the old and new system. With one system it is 'Work in Progress', in the other it is 'Stock'. Now, we have the work in progress in a separate location and it is kept up to date manually, with dummy registrations." [1]

The way we interpret the above situation is that there was a mismatch in the related declarative memories, i.e. the way people described the inventory. Because people did not use the new terms correctly, they also made errors in the underlying procedural and performative aspects of the routine, which resulted in extra inventory being ordered inappropriately. We have identified several processes, such as translating and conceptualizing that may both give rise to and potentially provide solutions or resolve organizational memory mismatches. These processes occur and reoccur throughout the whole life cycle of ERP's best practices and the implementation and use of any packaged solutions. For example, the mismatch identified above was resolved both by re-translating and re-conceptualizing about "stock" and "work-in-progress". Once a mismatch has been identified - what we might call an error in translation - it may be possible to re-conceptualize the source of the mismatch. In this case, if possible, the ERP system's conceptual structure would need to be modified to allow for regular inventory and work-in-process inventory. Although this action may not appear very onerous such needs for re-conceptualization may be legion in a relatively complex system and may be difficult to achieve particularly once the system has 'gone-live'.

As some scholars note, SAP, like other enterprise systems, is rather "germane" (Kallinikos, 2004), and it has its specific language (part of which is captured in the process modeling tool ARIS and the implementation tool Accelerated SAP) that the adopting organization needs to learn. In the case of Electro, not only did people re-translate, in the sense that they acquired the new language and learned the appropriate terms for inventory, they also formed new concepts, understandings of inventory, and how to deal with it according to the new best practice routine. Changes were thus also made to procedural memories involved in performing the routine. In

---

[1] Interviews and documentation are in Dutch and have been translated by one of the authors.

addition, a separate location was used for one type of inventory and dummy manual registrations were used. These 'workarounds' may have resolved the problems but they carry with them significant risks.

It is also important to observe that routines that were originally encoded may not be appropriately representing the routine that needs to be enacted. For instance, Electro experienced this type of issue regarding the evaluation of personnel (Electro's issue list, 2002) as shown in Exhibit 1. In terms of organizational memory mismatches, we would say that the memory of pool capacity as encoded in the ERP package did not match with the memories encoded in the organization's routines to evaluate separate work places separately. Declarative memories relating to separate work places appeared to be lacking in SAP (which made the related procedural memories incomplete and the desired practice not possible to enact) and it was suggested that these memory contents should be separately encoded. In this case we would consider this a different type of mismatch when compared to the mismatch that occurred with the stock, as we discussed earlier, where there was an inconsistency rather than the lack of specific memory contents (Van Stijn & Wensley, 2001).

Exhibit 1. Encoding the ERP routine of capacity evaluation (Electro's issue list, 2002)

Description:

The capacity evaluation of personnel is set up with pool capacity. This does not anticipate in evaluation of the separate work places.

Solution:

It is suggested that separate capacity sources per work space be created that are "active" next to the pool for the units Assembly, Lighting and FAS Lighting. In this way the personnel capacity is shown in two ways: for the pool and for each specific workspace. The capacity availability in the workspace indicates the maximum number of employees (that physically can work at one line). Is this what is intended? If yes, a "conversion scheme" has to be developed.

In addition to (re-) encoding, we consider the process of (re-) translating. During the blueprint phase at Electro, the primary task of the consultants of PCCons was considered to be the translation of the best practice processes of the selected ERP package SAP R/3 into applicable blueprints for the organization based on interviews held with members of the organization. The result of this initial translation at Electro was not regarded as having been successful:

> This process was not clear. The results of interviews just went into PCCons and
> a blueprint emerged. We did not recognize it [as an appropriate representation

of (future) business processes]. It seemed to be the work of very dyslectic consultants. The blueprint actually was supposed to serve as a test (go/ no go), but that was not possible. Looking back, they didn't really do a great job. […] They are consultants, and think 'it should be like this', but they don't mention the preceding steps, it is just prose." – *Steering committee (October 2000)*

Overall, the consultants' way of working did not facilitate the acquisition of the SAP language by Electro. This was in spite of the fact that during the kick-off meeting in December 2001 the issue of potential terminological confusion was raised and the end-users were shown some of the terms in the old system, and how they could be translated into SAP. For instance, what used to be called a "recipe" now became the "routing and bill of materials". However, people did not actually learn the new language, and mismatches arose regarding such instances as the distinction between "stock" and "work-in-progress" as we discussed earlier. Such language problems can be accentuated by communicative differences between consultant and client. "Clearly, the consultants were talking a different language, without much thought to how they were communicating their messages. The research revealed that that consultants tended to employ a particular type of person, who often found it difficult to communicate with people at lower levels, such as factory workers (Skok & Legge, 2002, p. 77)." A problem relating to problems of communicating between different levels was also apparent at Electro, as we will discuss later.

The notion of a common language and understanding - or lack thereof - is indeed an interesting conceptual conundrum underpinning our work. A common language is often assumed but far less often achieved (cf. Boland, 1996). Though it is possible to learn from and share with each other (with sometimes considerable effort), there will always be manifest opportunities for the occurrence of misunderstandings and mismatches – both small and large with equally varying consequences. In her discussion about developing shared understandings among different groups (engineering, assembling and manufacturing), Bechky (2003) mentions: "When a routine is made explicit, it is frequently codified in the language that is resident in the community of its origin. This language may be inexplicable to members of other communities. Therefore, while making routines explicit may work in some cases, it is transformation of understanding into the new context that makes it possible for it to be used across the organization (Bechky, 2003, p. 327)."

Even if it were possible to establish a common language, not all necessary knowledge of best practices can be encoded in, for instance, the blueprints. Our thinking about contextualizing stresses the idea is that a certain incompleteness (and hence mismatches!) is inherent and even necessary in the specification of best practices (Becker, 2004). This incomplete specification introduces a certain level of uncertainty and ambiguity that has to be dealt with, in particular with the implementation of the best practices. This was not explicitly realized at Electro. In this analysis, their worries about the "dyslectic consultants" were not only a question of a new language and the need for translation. Even more so, it was unclear as to whether the consultants had actually understood the context of Electro and whether the best practices were appropriately contextualized. We are reminded of Tyre and Von Hippel's caution: "Too often, input from these people [users] is collected in strictly verbal form, with the result that users' input appears superficial or even inaccurate. By contrast, observing users *in* their normal work environments can enable managers or experts to develop a rich, contextualized appreciation of the issues that users describe (Tyre & Von Hippel, 1997, p. 81)."

Problems of context also apply in relation to reference models. Just where do reference models apply? What are the relevant aspects of the business environment that need to be present for a reference model to actually constitute best practice? Processes exist within a rich context that includes aspects of the organizations products and services, its customers and suppliers, its employees and the organizational structure and culture. "Many interviewees said developers do not have a real understanding of the marketplace, the competitive situation, and the economic climate. The study identified that developers lacked the 'big picture' perspective of the company's business operations and focused instead on time consuming technical issues (Skok & Legge, 2002, p. 78)." The danger is that much of this contextual information may be missing from the ERP system - it is often tacit and embedded in other organizational memory media. As a result the assumed context of the reference processes may conflict with the actual context in which the reference processes are actually implemented leading to under-performance with the ERP system (Van Stijn & Wensley, 2001). Furthermore, given the tacit nature of much of this contextual knowledge the specific reasons (in terms of knowledge conflicts or knowledge gaps) may be very difficult to diagnose or correct.

In learning to enact the new best practices, essential changes in understanding of language, concepts and context are required in developing capabilities to deal

successfully with the extensive integration of the routines and the system (Beretta, 2002). In the case of Electro, the importance of such integration capabilities had been particularly underestimated during the implementation phase. Interviewees commented that there were "a lot of little islands", that people "missed the jargon", that "the integrative character faded" and that "everything would fall in its place automatically". To make matters worse, during training the focus was on SAP's transactions and screens, rather than the interdependency of the different organizational routines in the various departments, as appears often to be the case (Amoako-Gyampah & Salam, 2004). "The course taught people the "buttons" but not the underlying steering concepts." In our interviews at Electro, some of the employees said that during implementation they did not genuinely understand the new processes because they had not actually worked with or through the processes or been able to develop their understanding of processes.

> The training consisted of a number of hours to get to know and go through the transactions that are of importance for the department. The key user showed the transactions, and then the end users went through the transaction themselves. Summarizing, all transactions were seen and executed once. Additional training material was a map with the relevant SAP screens. This training is the only time I have seen the system. It did not really contribute to the learning of the tasks at hand. – *End-user MM (October 2002)*

In comparison, respondents in a study by Kumar et al. (2003) mention that "it was very hard to explain the integrated nature of the process and the consequences of individual actions on the down-stream processes in the new work processes supported by the new systems. This was also because training was mostly focused on helping the users learn how to use the software (Kumar *et al.*, 2003, p. 801)." Robey et al. (2002) also note that people may struggle with learning how their new job should be carried out and, in addition, with understanding how the new practices are interrelated and integrated with existing practices.

> It struck me that sales people had to explain financial invoices without someone from finance attending. People had to explain things in areas where they are not so knowledgeable. Also, not everybody has grounded didactical skills." – *Key-user SD & SM (October 2002)*

Learning-by-doing is critical to an understanding of systems and routines (e.g. Winter & Szulanski, 2001), but it may well be very demanding on the user. At Electro, the role for the end-users in the implementation was marginal. The project members justified this by saying they had the necessary knowledge and that the end-users were basically not smart enough to understand. "The end-users would only be confused by the many and fast changes." End-users on the other hand felt that they "joined in the middle of a conversation". The fact that Electro's project team was located in a different building, called "The House" further exemplifies the distance that was created during the implementation process. This may have seriously hampered the learning process.

> Communication was rather miserable. A lot of time was spent in The House. It was not clear for end-users what people were doing there. More feedback on the project status should have taken place. – *Key-user SD & SM, October 2002*

Physical setting may also directly contribute (or fail to do so) to the learning process. "The events, procedures, technical systems, and daily routines embedded in a given setting provide learners with both specific clues as to the nature of the problem (or solution), and tools or resources to aid investigation. Thus, *where* activities take place partly determines what actors can do, what they know, and what they can learn. It not only determines who can interact directly with whom, but also the way in which interactions unfold. Moreover, because different settings provide different opportunities for learning, activities in physical settings have a cumulative quality: progress in one setting often makes it possible to use clues or resources found in a different physical domain. Thus, learners often have to shift repeatedly between several settings (e.g., lab and plant) before they can reach an understanding of the underlying problem and develop possible solutions (Tyre & Von Hippel, 1997, p. 73, original emphasis)." Bechky's (2003) case study of the production work floor describes that often physical objects were used to define and clarify problems, where the abstract engineering drawings or users' explanations were much more difficult to use or understand. This might be linked to the difficulties people seem to have with integrating ERP process models with their own understandings of process and instigating change when necessary.

As a result of users not having been trained appropriately and lacking a thorough understanding, they are likely to retain previous memories unmodified and these are likely to result in memory mismatches when working with the ERP system. For example, one of the issues at Electro was "tuning at the back of the line".

Orders were placed inappropriately and many rush orders were misplaced. This is a result of the connection of production, planning, sales, and purchasing. It still happens that someone enters wrong data… In the beginning, the system was meant to be trusted completely, but it didn't work that way, it had to be done purely on ones own knowledge. Now we gradually switch to the system, the "old pain" is gone." – *Key-user MM (October 2002)*

From a memory mismatch perspective, we consider that not only did mismatches arise regarding the integration of the routines but also procedural memories were conflicting. For example, it was unclear how to deal with requested orders versus actual orders. In the case of Electro, the requested orders were processed as if they were already approved and actually needed, whereas they were actually just the outcomes of the tentative planning procedure. This mismatch could have been signaled early on if the people from the involved departments had communicated (and questioned) why so many rush orders were being placed. However it went unnoticed for some time, the main excuse being that "the ERP system said so".

In another context, namely that of a production data management (PDM) system, D'Adderio (2003) highlights a mismatch in declarative memory, between the way data for the "Engineering Parts Lists (EPL)" are organized and interpreted by engineering and production. The two groups have different ways of organizing and making sense of the same set of data. "Engineering and production basically speak two different configurational and database languages, corresponding to two different disciplinary and functional backgrounds (D'Adderio, 2003, p. 334)." However, the new system they introduced favored only one view, for engineering. It is "the attempt to standardize and unify the actions and viewpoints of different groups and departments; this is aimed at achieving a higher level of interfunctional co-ordination and integration in design and development (D'Adderio, 2003, p. 333)." However, the introduction of PDM emphasized the "pre-existing gap in meaning formation, a divide in understandings and practice between engineering and production (D'Adderio, 2003, p. 335)." In this case, contrary to the suppliers' rationale, a conversion procedure was adopted, to go from one way of organizing the data to another. However, this did not allow the two groups to come to a better understanding of each others' perspective and therefore when data was 'shared' many mistakes and mismatches were simply not spotted. This resulted in more errors and inefficiencies than before the introduction of the software. In this way the software magnified the pre-existing situation and problems, rather than providing a solution.

In this section we have discussed several organizational memory mismatches and the processes that may give rise to them and resolutions, particularly in the context of Electro. It should be noted that in many situations employees develop informal ways of handling conflicts between the ERP system and other sources of knowledge. These informal approaches or 'workarounds' are rarely documented and are thus often overlooked. We contend that this potentially undermines the ability of the organization to function effectively. Most obviously senior management does not receive unambiguous signals from the ERP system or misinterprets the signals provided and fails to act appropriately. More seriously important information required for interpreting the outputs and inputs of the ERP system goes unrecognized and unprotected. Finally, information that is likely to be vital to the future survival of the organization is overlooked since many of these workarounds contain indications of where current information needs to be adapted to 'fit' into existing information categories and processes and to resolve related mismatches. In the next section we place the organizational memory mismatch approach in its broader context by linking it to related research.

4. Discussion

An interesting starting point for the further definition of memory mismatches is not found in organizational memory theory, but in cognitive dissonance theory, where the individual's memory is investigated. In his discussion of cognitive dissonance, the psychologist Festinger (1957) states that there are three possible relations between pairs of cognitive elements within an individual's mind, namely irrelevance, dissonance, and consonance. Irrelevance occurs when two elements have nothing to do with each other. When two elements are related to each other, they may either be consonant or dissonant. Two elements are dissonant if, they do not fit together, because they are inconsistent or contradictory. Festinger's theory further proposes several strategies that people adopt to deal with dissonance. In particular, people will try to ignore part of the dissonant element(s) and rationalize the choice, if made, for one element of the dissonant pair (Festinger, 1957). This alerts us that memory mismatches may be give rise to similar strategies. Therefore, one element of a mismatch, one item of organizational memory, may be ignored thus eliminating the mismatch. Such a strategy both prevents the necessary investigation as to the nature of the mismatch and often prevents the subsequent investigation by failing to even record or retain the elements that have been ignored.

It is important to set our concept of memory mismatches apart from the concept of institutional misalignments, because at first glance we may appear to be talking about the same set of concepts. Gosain (2004) and Soh et al. (2003), who identify institutional misalignments as problematic to the successful implementation of enterprise systems, focus on institutionalization/structure, in particular rules and norms, and rather less on interpretative schemes (knowledge, cognition) (Giddens, 1984) as well as the processes and the individuals that play their parts in the implementation and use of ERP's best practices. Looking at similar problematic situations, we would reason about memory mismatches and interpretation, conceptualization, understanding etc. instead of opposing institutional forces (Gosain, 2004; Soh *et al.*, 2003). In particular, our conceptualizing of memory mismatches relates to what Gosain calls equivoque, to "refer to the technology that admits several possible and plausible interpretations and creates the possibility of misunderstandings, complexity and uncertainty (Gosain, 2004, p. 157)." All in all, we provide a different theoretical and narrative framework for understanding that supports additional levels of detail and richness.

Further reasoning about diversity and memory mismatches may start with the recognition that people will inherently have different knowledge and interpretations about the routines they are (trying to) perform. "The involvement of multiple individuals inevitably introduces diversity in information, interpretive schemes, and goals of the participants. The individuals performing the routine do not all have access to the same information, and even if they did, they might not interpret the information in the same way. Everyone who engages in a pattern of activity is not necessarily seeking the same result. As a result of these factors, their subjective interpretations of the appropriate course of action will differ. […] There is no single, objective routine, but a variety of different perspectives on what is involved (Feldman & Pentland, 2003, p. 104)." Individuals not only have power (not) to act or to act differently, their different understandings and interpretations also result in changing actions (or performances of the routine), again opening the way for diversity and mismatches.

Looking from an organizational memory mismatch perspective incorporates the understanding that in the adoption of technologies, people and other non-human "actors" are important, both with respect to their internal capabilities and knowledge and also with respect to their participation and interaction with their external environment. This gets reflected in the discussion of external parties (such as for ERP the suppliers and consultants). Indeed, it is interesting to consider the way in which specific associations and platforms for users support the adoption and use of routines

in general and best practices in particular (Swan et al., 2000). For instance, some people at Electro were also involved in a Dutch ICT network for SMEs. Through such networks and discussions with suppliers, consultants, peers, and information in magazines or at conferences, people will form their basic ideas about the best practice. This may be seen as providing an opportunity for achieving some sort of common ground that traverses different communities and cultures. In the light of mismatches then, our work may be related to the cross-cultural studies in the sense that different mechanisms and institutional arrangements may be developed to share understandings within organizations than those to share understandings between organizations. In this respect it is tantalizing to question how the implementation and use of an ERP system will impinge on pre-existing mechanisms and institutional arrangements to share knowledge.

Structuration theory also provides a theoretical opportunity to achieve the sensitivity for situatedness that we consider important in the context of memory mismatches and ERP's best practices. Hayes and Walsham (2000) couple the interpretative aspect to the other realms that Giddens' discusses in his structuration theory, while maintaining a focus on language and meaning. They describe the case of a Lotus Notes implementation where two discourses on control versus empowerment co-existed and interfered with each other. Thus, there was confusion between people as well as within people's minds and practices. "The two discourses were more than just two ways of looking at the world; they were both ways of talking about, thinking about and acting towards customers, employees, technologies and departments. (Watson, 1996,p. 114) (Hayes & Walsham, 2000, p. 56)." As a result, the discourse and its interpretations reflect and get reflected in the practices of people, their power relations, etc. In the light of Electro's ERP implementation, one thing that strikes us in a similar vein is the way people were talking about the end-users as not being able to understand, which may be seen as a way of legitimizing the fact that they were excluded from the implementation process and together with the training they received turning it into a self-fulfilling prophecy.

In implementing an ERP system, certain ways of thinking and acting become privileged and others get de-legitimized. The modeling of processes in this context has taken a different form with the involvement of various third parties, such as suppliers, consultants and application hosts. An implication of the diversity of memory and a certain knowledge asymmetry is that people are unable to fully understand and anticipate how the resulting ERP system will affect later use. "Involving employees in

planning change is one way of reducing unanticipated consequences. But that only eliminates the consequences that the employees can anticipate and that the managers cannot. Even people who do a job well and are very reflective about it are often not able to articulate all that is involved in accomplishing their work. […] In addition, they are not necessarily able to see the connections between the actions they take, the resources they create, and the schemas they are subsequently able to enact. Therefore, managers should not expect that employees are able to anticipate or articulate all the consequences of change (Feldman, 2004, p. 307)." On the other hand, this inability should not be used as an excuse for leaving employees out of the process, as was the case with the end-users at Electro.

To further understand the difficulty with articulating process understanding and anticipating change, we highlight the notion that practice exists as a form of collective knowing rather than a body of knowledge (Orlikowski, 2002). "Knowledge of a particular practice [...] does not therefore form a complete and coherent body of knowledge that can be precisely documented or even articulated by a single individual. Rather it is a form of knowing that exists through the interaction among various collective actors (Newell *et al.*, 2003, p. 3)."

The comprehensiveness and pervasiveness of ERP systems means that they have a large array of formal rules, regulations, norms, and knowledge embedded or implied. This formality, as a consequence of the rationality model underlying most ERP systems, brings about a specific rigidity that makes dealing with emergent situations, learning, and creativity a difficult issue. "The transactional mechanics which ERP packages bring about may thus block exploration of alternative ways of perceiving and acting on reality and by extension organizational development and innovation (Kallinikos, 2004, p. 25)." In other words, the formal, rule-based character of knowledge and understanding privileged by ERP systems may make it difficult for the people in the organization to actually think out of the box, beyond the rationale of the ERP paradigm, and may prevent them from exploring alternative ways of doing business. Additionally, the existence of a dominant ERP paradigm may make it difficult for individuals to integrate the ERP knowledge with their own memories and understandings.

ERP systems being developed as a form of standard means that the practices are partially de-contextualized by suppliers to enable cross-organizational adoption. In this light the intermediary consultants in particular have a role in assisting the implementing organizations with putting the practice back into context. Training in this sense may

also be understood as a form of re-contextualizing as is actual performing the best practice routines. Such re-contextualizing processes are another potential source of memory mismatches. Re-interpretation of consultants' prior knowledge in the context of an organization and the subsequent translation of this knowledge into specifications of best practices and their following encoding may thus lead to memory mismatches. The consultants' understanding of the client or the system may be limited, as suggested at Electro and other organizations (Skok & Legge, 2002). The complexity and integrated nature, as well as the continuous evolution of ERP systems may make it difficult to keep track of the underlying knowledge embedded in such software. The language of for example SAP may not come across appropriately in the adopting organization, failing to become 'in context'. In this sense, another related area is research which studies the differences between developers and users with particular reference to their not sharing the same values or not using the same language or conceptualization of the situation.

During training, people may not be able to integrate the memory implied by the system with their own memories appropriately, or they may interpret the system differently than was intended. As Tushman and Scalan (1981) caution: "The interaction of local languages and local conceptual schemes make consistent enactment and encoding problematic. Communication across boundaries, therefore, is difficult and prone to bias and distortion. The greater the language/cognitive differences, the greater the communication impedance (Tushman & Scanlan, 1981, p. 291)." Another word of caution is necessary here. Since memories may be refined, expanded and sometimes discarded during the implementation phase, there is an apparent need to somehow assess the extent to which actual pre-existing memories are appropriately represented in the ERP practice and the package. There is also a need for significantly more research into the location, nature and extent of process memories both before and after the implementation of ERP technology and practices. Care must be taken to investigate how procedural memories stored on different media interact both before the implementation of the practices and after its implementation. The type of encoding that ERP systems prescribe does not appear to allow for any significant evolution of the approach to encoding post-implementation. It is also worth observing that organizations are likely to have both formal and informal memory processes for maintaining and enhancing memories. These may interact with those explicit and implicit in the ERP system in complex and unpredictable ways.

We believe that the preceding section has demonstrated that the memory mismatch approach provides a fertile ground for investigating and understanding problems that may arise in the context of ERP's best practices. In the following section we draw together some of the threads that we have introduced in the preceding sections and attempt to draw some conclusions.

5. In conclusion

The language of ERP's best practices seems to suggest that there are standard templates for particular processes and that these templates can be transferred in a relatively straightforward manner. On the contrary, we have seen that people have difficulties in acquiring this language and, even more difficulty understanding the underlying ERP best practice concepts. Furthermore, we have argued that the notion of standard templates is in some sense incoherent, since best practices are contextualized and we have to recognize that such practices will be interpreted or re-interpreted when they become part of and are enacted in the organization. The situations in which the practices exist or should come to exist are considered to be unique and that makes simply imitating them rather impossible. Further, once instantiated particular ERP best practices are not necessarily "best" for a particular organization, though once they are adopted and used, they may at least provide useful ways of conducting business. There may also be little sense in which there are standard best practices independent of a rich variety of subtly different instantiations of each particular best practice.

We have noted that ERP's best practices may be considered to be a specific form of organizational routines. Considering best practices as organizational routines implies that they are a "repository" for memory contents (Walsh & Ungson, 1991). The concept of organizational memory embraces the understanding that there are a variety of memory media present in organizations and that these also potentially act as storage media for related process knowledge. This has allowed us to adopt a memory mismatch approach to our subsequent analysis. In this context we defined organizational memory mismatches as deficiencies between such memory contents "stored" in the ERP best practice and contents located in other repositories, such as individuals and other organizational routines.

We have stressed diversity and conflict in the declarative and procedural memories involved. In doing so, we believe that we have added a different set of understandings and additional levels of detail and richness. Our focus helps to raise a new set of

questions and offers a variety of suggestions for future research. Our discussion of Electro's issues with organizational memory mismatches also gives us some interesting insights into the practices surrounding the implementation and use of ERP systems in particular and complex enterprise systems in general. So-called best practices are developed and evolved within an elaborate network of actors. To be able to "move" around, extensive translation, conceptualization, and encoding processes have to take place, and the routines are de-contextualized and re-contextualized to become part of the organization and its organizational memory. The actual physical setting can be an important impediment (like in The House of Electro) or impetus for creating a more common understanding, thus potentially limiting memory mismatches (Bechky, 2003).

In our view, organizational memory mismatches inevitably exist, firstly because of the dynamics of organizational memories through the continuous re-interpretation and re-enactment of the ERP best practice routines, and secondly because we consider a totally shared language and understanding to be essentially utopian. This makes studying how to be able to cope with mismatches and processes of (re-) conceptualization, (re-) translation and (re-) interpretation to be both necessary and fascinating.

We have further noted that the structure (and contents) of organizational memory is likely to change as a result of the introduction and use of complex systems such as ERP systems. It is our contention that the nature of such changes needs to be actively and intensively researched as it may have significant consequences for the organizations implementing such systems. We have also discussed some of the implications of our approach and perspective on the way(s) in which individuals may be trained to use ERP systems. Too often training has been seen as a narrow 'transfer' of knowledge between the trainer and the individual users. We suggest that training is better conceived of as a process of re-contextualization where the trainer and user work together to interpret system routines and conceptual structures. We have made some suggestions as to how such a perspective is likely to alter the way we conduct training programs.

We hope that our paper demonstrates the importance of the interaction between organizational memory and complex systems such as ERP systems. Such interaction occurs both during the implementation and in-use stage. There is a need to develop models to assist in the understanding of such interactions and through such

understanding enable the creation of more flexible, adaptive systems. We believe that the memory mismatch approach provides a useful perspective for conceptualizing some of these interactions.

It is also important to be mindful of the issues raised in this paper which point to the differences (which may be very significant) between best-practices-as-designed and best-practices-as-used, and the underlying conflicts in individual memories and organizational "memories" that are likely to arise and likely to impede the performance of the organization. Failures to focus on these issues, particularly where routines are supported by all-embracing enterprise systems, may result in costly problems and suboptimal organizational performance.

Finally, we hope that this paper stimulates more research into the use of an organizational memory mismatch perspective in the development and use of ERP and other complex information systems.

References

Ackerman, M. S., & Halverson, C. (2004). Organizational memory as objects, processes, and trajectories: An examination of organizational memory in use. *Computer Supported Cooperative Work, 13*, 155-189.

Amoako-Gyampah, K., & Salam, A. F. (2004). An extension of the technology acceptance model in an ERP implementation environment. *Information & Management, 41*, 731-745.

Bearda, J. W., & Sumner, M. (2004). Seeking strategic advantage in the post-net era: Viewing ERP systems from the resource-based perspective. *Journal of Strategic Information Systems, 13*(2), 129-150.

Bechky, B. A. (2003). Sharing meaning across occupational communities: The transformation of understanding on a production floor. *Organization Science, 14*(3), 312-330.

Becker, M. C. (2004). Organizational routines: A review of the literature. *Industrial and Corporate Change, 13*(4), 643-677.

Beretta, S. (2002). Unleashing the integration potential of ERP systems: The role of process-based performance measurement systems. *Business Process Management Journal, 8*(3), 254-277.

Boland, R. J. J. (1996). Why shared meanings have no place in structuration theory: A reply to Scapens and MacIntosh. *Accounting, Organizations and Society, 21*(7/8), 691-697.

Cohen, M. D., & Bacdayan, P. (1994). Organizational routines are stored as procedural memory: Evidence from a laboratory study. *Organization Science, 5*(4), 554-568.

Corbett, J. M. (2000). On being an elephant in the age of oblivion: Computer-based information systems and organisational memory. *Information Technology & People, 13*(4), 282-297.

D'Adderio, L. (2003). Configuring software, reconfiguring memories: The influence of integrated systems on the reproduction of knowledge and routines. *Industrial and Corporate Change, 12*(2), 321-350.

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review, July - August*, 104 -112.

Feldman, M. S. (2004). Resources in emerging structures and processes of change. *Organization Science, 15*(3), 295-309.

Feldman, M. S., & Pentland, B. T. (2003). Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly, 48*, 94-118.

Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, Ill.: Row Peterson.

Giddens, A. (1984). *The constitution of society*. Berkeley [etc.]: University of California Press.

Gosain, S. (2004). Enterprise information systems as objects and carriers of institutional forces: The new iron cage? *Journal of the Association for Information Systems, 5*(4), 151-182.

Hayes, N., & Walsham, G. (2000). Competing interpretations of computer-supported cooperative work in organizational contexts. *Organization, 7*(1), 49-67.

Kallinikos, J. (2004). Deconstruction information packages: Organizational and behavioural implications of ERP systems. *Information Technology & People, 17*(1), 8-30.

Kumar, K., & Van Hillegersberg, J. (2000). ERP experiences and evolution. *Communications of the ACM, 43*(4), 23-26.

Kumar, V., Maheshwari, B., & Kumar, U. (2003). An investigation of critical management issues in implementation: Empirical evidence from Canadian organizations. *Technovation, 23*, 793-807.

Markus, M. L., & Tanis, C. (2000). The enterprise system experience - from adoption to success. In R. W. Zmud & M. F. Price (Eds.), *Framing the domains of IT management: Projecting the future through the past* (pp. 173-207). Cincinatti (OH): Pinnaflex Educational Resources.

Moorman, C., & Miner, A. S. (1998). Organizational improvisation and organizational memory. *Academy of Management Review, 23*(4), 698-723.

Newell, S., Edelman, L., Scarbrough, H., Swan, J., & Bresnen, M. (2003). 'Best practice' development and transfer in the NHS: The importance of process as well as product knowledge. *Health Services Management Research, 16*, 1-12.

Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science, 11*(4), 404-428.

Orlikowski, W. J. (2002). Knowing in practice: Enacting a collective capability in distributed organizing. *Organization Science, 13*(3), 249-273.

Pollock, N., & Cornford, J. (2004). ERP systems and the university as a 'unique' organisation. *Information Technology & People, 17*(1), 31-52.

Rose, S. (2003). *The making of memory: From molecules to mind* (revised ed.). London: Vintage.

Scheer, A. W. (1998). *ARIS - business process frameworks* (2nd ed.). Berlin [etc.]: Springer.

Skok, W., & Legge, M. (2002). Evaluating enterprise resource planning (ERP) systems using an interpretive approach. *Knowledge and Process Management, 9*(2), 72-82.

Soh, C., Sia, S. K., Boh, W. F., & Tang, M. (2003). Misalignments in ERP implementation: A dialectic perspective. *International Journal of Human-Computer Interaction, 16*(1), 81-100.

Somers, T. M., & Nelson, K. G. (2004). A taxonomy of players and activities across the ERP project life cycle. *Information & Management, 41*, 257-278.

Swan, J., Newell, S., & Robertson, M. (2000). The diffusion, design and social shaping of production management information systems in Europe. *Information Technology & People, 13*(1), 27-45.

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal, 17*(Winter Special Issue), 27-43.

Tushman, M. L., & Scanlan, T. J. (1981). Boundary spanning individuals: Their role in information transfer and their antecedents. *The Academy of Management Journal, 24*(2), 289-305.

Tyre, M. J., & Von Hippel, E. (1997). The situated nature of adaptive learning in organizations. *Organization Science, 8*(1), 71-83.

Van Stijn, E., & Wensley, A. K. P. (2001). Organizational memory and the completeness of process modeling in ERP systems: Some concerns, methods and directions for future research. *Business Process Management Journal, 7*(3), 181-194.

Wagner, E. L., & Newell, S. (2005). 'best' for whom? The tension between 'best practice' ERP packages and diverse epistemic cultures in a university context. *Journal of Strategic Information Systems*, article in press, 1-24.

Walsh, J. P., & Ungson, G. R. (1991). Organizational memory. *Academy of Management Review, 16*, 57 - 91.

Wijnhoven, F. (1999). *Managing dynamic organizational memories: Instruments for knowledge management*. Pacific Grove [etc.]: Boxwood Press.

Winter, S. G., & Szulanski, G. (2001). Replication as strategy. *Organization Science, 12*(6), 730-743.