Miracle or Mirage?

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MIRACLE OR MIRAGE?

AN EXPLORATION OF THE PERVASIVE ERP SYSTEM PHENOMENON INFORMED BY THE NOTION OF CONFLICTING MEMORIES

DISSERTATION

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the doctor's degree at the University of Twente,
on the authority of the rector magnificus,
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on account of the decision of the graduation committee,
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by

Eva Jantine van Stijn

born on October 24th, 1977
in Utrecht, The Netherlands

This thesis has been approved by the promotor:
Prof. Dr. Robert A. Stegwee

And the assistant promotor:
Dr. Anthony K.P. Wensley

Voor mijn opa en omi – heel veel liefs

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More amazing than what people do, is the fact that they are there.
Harry Mulisch

Now that this Ph.D. journey approaches its final destination, it is a great opportunity to take a moment to think of, and thank, some of the wonderful people that in one way or another joined along the way.

Let me start with expressing my deep gratitude to my parents, Ries and Teunie. You have instilled within me the confidence to follow my intuition and my heart to realize my dreams. I cannot repeat enough that your love and support gets me through every single day. Mariska and Alexander, next to the bond we share as siblings, I really enjoy the fact that all three of us like to live in and experience different cultures. It is not always easy to challenge and bridge differences. Your successful courage is inspiring. I like to thank all my family and friends for lending their listening ears, bringing some structure in the chaos, and putting me back on the road now and again, for the laughter, holiday fun, playing music, and illuminating and entertaining get-togethers. I hope you forgive me leaving out the complete list here.

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Management (IS&CM), I enjoy how you helped to facilitate a pleasant workplace also by embracing and enhancing minorities and diversities.

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I also like to thank the members of the promotion committee for your time and efforts in reviewing this dissertation. Your insightful questions and remarks provide a valuable impetus for my continuing learning and exploring. I look forward to a fruitful discussion at the defense.

I am happy that Karen and Boriana will be there at the center stage as my "*paranimfen*". Boriana, it has been a delight to travel through the Ph.D. processes in Twente together. I admire it that you now shift more to the 'soft

side' of the IS field. Karen, dear friend, sometimes along the way I thought I should also consider a move to your field of geology, where the scenery appears slightly more spectacular. Perhaps the prospect of all the computer models and so on kept me hesitant. Karen, all the best with your thesis – it's your turn now.

To finalize this last piece of writing for my dissertation, I like to thank Peter [1] for recommending Douglas Hofstadter's book *Gödel, Escher, Bach: an eternal golden braid* [2] to me. Frankly, Gödel's mathematics described in there is sometimes beyond me, and I prefer listening to Bach's music, especially the cello suites. Yet I thoroughly enjoy Hofstadter's eloquent stories and accounts.

Most of all, dear reader, it has been a source of inspiration while I found the world of Enterprise Resource Planning (ERP) systems and conflicting memories a world at times as surreal and illusionary as the drawings of M.C. Escher, and as magical and intriguing.

Eveline

Enschede, June 2006

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[1] As I decided to write a first-name-basis acknowledgement, let me here give you their full names. They are in order of appearance: Teunie, Ries, Alexander and Mariska van Stijn, Anthony and Karen Wensley, Robert Stegwee, Paul Hal, Fons Wijnhoven, Christiaan Katsma, Floris Blankestein, Tanya Bondarouk, Brenda Kroeze, Boriana Rukanova, Karen Leever, and Peter Schuur. Details of the committee can be found in the colophon. Let me emphasize that everybody else matters equally!

[2] Hofstadter, D.R. (1979) *Gödel, Escher, Bach: an eternal golden braid* New York: Basic Books.

Contents

1. Miracle or Mirage?

Any sufficiently advanced technology is indistinguishable from magic.

Arthur C. Clarke

1.1. Preface

In their 1977 paper "Data base systems for small business: miracle or mirage?"[3] Benbasat and Goldstein discuss key issues and challenges for organizations that want to introduce data base systems and micro computers in their organizations. They caution that with the euphoria surrounding this new technological development, it is often the case that the organizational and managerial issues are ignored. Furthermore, they warn that successful outcome should not simply be assumed.

> "We recommend that the manager of a small business organization carefully evaluate the anticipated DBMS advantages in his own environment, rather than assume that all of the advantages listed in the numerous articles which have appeared in both professional and academic journals are directly transferable to all situations." (Benbasat & Goldstein, 1977, p. 8)

Since 1977, information technology has further conquered our personal as well as organizational lives. This dissertation concentrates on Enterprise Resource Planning (ERP) systems, an ambitious type of information system that has entered many organizations around the world particularly since the early 1990's. However, concordant with Benbasat and Goldstein's cautions, the euphoria around ERP systems is wearing off and it has become clear that these systems do not automatically lead to the promised benefits they have been sold on. Though more of the organizational and managerial aspects are considered there has been a tendency to overlook people in our rush to implement and use new information technology (Lengnick-Hall *et al.*, 2004).

Considering the ambitions and high stakes, the high risk and costs of failure, and the multi-billion market surrounding ERP systems (involving suppliers, consultant, application hosts, etc.) improving the success rate for implementing and using such systems is obviously a major practical and academic concern. Indeed, the general question as to how we may develop,

[3] This obviously is not the only paper making these or similar observations, and also not the most widespread one, but the only IS paper that I found that makes use of the miracle or mirage expression, interestingly enough...

implement and use ERP systems efficiently and effectively in order to improve our business and gain competitive advantage still has not lost its relevance and there is a need to further our understanding of the difficulties that are likely to be associated with the introduction of ERP systems.

In particular, I am interested in the cognitive side of the issues and difficulties that may arise. Thus, emphasis is placed on people, their knowledge, and the part that knowing plays in relation to the ERP technology and ERP-related organizational practices. When an ERP system is implemented and subsequently used, existing individual memories, organizational memories and their interconnections may be strengthened, modified or deleted altogether. The implementation and use of the ERP system leads to the creation of new individual and organizational memories and the establishment of new interconnections between them. Furthermore, the ERP system also leads to new interactions between memories as the system is called upon to support interpretation and enactment of practices. Thus one may say that the ERP system also becomes an additional source of memory in the organization and so takes its place in the networked webs of memories that co-exist in time and co-evolve over time. In this thesis, the results of my explorations are presented with respect to the articulation of such changes, particularly focusing on what have been termed 'organizational memory mismatches' or conflicts and the set of memory-related ERP problems that I seek to explain through the 'lens of memory' perspective. The high-level ambition of this thesis is to develop such a 'lens of memory' perspective and explore its theoretical and practical implications in the ERP setting.

The remainder of this chapter is structured as follows. In the next section, I will introduce the ERP phenomenon, and the processes of development, implementation and use. Next, an overview of prior research on ERP systems from a knowledge-centric perspective is provided. Then, the research approach is further addressed, detailing the research questions and an overview of the following chapters.[4] The chapter continues with a discussion

[4] I feel it is important to point out that rather than being a 'single manuscript', this dissertation consists of five separate papers accompanied by this chapter.

of the 'lens of memory' and the outline of a research agenda, followed by a brief conclusion.

1.2. The pervasive phenomenon of ERP systems

ERP systems are one of the most pervasive, extensive, and complex organizational information systems (IS) around nowadays. In this section I will provide an initial discussion of what ERP systems are and how they are developed, implemented and used in organizations around the world.

Enterprise Resource Planning systems

ERP systems are a widespread global phenomenon. Large Fortune 500 multi-national firms as well as small and medium enterprises (SMEs) in many different sectors and settings have embarked upon ERP projects (e.g. Davenport, 2000; Hirt & Swanson, 1999; Markus *et al.*, 2000; Muscatello *et al.*, 2003; Olhager & Selldin, 2003; Sarkis & Sundarraj, 2003). Some suppliers are very large, for instance SAP and Oracle, but numerous local suppliers are active as well. Many large consultancy firms have ERP specialists (especially most that partner with the large suppliers), but local consultants may also assist with package selection, business modeling, training, and so on.

Enterprise Resource Planning systems are a specific type of complex information systems that organizations use in order to enhance efficiency (or at least with the intention of enhancing efficiency), in particular by supporting the internal administrative and logistic processes and management functions (Klaus *et al.*, 2000; Van Stijn, 2002). ERP systems may be conceived as a generation of IS that is able to standardize and thus integrate information streams among and across the different functional areas in the organization. In particular, this implies that people supposedly share the same set of data by means of the ERP system and that they put these data to use in support of the plethora of processes existing within the organization (Al-Mashari & Al-Mudimigh, 2003; Davenport, 1998).

A particular trend for ERP systems is that they have been sold on the idea that they bring with them extensive conceptualizations and representations of

what should be ideal 'best' practices (Wagner *et al.*, 2004). This kind of information system provides for structuring of organizational working practices by prescribing and proscribing certain practices and creating dependencies between people that often have not existed before – or at least not in an integrated, formalized and rationalized manner (Koch, 2001; Pollock & Cornford, 2004; Pollock *et al.*, 2003). Indeed, ERP systems may be considered to consist of models of rationalism which results in their being comprised of a large array of formal rules, regulations, norms, and knowledge embedded or implied in the system. This formality, necessary as it is to manage the complexity of the practices they are intended to represent, brings about a specific rigidity that makes dealing with emergent situations, learning, and creativity a difficult issue (Kallinikos, 2004).

Of interest here is the observation that it is likely that ERP systems and their underpinning rational approach – to process and knowledge – has a potential to perpetuate potentially problematic issues with respect to the ways in which memories are incorporated into ERP systems during development and implementation and how people engage with memories to enact and interpret the ERP practices during use. These issues are further investigated in this thesis.

ERP processes: development, implementation and use

At a high-level, I distinguish three phases relating to the incorporation of ERP systems into organizations, namely development, implementation and use. It should be noted that these processes co-exist and though at a first glimpse it may appear that they are invoked in a linear fashion, they are not. The suggestion of ERP efforts being a never-ending story implies that one goes back and forth from implementation to use and vice versa and that some of the activities involved may take place simultaneously, and in a more emerging way than is often acknowledged in more rationalistic ERP approaches (c.f. Kirchmer, 1999).

In contrast to many of the earlier information systems, ERP systems are developed by third parties, rather than within the user organization itself. This

results in significant incentives for the vendors to (attempt to) develop standardized solutions, so as to be able to capitalize on the development of the packages. Thus, the suppliers' product development approach tends to be a form of mass customization: providing a platform that has standard characteristics but also a certain degree of freedom for the organization that implements and uses the ERP system to adapt the ERP system to their own circumstances. Over time ERP suppliers have adopted a number of strategies to develop their systems. One of these has been to co-operate with or to acquire (small) companies that develop specialized software and then incorporate their products into the kernel package. This modular approach is prefaced on the assumption that one can more or less randomly combine and integrate the different practices that are embedded or implied by the different software components.

Another adopted strategy is to work alongside with a reference organization – or a network of such organizations – as well as research communities. Through such partnerships, it is aimed to elicit both the conceptualizations of working (in terms of terminologies, representations, codifications, information requirements, and so on) and the ways of working (that are said to be superior) and subsequently codify this in the ERP system. Informative studies in this context are for instance the study of Big Civic (Pollock, 2000; Pollock & Cornford, 2004) and investigations of the Ivy case (Scott & Wagner, 2003; Wagner & Newell, 2004). Both of these cases are illustrative of the complexities of the people processes surrounding the development of ERP systems, and indicate that the "true stories" of the realization of 'best' practices in the system are complicated.

In this research, it is of central concern that the diversity of knowledge and representations at the partner organization is often not recognized, and that the underlying assumption – namely that one can identify one way of working as better than others, and in many different contexts – is a deceptive one. As Scott and Wagner (2003) account, Oracle's 'gold standard' as such was never actually implemented at the university that partnered with them (Ivy further customized it). It is also interesting to observe here that some reference organizations may have more bargaining power than others. Thus, they may

be able to push suppliers to incorporate practices that are neither generic nor "best" for other companies, requiring those organizations to settle with solutions that are far from ideal (Pollock *et al.*, 2003). The relation of 'best' practices and memory mismatches is further explored in this thesis.

The implementation phase may be understood as the phase during which the ERP package is configured and customized, and in which the organization undertakes a change program (including training of the future users) in order to be able to put the ERP system and its associated practices into action when it "goes live".

During implementation, the process of business modeling allows people to design the new ERP practices through the representation of a selection of possible practices in the ERP package in a context-specific – situational – manner. This representation requires both the concept formation within the organization, as well as 'translation' of concepts from the supplier's worldview (as embodied in the package) towards the organizational setting (Ko *et al.*, 2005; Pawlowski & Robey, 2004). The process of modeling that is of interest here is further investigated here.

To the (sometimes limited) extent that organizations do have a degree of freedom with respect to the standardized and formalized ERP practices, it is important to realize that the underpinning processes are open to a certain amount of re-contextualization to adapt them to the specific situation of the adopting organization. The nature of such re-contextualization and how people (re)construct ERP practices is not well-understood yet and one of the topics this thesis further explores from the notion of conflicting memories.
Self-evidently, the use phase is essential to actually realize any success with ERP systems. With success being a multi-dimensional construct, I observe an important issue with organizations overly focusing on 'project success' in terms of timeliness and cost/ budget, rather than actual benefits (though I acknowledge that many organizations struggle with even such 'project success'). Further, where evaluative studies have been conducted to measure performance after ERP systems have "gone live", these studies tend to decouple the performance of the system from the actual use and

implementation experiences (Gefen & Ragowsky, 2005; Holsapple & Sena, 2005; Teltumbde, 2000). Though for instance Markus and Tanis (2000) strive to overcome this and describe a phase model of ERP adoption (from 'project chartering' to use) it is difficult with this model to understand exactly how and why problems occur or how the problems experienced in one phase are dependent upon what happens in other phases. As such it has limited explanatory power.

Research on how people actually interact with ERP systems is scarce. An exception is a study by Boudreau and Robey (2005) on how users and other social players shape the enactments with an ERP system in the setting of a large governmental organization. They describe how people learn to deal with the anticipated and unanticipated outcomes of the ERP implementation and the ways in which they circumvent new ways of working as they engage with the ERP system. Their perspective as it is based on theories about agency, inertia, and learning, offers in my opinion an interesting complementary way of thinking about ERP use to the 'lens of memory' perspective presented in this thesis.

Importance of ERP research

As with other information technologies, the outcomes resulting from the implementation and use of ERP systems are contradictory (Boudreau & Robey, 1999a). One may encounter stories of extreme success to drastic failures. "IBM's System Storage (disk drive) division achieved a reduction in the time to enter pricing information from five days minimum to five minutes, replacement part shipping went from twenty-two days to three, and credit checks that previously took twenty minutes are now accomplished in three seconds" (Davenport, 2000, pp. 7-8). Failures are reported as well, for example "Unisource Worldwide Inc., a $ 7 billion distributor of paper products, wrote off $168 million in costs related to an abandoned nationwide implementation of SAP software" (Bingi *et al.*, 1998, p. 7). An even more extreme outcome may be illustrated by the ERP implementation at FoxMeyer – this failed project has been argued to have been a major factor in their bankruptcy (Scott, 1999).

Markus and Tanis (2000) provide an overview of the type of problems organizations may face when they are implementing and using an ERP system, a listing that provides a good – yet not exhaustive – impression of possible issues. One may categorize these problems as being technical, organizational and cognitive in nature, parallel to the way ERP systems are described in the next chapter. While recognizing that all three sorts of problems are interesting to look at in their own right, in this thesis, a cognitive orientation is adopted. When an ERP system is introduced and subsequently used in an organization, this impacts on the practices that are to be engaged in with the ERP system and the webs of memories that are instrumental to interpreting and enacting such practices. Thus, appropriating an ERP system means that these networked webs of memories – consisting of both individual and organizational memories – necessarily adapt and change. The central proposal of this thesis is that such changes will lead to the occurrence of memory conflicts (additional to the ones already existing in these complex webs) that are important signals of memory-related issues that make the adoption of ERP challenging and problematic.

To further establish the context of my research, I elaborate on prior studies that have a knowledge-centric focus on ERP systems next.

1.3. Prior ERP studies from a knowledge-centric perspective

Robey *et al.* (2002) discuss how people struggle with learning about how a new job should be done and with understanding how the new practices they participate in are interrelated and integrated. Before people can learn to work with the new processes (*assimilation*) they need to learn more about the software in order to enable them to configure and re-contextualize the new business practices (*configuration*). These findings suggest that there is a dialectic taking place between memories and new experiences. To the extent that memories and new experiences are inconsistent or conflicting it may not be possible to integrate new experiences into existing knowledge. Thus, memories may be considered to be a barrier towards learning and implementing new knowledge. In the ERP setting, a significant amount of knowledge needs to be formalized and codified in order to be able to build

representations that can be embedded into the technological system (Lee & Lee, 2000). Hislop *et al.* (2000) narrate that at Pharma-Co, the project management team bypassed the production managers to involve lower level production management for the process mapping.

> "The project team disguised its motivation for conducting the process mapping exercise by telling the production staff involved that it was related to new quality assurance certification. The necessity for the process mapping exercise, which was concerned with codifying and formalizing internal production procedures, was related to the tacit and embodied nature of the production process, which the project team needed to utilize to design their change program. This knowledge had never been fully, formally, codified into documentation and was instead possessed by production staff, who had acquired it through on the job learning. Thus, to tap into this knowledge/ expertise the project team found it necessary to directly engage with the staff that possessed it." (Hislop *et al.*, 2000, p. 403)

Though the direct involvement of end-users, the people who are actually engaged in the processes, is commendable, the fact that it was disguised and taken out of the context of the ERP implementation is questionable. In addition, it becomes difficult, in such a situation, to share representations or knowledge about the processes, which postpones the identification and detection of inconsistencies in knowledge and memories until later times. The latter point has not been addressed in prior research studies, though Newell *et al.* (2004) interestingly note:

> "After an abortive attempt by some to work together, each member conducted his/ her workshop independently and then proceeded to map out the particular processes associated with his/ her functional area. There was very little attempt to share these maps or to see overlaps between them." (Newell *et al.*, 2004, S. 49)

And that:

> "To map existing organizational processes, then, involves accessing and integrating these collective understandings, which are both dispersed and ambiguous." (Newell *et al.*, 2004, S. 44)

Several studies theorize about the transfer of knowledge and knowing internally in the organization (Lee & Lee, 2000; Volkoff *et al.*, 2004). Lee and Lee (2000) present a case study of the University of Nebraska. These studies suggest that knowledge transfer takes place by adopting the core business knowledge proposed by ERP and by mapping the reference process models or 'best practices' to the organization. They focus on the explicit codified knowledge and representations, in a rather rationalistic manner, and do not indicate how other knowledge is of relevance (Hislop *et al.*, 2000). Although Lee and Lee point towards conflicts with existing organizational structures and values – more reminiscent of the misfits approach suggested by Soh *et al.* (2000) – they do not investigate the relations and interactions of individual memories and the organizational epistemic with ERP systems and they do not observe conflicting memories in the way that is put forward in this thesis. I would suggest that such approaches to knowledge transfer ignore much of the context that must necessarily be invoked in order to enact practices, 'best' or otherwise, in any organization.

Volkoff *et al.* (2004) investigate the knowledge transfer from an implementation team to users at the level of communities of practice, and particularly the role of "power users" therein. Attention is paid to the fact that the transfer of knowledge among different communities is difficult because of incompatibilities between what constitutes knowledge in the different communities. Thus knowledge transfer often requires at least translation and sometimes also transformation (Bechky, 2003; Carlile, 2004). This aspect of the transfer and translation of knowledge is also illustrated in the case of ManDisCo, a manufacturing and distribution organization (Pawlowski & Robey, 2004):

> "We sit with our users. So every day is a knowledge transfer. I have people throughout this whole building, sitting there, knowing the business, being able to talk their language, to be able to interpret what they're asking for. (Director, Information Resources – Informant #4)." (Pawlowski & Robey, 2004, p. 654)
>
> "IT professionals thus viewed themselves as both translators and interpreters – reframing, explaining, and clarifying information in the context of the work practice of a particular group. Because each group's

> meanings were situated in their own work context, IT professionals needed to be aware of the differences in meanings of the same words, or the same word used differently, and forms of speech used by different organizations." (Pawlowski & Robey, 2004, p. 659)

Indeed we also would need to be aware of the use of different words with the same meaning in this context – how do we recognize that we are referring to similar things? Further, these observations prompt questions about whether knowledge is actually being transferred in these cases. Indeed it would appear that a process is taking place that results in the creation, recreation, or reconstitution of knowledge, rather than its transfer.

Jones *et al.* (2006) take a pragmatic view on knowledge sharing in an ERP setting, defining it as "sharing of knowledge about business processes and the related knowledge required to make these processes work" (Jones *et al.*, 2006, p. 412). They investigate how different dimensions of organizational culture may facilitate or hamper the knowledge sharing process that is necessary for ERP. Wagner and Newell (2004, p. 308) take a different path where they develop the notion of diverse epistemic cultures, focusing on "the heterogeneity of the knowledge-creating activity across contexts".

> "Knorr Cetina (1999) argues that different communities exhibit distinct epistemic cultures; that is different sets of social, material and discursive practices that make up 'how we know what we know'." (Wagner & Newell, 2004, p. 308)

Thus they focus on diversity between different groups, as for instance the difference between the budget director, faculty and administrative staff regarding the budgeting approach – illustrated in their case study of the university Ivy. This resulted in conflict rather than cooperation and may be related to the way that ERP 'best' practices tend to force organizations to choose one set of knowledge over another. As Wagner and Newell put it:

> "The power of best practice software is then to inscribe the values and politics of professional managers over traditional academic standards. This has the potential to reorder the working activities of actors and send the message that there is only one source of valid knowledge within the university. Focusing on these processes of standardization helps us think about the implication of design – of squashing multiple knowledge repositories – when the ultimate goal is to find a way to co-ordinate and

> govern an organization. In this way perceived success or failure of an ERP design is secondary to understanding the power of technology to act as a delegate for a particular world view, and a silencer of others." (Wagner & Newell, 2004, p. 324)

Lastly, prior studies consider the role of third parties in general, and consultants in particular. Consultants are supposed to bring with them appropriate knowledge about aspects such as project leadership and management, system customization and administration, as well as technical knowledge (Haines & Goodhue, 2003). Knowledge transfer may take place through working together, but also occurs as a result of the training process between consultants and the organization.

> "The most common training approach was to train key users and key project team members, who then established an internal training program. This is also referred to as the "train the trainer" approach. … Only one organization, PumpCo, had no significant training program. For this reason and the fact that almost all of the technical realization and even project management issues were handled by the consultants, hardly any knowledge was transferred from the consultants to the internal staff at PumpCo." (Haines & Goodhue, 2003, p. 33)

Ko *et al.* (2005) found that the successful transfer of knowledge between consultants and clients depends on such factors as absorptive capacity, shared understanding, intrinsic motivation, and credibility.

> "During ERP implementations, consultants bring to the engagement their prior work experience, work values, norms, philosophy, and problem-solving approaches. To the extent that these are similar to those of the client, there is a greater likelihood that the two are able to work effectively toward transferring knowledge." (Ko *et al.*, 2005, p. 64)

However, the research presented in this thesis suggests that such a shared understanding cannot be assumed, given the fact that consultants and clients are part of their separate webs of memories and the interactions may give rise to additional conflicts. It may even be impossible to achieve a shared understanding also to the extent that the interaction with consultants may not be focused on recognizing and reconciling extant mismatches. As Scott and Wagner note referring to Ivy University:

> "External ERP experts lacked contextual understanding of Ivy's ethos and workflow, making it difficult to develop a common basis for a collective work focus." (Scott & Wagner, 2003, p. 301)

In this section, I have discussed how prior research has begun to address topics like learning and transfer of knowledge within the organization (related to process knowledge and key users). Further, knowledge has been examined at a cultural level, emphasizing its social nature. Finally, research has also considered the role of external consultants. The work of Wagner and Newell (2004) is the only paper that puts the diversity of knowledge at center stage. However the overview provides ample motive to further investigate the problematic nature of such knowledge diversity in the setting of ERP systems.

Next, the research approach is further addressed.

1.4. Methodological remarks

Research objective and questions

Whereas, in the past, researchers have dealt with questions as to how new knowledge is transferred, shared, and integrated with existing knowledge in the setting of ERP systems, such investigations have provided only a limited understanding as to how difficulties arise from the fact that such knowledge is often diverse, ambiguous, vague, unshared, or indeed conflicting, and how this influences the ways in which people are able to construct and reconstruct the practices represented by ERP systems when these practices are re-contextualized during implementation and use.

The overall objective is to construct the 'lens of memory' perspective - as being built up from different partial investigations into the ways in which this perspective helps us understand ERP systems and their memory-related problems. The following specific questions deal with the explorations as developed in the chapters that follow:

1. What are ERP systems and how can they be linked to the cognitive dimension?
2. How are memory mismatches understood in relation to process and process modeling in the ERP setting?
3. How do conflicting memories occur throughout development, implementation, and use, explaining the problematic nature of 'best' practices?
4. How are memory mismatches signals for problems with the construction and reconstruction of ERP practices during implementation and in particular the use of ERP systems?
5. How can we construct the 'lens of memory' approach as an explanatory instrument in a retrospective case study on the introduction of an ERP system?

The aim of the research is to further understand and explain cognitive ERP problems that occur, in particular during implementation and use. The 'lens of memory' perspective is a way to describe and analyze cognitive ERP problems, where these relate to "memory mismatches" or "conflicts". The research focuses on the conceptual development of the 'lens of memory' perspective and the practical exploration of conflicting memories.

Five separate yet interrelated papers have been written to provide answers to the questions above.[5] I outline the contents in more detail in the next sections. The first two chapters can be characterized as conceptual. Chapter 2 provides an overview of how ERP systems may be described and Chapter 3 introduces the "organizational memory mismatch approach" in relation to process modeling that takes place in the context of the implementation of ERP systems. The next two chapters add further conceptualization but also add two re-analyses of existing cases. In Chapter 4 the topic of 'best' practices is investigated making use of the study of Big Civic (e.g. Pollock, 2000; Pollock & Cornford, 2004). Chapter 5 focuses on the reconstructions of ERP practices providing a re-investigation of the AcademCentre case study

[5] For more details the reader is referred to the acknowledgements of each chapter as well as the List of related literature.

(Bondarouk, 2004, 2006). The final chapter presents the developed 'lens of memory' perspective and presents the results of a retrospective case study I conducted at a small Dutch electronics company (Electro) then. Further methodological remarks are made within the chapters.

I would like to stress that although an implicit assumption behind this study is that the ability to deal with conflicting memories successfully would help to solve some of the problems with ERP systems, the research does not yield a new tested method in that direction. Rather the research reported here has been focused on the development and exploration of the 'lens of memory' perspective.

Indeed I consider this study to be exploratory in two ways. First, when I started this research in 2000, ERP implementations were undertaken in many companies worldwide, because of they had to replace their legacy systems for the Y2K deadline. However, academic research was only just starting to grow. For instance, in that year there was a first special issue in the Communications of the ACM (Kumar & Van Hillegersberg, 2000). After that, increasing numbers of publications and special issues have been published and we see that ERP research has become a key topic – which reflects the relevance in terms of its practical importance and its problematic nature (Howcroft *et al.*, 2004; Ragowsky & Somers, 2002).

Second, the proposed 'lens of memory' perspective, also referred to as "the organizational memory mismatch approach", is a new perspective for investigation, especially in the context of ERP systems and the processes that surround them, but also in a broader setting of information systems and knowledge management. In particular, the study has been used to explore how to further develop the mismatch ideas in a conceptual sense. In addition, the case studies that are described in the various chapters are not only meant as an enrichment of the narrative of the conceptual approach introduced here, but they also provide embedding in and linkage to practice, and give insight into the practical ramifications of the research.

The preliminary results of the investigation indicated that the research should not be limited to the implementation phase only, as was initially the intention. The reason for also including the use - or enactment - of the ERP practices, is that many of the mismatch issues that arise will only become apparent during actual use of the ERP system. Furthermore, their origin may partially lie in the ERP implementation, with such processes as blueprint design and training, but also be linked to the ERP development, and how practices are standardized and packaged. Another reason is that ERP implementation processes are viewed as ongoing processes that continue and reoccur after the go live date. Evolution and change, sometimes even in the form of a whole "re-implementation", will take place throughout the entire life cycle of the ERP package. Thus I contend that developing an understanding of the webs of memories and their dynamic interaction with ERP systems through all stages of the system life cycle will help understand why problems arise and also may provide initial guidance as to how to deal with mismatches and their associated problems, in particular during implementation and use.

A final remark here is that the theorizations put forward in this thesis are based on a literature study that in particular combines literature on ERP systems and information systems in general with literature from the areas of organizational memory and organizational routines in order to investigate memories at the level of ERP practices – that is, the processes supported by an ERP system that people engage in. It is at this level where we can see the interconnections and interactions of knowing between the individual, social and technological realms. Here, the interpretation of such knowing is based on a view of (ERP) knowledge that knowledge – contrary to a view that sees knowledge as a codifiable object easily shared and transferred – is continuously shaped and reshaped in networked 'webs of memories' that span those realms and that are exhibiting vagueness, ambiguity, diversity and in particular what are called 'organizational memory mismatches' or conflicts. With the introduction of an ERP system, new mismatches inevitably arise because of the changes that take place in these networked webs of memories. This refers for instance to the ways in which an ERP system becomes itself an active component of such webs, but also to the changes due to the fact

that people engage in new practices with new technology, where new interpretations and enactments subsequently change memories.

Before detailing the key findings of the research, I first present an overview of the dissertation's further chapters.

Outlining the thesis

Chapter 2 "Beyond ERP systems as a hype: understanding ERP systems as distinct technological, organizational and cognitive phenomena" investigates what characterizes ERP systems – to answer the first question. A further theorization of ERP systems is presented, discussing some of the key ideas and ideals that underpin them. As a way to theorize about this specific IT artifact, I describe how ERP systems may be understood, combining technological, organizational and cognitive aspects. The position taken here is that all these aspects would need to be accounted for to comprehensively understand and appreciate what an ERP system is. The chapter points out that especially the cognitive aspects have been scarcely addressed.

Chapter 3 "Organizational memory and the completeness of process modeling in ERP systems" addresses the question as to why memories are relevant in the realm of ERP by highlighting the process modeling that underpins the recreation of practices. The memory mismatch approach is introduced here, stating that deficiencies may exist between memory contents in the ERP system and related contents in other media. Three types of such incoherent patterns have been identified, namely under-redundancy (lacks, gaps), inconsistencies, and over-redundancy, proposing a way of systematically analyzing mismatches and assessing their potential consequences. It particularly calls for organizations to question how they are developing workable representations and models not only in terms of realization in the ERP system but particularly in terms of successful appropriation by the users, when they are taking a limited view on existing process memories that are inherently conflicting with the new ways of working and process knowledge proposed by the ERP system.

> "Indeed many process choices have become increasingly ambiguous, leaving room for a variety of diverging interpretations, none of which can encompass the total range of possible situations, not even within the context of a single company. Of course, where business processes are modeled in the software, they can be easily changed, but this does not mean that they are contextually adapted. In other words, it is not because processes are modeled in software that all actors will accept this representation of their work. For these actors, it is not enough that a few key users have been co-opted nor that they have complied under pressure." (Besson & Rowe, 2001, p. 60)

Chapter 4 "Adding the notion of conflicting memories to the story of ERP 'best' practices" provides a more detailed look on 'best' practices and the difficulties presented by conflicting memories. One of the premises that ERP systems are sold on, is that they embody preferred ways of doing business in the form of so-called "best practices". However it is a concern that throughout the cycles of development, implementation and use of such 'best' practices, significant problems occur with their identification, representation, interpretation and enactment. Introducing the notion of conflicting memories allows us for instance to re-interpret the "departmental silos" at Ivy along the webs related to culture, as well as individuals, structure, transformations, and the existing information systems (Stein & Zwass, 1995; Walsh & Ungson, 1991).

> "Departments are very much in silos. They operate like little, independent corporations… But what we are trying to do is to prepare people to break down some of those departmental walls and look beyond their departments to build an integrated administration. Knowing that any integrated system is going to be much more complex than the ones they had been used to – not only the systems themselves or the computer systems – but also the new policies, procedures and whatever – we are hoping that we can get everyone on the same page and make a big – a whole administration. – Distributed administrator" (Wagner, 2002, p. 109)

The chapter also addresses that memory mismatches are not only a problem in the context of implementation and use, but also in relation to the development of the ERP packages, re-analyzing the case study of Big Civic (Pollock & Cornford, 2004; Pollock *et al.*, 2003). The Big Civic case

exemplifies the occurrence of memory conflicts empirically. The material shows the difficulties with having different languages, and understanding concepts, especially when people have to "shift" webs. Linking back to the process modeling, it provides further support for the inherent incompleteness of 'encoding' and modeling. Memory mismatches also have implications for the interpretations and enactments of practices during use. Problems arising from them are sometimes 'solved' by local workarounds. However, as this is counter to the 'best' practices view, the managerial attitude towards workarounds is often negative.

In chapter 5 "Analyzing reconstructions of ERP practices", the problematic nature of processes and contextualization is further explored in terms of how people represent and recreate practices and how mismatches may explain problems that are occurring in this reconstruction process. It is discussed how ERP practices need to be and become re-contextualized within the adopting organization. Wagner *et al.* (2004) have described part of this re-contextualization in terms of negotiations, emphasizing the politics involved.

> "Although an orthodox ERP system might never be the best practice at Ivy, the evidence suggests that the design of multiple perspectives into systems is a resilient and ingenious act of will. As expressed by the newly appointed director of Integrated Administrative Systems:
>
> So, what's the good stuff? … One is that I find that the people who were… actually involved in project implementation – in spite of all the arguments… are a pretty cohesive and dedicated group. They understand how things work and they try very hard… everyone wants to do their best… but what we think is best differs. We'll make it work but… there's a tendency to… fall back to the old way of thinking… So it's… a balancing act… you can't keep… all these independently minded ducks in a row, especially when those ducks are Nobel Prize winning faculty." (Wagner *et al.*, 2004, p. 442)

Here, the focus lies on exactly how people come to understand the system and work with (or around) new practices, thus further addressing the cognitive foundations on which re-contextualization is negotiated. This chapter provides a re-analysis of the AcademCentre case (Bondarouk, 2004, 2006). It is further argued that close attention needs to be paid to how existing memories and new memories interact in the enactment and re-

enactment of organizational routines and processes, especially after the ERP has been implemented. It is likely that the interaction of old and new memories, among other factors, leads to these practices being enacted in ways which may significantly differ from those envisaged by the implementers of the ERP system. Although the observation that the system-as-designed is likely to display different static and dynamic characteristics from the system-in-use is hardly new, our approach let researchers focus on the impact of existing and new memories and memory webs on their understanding of organizational processes and routines.

Chapter 6 "Investigating ERP systems through a 'lens of memory' " further develops the theorizing of the prior chapters into a conceptual framework of the "lens of memory" approach, linking webs of memories and ERP practices to processes of re-contextualization, learning and training, and usage, using mismatches as a unifying construct. The Electro case of a small Dutch manufacturing firm provides an empirically-based elaboration of the framework, detailing issues such as forming representations and understanding concepts, push button training, and workarounds. The study particularly addresses difficulties with "shifting" webs and forming memories, problems that were augmented because of a general lack of involvement of the end-users.

In the next section I summarize the key aspects of the 'lens of memory' perspective.

1.5. (P)Review: introducing the 'lens of memory' perspective

Using the 'lens of memory' perspective, we consider that introducing an ERP system into an organization entails constructing a new web of memories that relates to the ways in which the organization is able to conduct its practices, structuring knowledge and information, and the ways in which this knowledge flows through the organization. As I will further detail, the prevailing mindset of researchers and practitioners in the ERP implementation and use tends to stress the explicit aspects of knowledge and memories, which then can be easily integrated and exchanged in the

organization. This perspective allows us to identify a number of critical challenges that this view of knowledge and memories is likely to either ignore or even potentially exacerbate.

The theorizations are partially based on organizational memory theory. Organizational memory is often defined as "stored information from an organization's history that can be brought to bear on present decisions" (Walsh & Ungson, 1991, p. 61). Whereas memories are often associated with the past, memories are actually activated and engaged in supporting and integrating behavior in the present and, in the process sometimes reconstructing the past creatively. Thus, we may consider that one of the central roles of memory is to enable interpretation and enactment of practices. Memories thus shape these practices and behaviors, and are potentially shaped by them. Further, to the extent that memories form a source of alternative perspectives and ideas, challenging the status quo of practices, they also exert considerable influence on future behaviors and stimulate change.

The 'lens of memory' approach not only focuses on the way memories support organizational practices, but also how memories are supported by organizational practices. Further, it postulates analogical links between the theory of individual memory and organizational memory. This is a start to explore the ways in which individual memory theory may be used to articulate and enrich organizational memory theory. Memories provide an essential foundation for the behavior of individuals and also play a central part in the enactment and interpretation of practices in organizations. They are essential to being able to understand what to do, how to do it. They provide the basis for reflexive monitoring and thinking through behaviors and practices, and form a basis for learning and change. Individuals act based on information that they retrieve from memory, and reflexively their actions shape their memories. At the organizational level there is a need to embed (or inscribe) memories of particular ways of doing things. Furthermore, at this level, it is important to recognize the interrelatedness of different memories, where they are for instance reflecting similar contents and are interacting with each other. On top of this, it becomes more important to understand that memories are

diverse, vague, ambiguous or even conflicting (Van Stijn & Wensley, 2001; Wagner & Newell, 2004).

A central feature of individual memories concerns the fact that they are subject to interpretation whenever they are accessed. Such interpretation relies on other memories and such devices as dialogue and narrative. It is proposed that understanding the ways in which individual memories are interpreted and re-interpreted can provide useful insights into the flexible enactment and re-enactment of organizational processes. This also relates to the question as to the importance or usefulness of having conflicting memories and varied perspectives. To a certain extent having mismatches needs to be preserved in order to have the creativity and flexibility, because mismatches can be seen as the foundation on which to change practices, in terms of the interpretation and enactment they symbolize, they can enable people to ask the necessary questions that may form the basis for change, and innovation. Thus, there is a need for the ability to engage in a continuing dialogue with the system and asking questions as to what is working, what is right, what is in need for change. However, we may see that a certain conscious reflexivity gets abandoned in the process, because of the rigid nature of ERP systems that silences other perspectives and may ignore certain conflicts.

It is important to stress that our 'lens of memory' approach rejects what might be referred to as the information-processing metaphor of memory in order to focus on networked "webs of memories" that are interconnected. Where knowledge and knowledge management are viewed from a rationalistic standpoint, the interpretation of the knowledge is seen as a rather simple task. Having explicit knowledge is seen to also imply having a shared understanding and people would thus automatically be able to engage with the knowledge. On the other hand, here, the adopted view of memories conveys the view that knowledge is much more ambiguous, personal, situational, and also to a certain degree conflicting. Memories and webs of memories interact with each other and also with the practices they support and the technologies in which memories are inscribed. The diverse and diffuse nature of memories as well as interacting of the memory webs implies

an emerging character of memories, meaning that they are shaped and shaping in unpredictable, implicit and sometimes hidden ways. Thus, the integration and exchange of knowledge is seen to be much more problematic than suggested within an information-processing view. As such, the 'lens of memory' perspective provides a means to further understand for instance the limits to codification of processes in terms of modeling and issues related to the lack of shared understanding and language.

The notion of conflicting memories

In the beginning of this research, conflicting memories have been described in terms of "organizational memory mismatches". Those refer to disparities between organizational memory contents implied by the ERP system (in terms of for instance representations of 'best' practices) and related contents in other media, such as individuals' memories, and the organizational structure and culture, i.e. they arise when different "stocks" of memories are missing or in conflict with each other (Van Stijn & Wensley, 2001). Rephrasing this, we may say that during implementation and use, interactions take place between people, the ERP system, and a variety of webs of memories. These webs are likely to evidence inconsistencies, incoherence, and conflicts. Identifying these 'pathologies' is itself a challenging research task. Additionally, some pathologies are actually valuable sources of alternative perspectives and creative tension, whilst others are genuinely dysfunctional.

Informative work has been Festinger's theory of cognitive dissonance. In this theory, Festinger (1957) describes how people cope when they are confronted with conflicting cognitive elements. For example when faced with a choice between two options that both have positive and negative consequences, one of our tendencies is to bias and rationalize to justify the option we intend to choose or have chosen. We may forget or lessen the downside of our choice, magnify its good points, and adopt the opposite strategy for the option that we do not intend to choose or have not chosen. Where Festinger's analysis focuses on the individual, the notion of conflicting memories takes the notion of cognitive dissonance not only into a social setting, but in particular to an

individual and social *memory* setting where stress is placed on the distribution and situatedness of conflicting cognitions in space and time. As such, it is thus partially about what Schultze and Leidner refer to as:

> "struggle, conflict, and tension as a natural state [that] assumes that these phenomena [such as knowledge, culture, and identity] are multiple, conflicting, and fragmented" (Schultze & Leidner, 2002, p. 216).

The 'lens of memory' perspective "highlights the dynamic and situated nature of knowledge" (Schultze & Leidner, 2002, p. 224) *and* the relatedness of such knowledge, or more precisely, the impaired relationships.

Next, a further (p)review of the findings is provided, in particular in the form of an elaboration of areas of interest for future research.

1.6. (P)review: An agenda for future research

The research has linked the problems with mismatches throughout the development, implementation and use of ERP systems. Furthermore, the linkage with routines is considered essential to understand the role memories play for the ostensive and performative aspect of routines. Knowing is necessary to interpret and enact practices and is also shaped by these processes. Looking through the 'lens of memory' entails investigating how people come to understand processes, how they gather information and knowledge about them, and how they integrate new process understanding with their existing memories. Furthermore, it provides a way to articulate how changes in the networked individual and organizational memories give rise to mismatches. Those mismatches are interpreted to be important signals of problems and also may be regarded as cues for reflective questioning and change.

With a multitude of individuals and memory webs involved in the development, implementation and use of ERP systems, one of the topics of interest for future research concerns the fact that the people actually using the ERP system at the most basic levels are not often involved actively (Somers & Nelson, 2004). Again, the research illustrates that it is often unwanted or thought of as unnecessary to involve the users, even though the policy of

consultants and suppliers states the importance of their participation. One of the tactics is to make use of key-users, power users, or core teams (Robey *et al.*, 2002; Volkoff *et al.*, 2004). As Bagchi *et al.* (2003) note:

> "Key-users are designated users who represent a specific functional are (marketing or finance) and are involved in the entire ERP lifecycle. They tend to be the users' primary voice in the process mapping stage and in negotiations having to do with the extent of process reengineering. They are handpicked because of their functional area expertise, technical skills and learning ability and are deemed ERP champions." (Bagchi *et al.*, 2003, p. 153)

The 'lens of memory' perspective may provide additional insights with respect to what the consequences are of people deciding on the implementation level not being the same as the ones actually using ERP at a practice level after the system has 'gone live'.

Indeed, having key-users in a project does not say that the "end-users" will accept the system that comes out of the involvement of those selected persons. They may resist the system, refuse to comply, feel that the processes are interpreted and represented wrongly, or be cut off and lack understanding that they would need to enact the practices (Besson & Rowe, 2001; Lengnick-Hall *et al.*, 2004). My research suggests they are even afraid to make mistakes and cannot reside with their memories, that is, they cannot integrate the memories associated with a technology with their own memories. Part of this is beginning to attract attention of other ERP researchers, but much more can be said of this.

> "Senior managers tend to exert pressure on subordinates to use the software package for their daily office work (if the employee, on whom the pressure is being put, does a job that requires ERP package usage). Users who would benefit from using ERP are not given the option of choosing whether or not to use the ERP system. Bypassing ERP is not an available option regardless of any inadequacies in the ERP system. Given the high costs of changing software, most organizations use 'workarounds' to customize the software." (Bagchi *et al.*, 2003, p. 150)

Some mismatches indicate difficulties with incomplete process understanding that make it problematic to compare representations of process in the ERP with representations of processes in the organization. As part of the implementation, process modeling takes place to translate process knowledge into models to design the ERP system and as a basis for change – though we see that the latter is only minimally used for instance at Electro. ERP suppliers provide so-called blueprints that reflect the de-contextualized reference processes and 'best' practices. In many cases, consultants or IT professionals will have the most formative role in the process of implementation, establishing the formal blueprints for the organization, assisting them in running the project, training and change management. They become a go-between and translator bridging supplier-client worlds and on top of that, will add his own insights and experiences (Pawlowski & Robey, 2004). Because they are not actively involved, users will not have the same opportunities for shaping their memories. This inherently leads to the creation and emergence of alternate webs of knowing. Furthermore, these alternate webs may not be compatible with each other; there may be significant differences in the actual interpretations and enactments of processes. Thus another thread for future research is to refocus the 'lens of memory' on the role of consultants.

This also means that we may look further to the problem of shifting from one web of memories to another, interacting and immersing with the differently shaped and situated memories. We know from prior research on knowledge sharing and creating shared meanings that "shifting through webs" is difficult, if not sometimes impossible, and the extent to which people can form similar memories becomes limited in situations where they do not have access to the same memories and experiences (Bechky, 2003; Swan *et al.*, 2000). Thus, not everybody has an equal opportunity to call upon the same networked memories, which indicates that heterogeneity and conflicts are to be expected to arise among memories. Being informed by the notion of conflicting memories helps us to understand such mismatches.

The adopted lens also implies that the prior memories of people are important to consider at many stages of the ERP life cycle; new situations

cannot be considered to be independent of pre-existing situations and, in particular, pre-existing or 'old' memories. Thus, the problem of forgetting is an interesting avenue for further research in the context of the ERP systems. When introducing an ERP system, one challenge is to combine, integrate, and bring together the old and new memories. This suggests a process of forgetting is necessary. Paradoxically enough, it seems that people, certainly in the early stages of implementation and use, cling to their old ways of doing and understanding, strengthening the memories rather than enabling them to move towards the new situations. Furthermore, because of the limitations often found in the packages it may well be possible that old and new have to co-exist and co-evolve in order to enact the practices in a more or less successful manner. How are people dealing with the conflicting memories that are arising in this situation?

In parallel with this study issues relating to the stabilization of memories can be the jumping off point for research into how ERP practices themselves become stabilized and routinized. Additionally, it would be interesting to examine how people 'understand' a new system when they have had extensive knowledge of working with the physical system of the organization or other previous systems – do they really understand the new ERP system or do they simply transfer their knowledge from the prior system to the new ERP system? These questions also touch on the extent to which users have a more extensive understanding of the interconnectedness of the system and the interactions that underpin its dynamic behavior. Relevant research questions here would be: How do they learn a more extensive understanding of the ERP system? How do people learn to enact the new ERP practices?

When people are required to run new practices by using an ERP system, we expect them to be instructed in how to do so successfully. However, the approach that is often used – we refer to it as a 'push-button' approach – does not readily provide users with the understandings of organizational processes, their interactions, or interconnectedness (Kumar *et al.*, 2003). Training can only roughly approximate what these practical situations will look like. If these training contexts are too unrealistic, users will obviously have difficulty in adjusting quickly after the system has gone live. Nor does it

help them to form memories of doing the tasks beforehand, but rather, we see that experiential learning becomes critical. Such learning though, from a methodological and managerial point of view, requires a different approach in order to facilitate and support it. Users should be able to learn from trying, learn from their interactions with the actual practices and other individuals, rather than making it a solitary act of people behind their computers. Users should also have adequate opportunity to reflexively question and evaluate their participation in organizational processes.

The actual use of the ERP system is also of interest. How are ERP practices interpreted and enacted? How are individuals able to deal with unanticipated situations? Is there enough room for reflexivity and asking questions from a different perspective? How does the ERP system enable or disable interactions with other memories so as to facilitate or impede flexibility and change? One of encountered issues is that it becomes (increasingly) difficult to question the rationale behind systems such as ERP systems. This rationale is in accordance with a general notion of rationalization, objectification, de-humanization that we see in a broad (Western) societal context. There is a significant danger that people are de-humanized through such things as the models and frameworks, the analyses, and formalizations. Indeed a rationalistic view of the world, which often prevails in the ERP context, may render organizations much less sensitive of the informal, personal, contextual, emerging, and interacting ways in which many of their processes actually take place and the memories get shaped by and shape practices. Furthermore, any "not-normal" behavior is negative, it is inappropriate deviation, bad, fault, intolerable etc. Workarounds are seen as ways to evade or sabotage the system, rather than as opportunities for learning, creating better understandings, or securing an environment in which change is emerging and realized through evolution. It follows from the research that those behaviors are essential and by prohibiting them, the workarounds will become 'undercover' behaviors that management is not likely to be aware of. This can create serious problems when change is necessary, as the ways in which management understands the ERP practices does not represent the actual work situation.

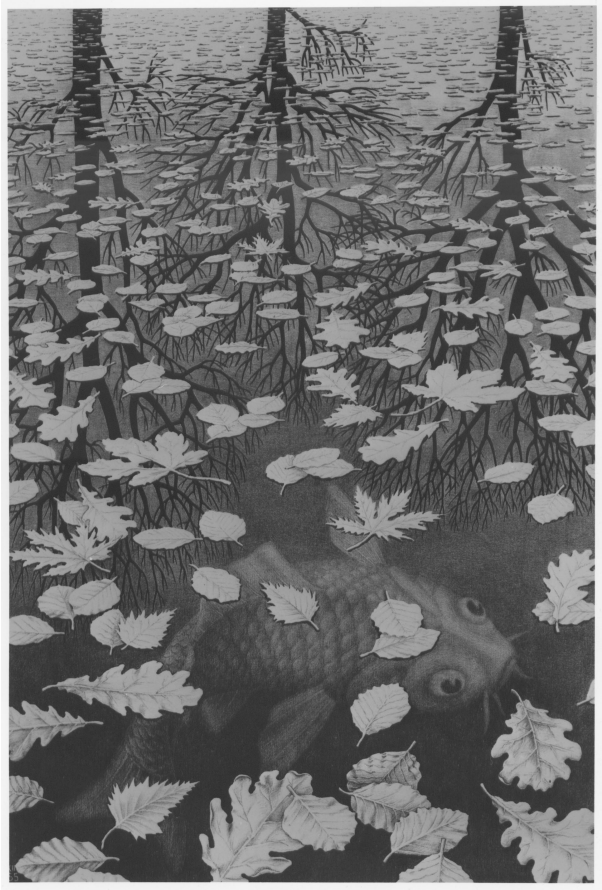
Responses to mismatches, leading to their resolution, may involve a variety of strategies which may require the collection of new information or the making or revision of assumptions. Further research into the nature of privileging and other mitigation strategies for mismatches is considered to be valuable. A fundamental research agenda would incorporate addressing the coping strategies that are adopted to identify and address incoherence with respect to memories and memory webs at all relevant stages of the ERP systems life cycle. Furthermore, an important finding is that developing the 'lens of memory' perspective in a more pro-active direction does not entail eradicating mismatches at all costs. Rather, the question becomes how we can successfully work *with* mismatches on an ongoing basis?

1.7. In conclusion

The following chapters address ERP systems in terms of what they "are", how they are developed, implemented, and used, and how they relate to interpretations and enactments of practices – sometimes identified as 'best' practices. Particularly, it will be discussed how organizational memory mismatches, or conflicting memories, are illuminating to study ERP systems. Critical questions for practitioners and researchers alike are asked throughout the chapters. As in this chapter, a lot of directions for future research are indicated. Although I am only able to explore some of the practical implications here, I am convinced that thinking through the identified issues from the central notion of conflicting memories provides an interesting start.

2. Beyond ERP systems as a hype

Understanding ERP systems as
distinct technological, organizational
and cognitive phenomena



2.1. Abstract

This conceptual chapter addresses the question as to whether research on ERP systems makes sense. Its purpose is to show that ERP systems are not simply hype or buzz. This chapter adopts the view that ERP systems are technological, organizational, and cognitive in nature. Along those dimensions, ERP systems can be compared to *and* distinguished from other Information Systems (IS). Accordingly, ERP concerns for further research are identified for such categories. Several identified issues also relate to the interactions and interrelations between the various characteristics of the dimensions. A variety of such issues is presented throughout the chapter. Further research promises to extend academic understanding of ERP systems, as a specific domain of IS. As a result of such gained insights, we may be better able to support business practitioners in actually realizing benefits with their ERP systems.

Keywords: ERP systems, ERP technology, knowledge management, effectiveness, integration, complexity, standardization

2.2. Introduction

Some scholars classify the term Enterprise Resource Planning (ERP) systems in the category of "buzzwords", probably together with other contemporary Information Systems (IS) terms such as customer relationship management, data warehouses, and knowledge management systems (Swanson, 2000). Moreover, ERP vendors start selling extended ERP solutions that might as well include all those IS. The academic concern for ERP systems, in teaching and in research, is increasing. But caution is advised!

> "Empirical researchers should not confuse the current buzz about information systems with the existing population of systems deserving of study. Perhaps much too frequently for their own good, empirical researchers seem to be attracted to the 'latest and the greatest' just like everyone else. They plunge in to make observations of scattered and ill-understood phenomena still under substantial development and change,

> coming too often to findings destined to evaporate in their relevance much too soon. They tend to ignore that which has become widespread, well established and even mundane, and therefore fail to make the more obvious observations and draw the needed longer-term, underlying lessons for us." (Swanson, 2000, p. 925)

Did we all plunge in the ERP hype? Or are ERP systems really worthwhile studying? Some publications illustrate that we were seduced by the hype, specifically when they indeed appear to forget the rigorous body of relevant scientific literature. Fortunately, other papers support the position that - like this chapter intends to demonstrate - ERP research is valuable both for science and practice. This chapter proposes to characterize ERP systems with respect to three dimensions, namely a technological, an organizational, and lastly a cognitive dimension. After a methodological note, such a comprehensive characterization is discussed. In addition to providing an approach to distinguishing ERP systems from other IS constructs, various directions for further investigation of ERP systems are presented.

2.3. A methodological note

Information systems are generally characterized as being technological and organizational in nature. Many different information technologies are available to organizations. Self-evidently, when applied in organizations, a diverse range of organizational aspects is important too, for instance regarding task-technology fit (Zigurs & Buckland, 1998), the degree of integration of IT decisions with common planning and decision-making in the organization (Van der Zee & De Jong, 1999), or organizational change in the context of IT (Boudreau & Robey, 1999a). A third - less commonly recognized - dimension is the cognitive dimension. Obviously, cognitive elements such as knowledge and information are also important in the context of IS. Structuration theory of IT (DeSanctis & Poole, 1994; Orlikowski & Robey, 1991) and organizational memory theory (Stein & Zwass, 1995; Walsh & Ungson, 1991) both explicitly address this dimension. Cognitive issues may relate for instance to organizational learning during IS

development and implementation (Robey *et al.*, 1995; Salaway, 1987; Stein & Vandenbosch, 1996)

In order to compare and distinguish ERP systems from other IS, such as workflow management systems and e-commerce systems, and to identify areas for further research, ERP systems are characterized along those three dimensions. Let me explain briefly how I did this. Based on 20 short descriptions of ERP systems complemented with study of other ERP systems, IS and organizational literatures, several general aspects have been identified for each dimension. Here is one of the used ERP descriptions:

> *"ERP systems are integrated, enterprise-wide, packaged software applications that impound deep knowledge of business practices accumulated from vendor implementations in many organizations. ERP systems are evolving to incorporate new technologies, such as E-commerce, data warehousing, and customer relationship management. ERP software is a semi-finished product with tables and parameters that user organizations and their implementation partners configure to their business needs." (Shang & Seddon, 2000, p. 1005)*

From the analysis, important characteristics of ERP systems have been translated in general characteristics. For instance, their potentially very significant integration of organizational processes has been categorized into the general characteristic 'organizational integration'. Compared to other IS, groupware may also score high on organizational integration, whereas an e-commerce system may score low.

Now, let us turn to the technological dimension.

2.4. The technological dimension of ERP systems

Five general IS characteristics may be distilled for the technological dimension and instantiated for ERP systems, namely applied technologies, development, standardization, complexity, and integration.

1. Applied technologies

ERP systems are a combination of different technologies such as client-server systems and web-technology with specific features, such as being real-time, online, and interactive (Brown *et al.*, 2000; Madani, 2000). The application of multiple technologies is assumed to lead to specific concerns regarding complexity, standardization and integration, characteristics that are discussed later.

2. Development

As opposed to information systems that were developed in-house in the organization, the current trend is towards outsourcing. As such, ERP systems are commercial packages from third-party suppliers. Currently, key suppliers are for instance SAP AG and Oracle (that incorporates PeopleSoft and J.D. Edwards). ERP systems can be understood as semi-finished products with tables and parameters to be configured in-house (Shang & Seddon, 2000). The organization may customize the ERP software, by means of add-ons or other enhancements (Keller & Teufel, 1998; Markus & Tanis, 2000). Yet unanswered questions are how to decide what aspects of the ERP package need to be enhanced (to better fit the organization's needs), how, and under which conditions?

3. Standardization

As ERP systems are developed largely out-house, they are considered to be prewritten, and of a generalized nature. This is very important for suppliers if they want to sell their product in many markets. Within the adopting organizations, more uniformity is also often aimed for. The level of standardization - striven for by means of reference business process models supplied by ERP vendors and consultants (Keller & Teufel, 1998; Scheer, 1998) - appears to be high. The reference business process models should make technological realization easier. However, suppliers have tended to

develop non-open systems, while standardization across packages did not take place (Loos, 2000). That may decrease the ERP system's flexibility, obviously an important requirement. Further componentization and standardization of interfaces are two solutions currently adapted to enhance flexibility (Loos, 2000; Sprott, 2000).

4. Complexity

Because of their large-scale and organization-wide scope, ERP systems are considered to be highly complex. One may distinguish component complexity, coordinative complexity, and dynamic complexity (Banker *et al.*, 1998).

> "Component complexity refers to the number of distinct information cues that must be processed in the performance of a task, while coordinative complexity describes the form, strength, and interdependencies of the relationships between the information cues. Dynamic complexity arises from changes in the relationships between information cues over time, particularly during task performance." (Banker *et al.*, 1998, p. 435)

In these terms, complexity of ERP systems has not been investigated yet, nor the potential effects. Hypothetically, high complexity may for instance negatively influence the implementation process.

5. Technological integration

Different forms of technological integration are identified, for instance relating to the hardware architecture, components, data, and other IT. With respect to all those forms, ERP systems are regarded highly integrated. For vertical integration of business news, data are obtained from Internet, processed applying text mining, coupled to internal data from the ERP system, and provided to the managers. Researchers can help to develop such technologically integrated solutions by investigating the problems that may occur. How reliable are for instance the text mining procedures? Do they really filter the data in such a way that the information need is fulfilled?

Next, the organizational dimension is discussed, including organizational integration.

2.5. The organizational dimension of ERP systems

The following three IS characteristics are distinguished: functionality, effectiveness orientation, and organizational integration.

1. Functionality

ERP systems aim to support many business processes, varying from human resource management to logistics (Davenport, 1998). Some functions of SAP R/3 in Table 2-1 illustrate this. Originally, ERP systems concentrated were on these internal organizational processes. Currently, ERP systems evolve into extended-ERP systems, providing support for inter-organizational processes as e-business and supply chain management (Kumar & Van Hillegersberg, 2000). As such we may see the functionality of ERP systems as a continuously evolving target, where the description of ERP functionality may fail to catch the 'spirit' of ERP systems, and might as well be outdated next week. Perhaps that is one of the pitfalls of studying a buzzword phenomenon such as ERP systems?

2. Effectiveness orientation

It is proposed here to use the concept of 'effectiveness orientation' to capture what ERP systems are about. The 'effectiveness orientation' - based on the framework by Quinn and Rohrbaugh (1983) - comprises of two dimensions, namely focus (internal/ external) and structure (flexibility/ control). It is proposed to exclude the earlier mentioned extended functionality from the ERP system. Instead, ERP is understood here as focused on control of resources and activities *within* the organization. Registering, planning, tracking, standardizing, optimizing, and performance measurement are all control functions embedded in ERP systems. It is yet unclear to what extent ERP

systems contribute to enhanced performance, and under which conditions. Indeed it may well be that the control focus of ERP systems inhibits an organization's overall effectiveness!

R/3 Financial	R/3 Human resources	R/3 Logistics
• Financial Accounting • Controlling • Joint Venture Accounting • Investment Management • Corporate Real Estate Management • Enterprise Controlling • Treasury	• Personnel Management • Organizational Management • Personnel Administration • Recruitment • Personnel Development • Training and Event Management • Compensation Management • Benefits Administration • Personnel Cost Planning • Time Management • Payroll Accounting • Travel Management	• Product Data management • Sales and distribution • Production planning and control • Project system • Materials management • Quality management • Plant maintenance • Service management

Table 2-1. Functionality of SAP R/3

3. Organizational integration

Organizational integration may be defined as "the action of forming an ensemble, a coherent whole, of the various administrative units that make up the enterprise, each of which assumes certain functions" (Alsène, 1999, p. 27). The organization may be interpreted as a collection of parts or subsystems (Katz & Kahn, 1966; Senge, 1990). One of the issues relating to ERP integration, then, is the definition of an organization in terms of interrelated subsystems. Which aspects of the organization are dependent in what way and to what extent? Highly related aspects may be integrated more tightly, while low interdependence can lead to very loose coupling (Weick, 1969). How can organizations integrate their ERP-related internal processes? Some organizations choose not to implement full ERP functionality, but for instance only implement human resource management and financial accounting components. In fact, they are not realizing an enterprise-wide

system, or the proposed enterprise-wide integration. What does this mean in terms of such organizations' realization of ERP benefits? Do other ERP problems originate here as well?

The third dimension, addressed next, is the cognitive dimension.

2.6. The cognitive dimension of ERP systems

Five cognitive IS characteristics are distinguished, namely information, skills, knowledge, and paradigms, and cognitive integration.

1. Information

> "Information is the flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and belief of its holder." (Nonaka, 1994, p. 15)

Information can be seen as messages that can become knowledge when its receivers can interpret them. In terms of actual content, ERP information particularly focuses on the functional domains, such as logistics and finance (see Table 2-1).

Though data may be interpreted as having a cognitive aspect as well, I regard data here as technological in nature, being the stored bits and bytes that may become information when they form a message.

2. Paradigms

Paradigms refer to the organizational beliefs and the governing values and norms about 'what is good and what is bad', about what one should and should not do (Kuhn, 1970). A key premise is that ERP systems embody best practices that allegedly lead to improved effectiveness (Davenport, 1998; Kumar & Van Hillegersberg, 2000). Best practices are based on theoretical and practical assumptions (beliefs) for 'the best way' to execute a given

process. They are also generalized and standardized. But processes exist within a rich context, including products and services, customers and suppliers, and employees (Van Stijn & Wensley, 2001). In which context do the best practices actually apply?

3. Knowledge

Knowledge, or interpretive schemes, can be described as "a mental template that individuals impose on an information environment to give it form and meaning" (Walsh, 1995, p. 281). Knowledge helps human actors to give the world meaning (Orlikowski & Robey, 1991). Process knowledge, both company-specific and general, is embedded in the ERP system. Procedural knowledge, for instance regarding financial controlling, logistics and sales procedures, are programmed into the ERP system (Koch, 2000).

4. Skills

Skills are comparable to tacit (Nonaka, 1994) or soft knowledge (Anand *et al.*, 1998), capabilities 'how things are done'. Usually, those capabilities have a personal quality, deeply rooted in action, commitment, and involvement (Nonaka, 1994). Skills may be elicited for the ERP in the form of routines or decision models, or in the form of a skill database in the HRM component of the ERP system, linking employees and skills.

5. Cognitive integration

Cognitive integration means the integration of the above characteristic 'contents' of the ERP system. Integration may provide the organization with a comprehensive holistic view of the business (Gable & Rosemann, 2000), but it may also pose difficulties. Though crucial when considering that organizational effectiveness will be "a function of the degree to which decision-makers have knowledge about the nature of these interdependencies (Duncan & Weiss, 1979, p. 83)", it may be very difficult to understand the

organization as a whole. It should be noted that although integration is important, it should not become a goal in itself.

2.7. Discussion

Table 2-2 summarizes the proposed general characteristics for the three dimensions.

Technological dimension	Organizational dimension	Cognitive dimension
Applied technologies	Functionality	Information
Development	Effectiveness orientation	Paradigms
Standardization	Organizational integration	Knowledge
Complexity		Skills
Technological integration		Cognitive integration

Table 2-2. Summary of the proposed dimensions and characteristics

The basic premise on which ERP systems are sold is that, like any IS, the purpose of ERP systems is to support the organizational processes in order to enhance effectiveness. Effectiveness is a complex and controversial organizational construct. One could say that effectiveness means that the organization functions in such a way that it has a relative sustained competitive advantage over its competitors (Hamel & Prahalad, 1994; Kettinger *et al.*, 1994). Such effectiveness, or performance, is dependent on how the organizational processes function. The design of those processes may be dependent on what is introduced here as the effectiveness orientation. ERP systems focus on control and internal processes. The latter characterization of ERP may appear to be counter-intuitive to the current trend of extended functionality and as such may appear to be slightly artificial. However, it may help to delimit what we consider ERP systems in this way, particular for research purposes, because it makes it enables us to study ERP systems within these borders, as well as its relations and interactions beyond. Illustratively, one could study ERP systems in relation to manufacturing and project planning (see Table 2-1), or investigate the impact of e-business on ERP.

In a similar fashion to integration, one may consider complexity and standardization cross-dimensional characteristics too. ERP business process models intend to standardize the various cognitive elements. Furthermore, the organization may adapt its organizational processes to standard business process models, thus leading to organizational standardization. Organizational complexity with respect to an ERP system may be very high, since the system relates to many different organizational functions and processes. Complexity with respect to the cognitive elements may also be very high. For instance, in the context of expert systems, knowledge complexity has been defined as:

> "the degree of depth and specialization of the internalized knowledge of human experts, the scope of the decision-making process, and the level of expertise required, including discipline-based knowledge, that is incorporated into the expert system application." (Meyer & Curley, 1991, p. 456)

High technological, organizational, and cognitive complexity may cause the adoption of ERP systems to be more difficult than of low complexity IS, potentially causing ERP implementations to take much more time (and money) (Bingi *et al.*, 1998). High complexity may also be hypothesized to make it difficult to realize ERP benefits, as opposed to benefiting from low complexity IS.

The discussed characteristics of ERP systems may be used as potential metrics for studies of ERP success, that is currently ranging from drastic failure to extreme success (Boudreau & Robey, 1999b). Though potential ERP benefits have been identified (Shang & Seddon, 2000), research on ERP evaluation is scarce (Rosemann & Wiese, 1999). To what extend are benefits actually realized? How do identified critical success factors (Holland *et al.*, 1999) such as top management commitment, contribute to these results? Allegedly, the integration of internal processes and the use of best practices are important factors contributing to the ERP system's success. Are they? What if cognitive contents the third party developing the ERP system had in mind are different than the actual knowledge of the organization that is implementing or using the ERP system? Such knowledge conflicts (or

organizational memory mismatches) may disable the organization to realize the ERP benefits (Van Stijn & Wijnhoven, 2000). What other influences do such knowledge conflicts have?

2.8. Conclusion

This chapter has raised the question whether we have all been seduced by the ERP hype or whether ERP systems are a valuable target for research. In other words: Are ERP systems really worthwhile studying? This chapter aimed to demonstrate that ERP system research is meaningful. Therefore I have described ERP systems along the technological, organizational, and cognitive dimension, and identified several general characteristics for each of those dimensions. Understanding them as multi-dimensional phenomena makes it clear that ERP systems exhibit a combination of specific characteristics that makes them distinct from other information systems that share some - but by no means all - of those characteristics. ERP is a distinct IS domain. A myriad of potential research questions, both regarding the individual characteristics and regarding their interrelations and interactions, have been posed, and clearly, many more issues may be identified. Considering that the proposed characteristics may be used as potential metrics for studies of ERP success, it is my contention that organizations may profit from future ERP research that aims to answer such questions to enhance our understanding of how to realize benefits with ERP systems. Such understanding contributes not only to understanding of ERP systems but also of other IS artefacts. As long as we do not forget the rich body of IS and other scientific knowledge, and engage in high quality research, it's a challenge to conduct ERP research.

2.9. Acknowledgements

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(IRMA) 2001, Toronto (Canada) (Van Stijn, 2001). I wish to thank my colleagues Diana Limburg and Fons Wijnhoven, and the anonymous reviewers of the IRMA conference, for their constructive comments on previous versions of that paper. The changes made for this thesis chapter reflect corrections to some errors in spelling and references and a few clarifications.

3. Organizational memory and the completeness of process modeling in ERP systems

Some concerns, methods and directions for future research

The memory is sometimes so retentive, so serviceable, so obedient; at others, so bewildered and so weak; and at others again, so tyrannic, so beyond control! We are, to be sure, a miracle every way; but our powers of recollecting and of forgetting do seem peculiarly past finding out.

Jane Austen, *Mansfield Park*

3.1. Abstract

Enterprise resource planning (ERP) systems not only have a broad functional scope promising to support many different business processes, they also embed many different aspects of the company's organizational memory. Disparities can exist between those memory contents in the ERP system and related contents in other memory media, such as individuals' memories, and the organizational structure and culture. It is our contention that, in general, these disparities or memory mismatches, as we will refer to them, lead to under-performance of ERP systems. In this chapter we focus on potential memory mismatches that may arise with respect to the embedding of process knowledge within ERP packages. Packages such as SAP provide a varied and rich environment for process modeling. However, we suspect that there are still many instances where process knowledge is either lost or represented in different ways in different parts of the organization. As we will discuss, the results of such memory mismatches will often not become evident until the system is in use. The overall thrust of the chapter is to identify a variety of concerns, intriguing questions and avenues for future research.

Keywords: Resource management, knowledge management, corporate culture, BPR, modeling, organizational change

3.2. Introduction

In this chapter we focus on problems that may arise after Enterprise Resource Planning (ERP) systems have been implemented - the in-use phase as we will refer to it. Various problems can be identified regarding the ERP systems in-use. Because of the organizational unwillingness or inability to make technology upgrades (Markus & Tanis, 2000), the enterprise system may take on the appearance of a legacy system in disguise. Furthermore, the users may still be working around the system or maintaining old procedures, instead of learning the relevant ERP capabilities (Markus & Tanis, 2000).

These problems are not only technological and organizational in nature, but they also involve cognitive aspects, such as adjusting existing work methods, mental models, and data-models. Hence, to solve the problems and enhance the ERP system successfully, it is necessary to view the ERP system in a broad sense, including technological, organizational, and cognitive aspects.

Clearly there are many areas where the knowledge embedded in the ERP system may conflict with existing knowledge residing in organizational memory. We focus in this chapter on the knowledge that relates to processes. Such knowledge may reside in many places within the organization. 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 concerned.

We provide a new approach to understanding why organizations' ERP systems may be under-performing and provide an initial indication as to how organizations can enhance their ERP system in order to better realize the intended benefits. We adopt an organizational memory perspective for our investigation, because it integrates the technological, organizational, and cognitive aspects of the ERP development. In common with the structuration theory of IT (Orlikowski & Robey, 1991), organizational memory theory places information systems in the context of human action, the organization, and organizational cognition.

ERP systems can be viewed as part of the organizational memory of an organization (Stein & Zwass, 1995; Wijnhoven, 1999), with contents related to a diverse range of organizational memory contents located at other memory media, such as organizational processes, structure, and culture. This

perspective allows us to conceptualize ways in which the knowledge embedded in the ERP system may be in conflict with other organizational knowledge – in particular, process knowledge. Based on this organizational memory perspective, we develop what we call the organizational memory mismatch approach. Organizational memory mismatches are discrepancies between organizational memory contents located in the ERP system and related contents stored at other organizational memory media. Such memory mismatches cause under-performance of the ERP system, which leads to a need for coping. Coping strategies are varied and may involve further enhancements to the ERP system or a variety of other strategies that we will only be able to address in a very cursory fashion in this chapter but that are the focus of future research work.

3.3. Prior research on the implementation and use of ERP systems

Current ERP research has primarily focused on the ERP implementation stage, this stage being seen as an "obstacle" to overcome first. However, it is self-evident that it is only after the ERP system has been implemented and is actually deployed or utilized that any success can be achieved (Fichman & Kemerer, 1999; Lassila & Brancheau, 1999). Some researchers discuss the implementation process itself. For instance, Kirchmer (1999) provides a normative model that describes how organizations should execute an ERP implementation (based on the software supplied by SAP AG). Proposed descriptive models - that discuss how different organizations are actually implementing their ERP systems - are for example the structurational model (Volkoff, 1999) and the framework for organizational change (Boudreau & Robey, 1999b).

Other researchers identify factors which contribute to successful and unsuccessful ERP implementations (Holland *et al.*, 1999; Scott, 1999). Among those identified critical success factors are top management commitment, strategic vision, and training of users. None of these approaches explicitly

recognize the need to identify the extent to which process knowledge is distributed across different organizational memory media. Further, the implications of representing some of this knowledge in the ERP system and the subsequent interaction of this knowledge with process knowledge resident in other media are not considered.

Research on ERP systems in-use concentrates on ERP performance evaluation and on identification of usage stage activities and problems. Prior research on ERP performance measurement is scarce (Rosemann & Wiese, 1999), and has mostly been conducted by practitioners, e.g. Deloitte Consulting (DeloitteConsulting, 2000). Implementation success is often measured in terms of cost and duration of the implementation (Bingi *et al.*, 1998). However, the overarching objectives associated with implementing ERP systems are to realize the promised benefits of enterprise systems. Typically, these benefits are in the form of reduced cycle times, reduced inventory costs, increased agility, or improvements in the availability of strategic decision information (Bingi *et al.*, 1998; Davenport, 2000). These benefits can clearly only be assessed during the in-use stage, for example, based on the balanced scorecard method (Rosemann & Wiese, 1999). An ERP performance evaluation helps in identifying problems and opportunities for further development of the enterprise system. It is important to note that such goals are dynamic and thus require that the performance measures evolve over time as well.

As with many information technologies (Boudreau & Robey, 1999a), results of the ERP implementation efforts range anywhere from extreme failures to extreme successes. There is a danger here that improved performance in the short term may not be the result of improved process knowledge, and that the success will not sustain in the long run. ERP packages result in the formal representation of much of the knowledge of the organization as it relates to organizational strategy, structure, processes and so on. Thus ERP packages may be seen as contributors both to the capture and management of

knowledge. There is a need to determine the success with which such knowledge is actually captured by the system. However, a word of caution is necessary here since knowledge may be refined, expanded and sometimes discarded during the implementation phase. Thus, there is a need to assess the extent to which actual pre-existing knowledge is appropriately represented in the ERP system. There is also a need for significantly more research into the location, nature and extent of process knowledge both before and after the implementation of ERP systems. Care must be taken to investigate how process knowledge stored on different knowledge media interacts both before the implementation of the ERP system and after its implementation. It is also worth observing that organizations are likely to have both formal and informal knowledge processes for maintaining and enhancing process knowledge. These processes must be identified and reconstituted in the post-ERP organization.

From a process perspective we may identify a variety of ways in which organizational processes may under-perform after the ERP system has gone live. Processes may generate an unacceptable level of errors, they may be unstable and have performance that is difficult to predict, cycle times may be much longer than anticipated. Processes may also fail in unpredictable ways and may be difficult to trouble-shoot and correct. Potential activities, problems and errors that may occur after the system has gone live have also been identified (Davenport, 2000; Markus & Tanis, 2000), some of which are listed in Table 3-1.

Although the need for ERP systems to respond to both major and minor changes in the organization and its environment after going live is undeniable there is a paucity of available research literature in this area. We would signal this as another fertile area for future research. Interesting research questions in this area are: what are the triggers for enhancement of ERP systems? In what ways can (should) the ERP system be enhanced to respond to these triggers? What knowledge is required of the organization and its members in

order to both identify appropriate triggers and define and implement appropriate responses to them? As we note later in this chapter, to the extent that the triggers relate to "mismatches" between the contents of the organization's memory a variety of coping behaviors may be appropriate.

Typical activities	Common errors/ problems
• Bug fixing and rework • System performance tuning • Adding hardware capacity • Problem resolution • Process and procedure changes • Retraining, additional training • Adding people to accommodate learning • Post-implementation investment audit • Continuous business improvement • Technology upgrading/ migration • Additional end-user skill building	• Business disruption • Difficulty diagnosing and solving performance problems • Excessive dependence on "key users" (project team members) and/ or IT specialists • Maintenance of old procedures or manual workarounds in lieu of learning the relevant system capabilities • Data input errors • Poor software ease-of-use • No growth of the end user skills after initial training • Under-use/ nonuse of system • Failure to achieve normal operation ("system" never stabilizes) • Not assessing system-related outcomes on a routine basis • Enterprise system of today becomes legacy of tomorrow (organizational unwillingness or inability to make technology upgrades) • No available documentation on configuration rationale • Turnover of knowledgeable personnel (IT and end-user) • No organizational learning about IT projects, enterprise systems • Failure to manage to the intended results of the enterprise system

Table 3-1. Typical activities and problems in the ERP usage stage (Markus and Tanis, 2000, p. 191-194)

In the following section we discuss in detail the memory mismatch approach. Our memory mismatch approach seeks to provide a framework for classifying ways in which an implemented ERP system is broadly in conflict with some aspects of organizational memory as it exists at the time of implementation. We do not consider in the present chapter a discussion of the processes that lead (or should lead) to modification and enhancement of

organizational memory that may be missing or in conflict with processes that are in place to enhance ERP systems after they have gone live.

Although we introduce the organizational memory mismatch approach in a general way, its applicability to specific contents of organizational memory as they relate to processes and process knowledge should be fairly clear.

3.4. The organizational memory mismatch approach

Organizational memory theory

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). Next to information, other types of memory contents can be included, for instance knowledge (Stein, 1995) and paradigms (Wijnhoven, 1999). The memory contents may be stored at different locations or repositories (Walsh & Ungson, 1991; Wijnhoven, 1999). Organizational memory processes, such as search and retrieval (Stein, 1995), operate on the memory base, thus enabling the actual use of the memory contents. These three aspects of organizational memory, contents, repositories and processes, are further discussed in the next subsections.

Organizational memory contents

Organizational memory contents are the cognitive elements that form the memory base. Different authors label and classify the memory contents differently (Moorman & Miner, 1997; Robey *et al.*, 1995; Stein, 1995; Walsh & Ungson, 1991). One may, however, distinguish four separate, more general types of memory contents, called information, knowledge, paradigms and skills here. Information is "the flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and belief of its holder" (Nonaka, 1994, p. 15). Thus, information may become knowledge when the receiver interprets the messages. Knowledge, or

a knowledge structure, is "a mental template that individuals impose on an information environment to give it form and meaning" (Walsh, 1995, p. 281). Knowledge structures thus represent what are called "interpretive schemes" in structuration theory, shared stocks of knowledge which help human actors to give the world meaning (Orlikowski & Robey, 1991). It is interesting to contemplate to what extent the knowledge structures that have been built up by individuals prior to the implementation of an ERP system are appropriate after the implementation of the system - do they allow individuals to behave appropriately? Can they work with the newly reconstituted processes? Are they able to diagnose process failures or performance deviations appropriately?

The third content type, paradigms, consists of the organizational beliefs, governing values and norms (Wijnhoven, 1999). As structuration theory's "norms", paradigms represent the beliefs and rules about "what is good and what is bad", about what one should and should not do. The fourth content type, skills, are comparable to what some refer to as tacit (Nonaka, 1994) or soft knowledge (Anand *et al.*, 1998). Skills are capabilities of people, "how they do things". These capabilities thus have a personal quality, deeply rooted in action, commitment, and involvement in a specific context (Nonaka, 1994). Only if individual members of the organization are willing to and capable of sharing tacit knowledge or helping in the development of skills by others, is the organization able to have access to them.

The four identified content types may be independent of a specific application area or domain, but they may also be domain-dependent, depending on a specific business process, organizational unit, the organization in general, or the industry or the nation(s) in which the organization operates. Memory contents may be stored in one or more different retention media; these are discussed in the next subsection.

Organizational memory media

Though some argue that such storage of memory contents may be interpreted metaphorically rather than literally, one can at least assume that the various repositories imply memory contents, such as knowledge and information. For instance, business processes, or transformations, are based on knowledge regarding what input is needed and what actions should be undertaken in order to produce a certain output. "The logic that guides the transformation of an input into an output is embodied in these transformation" (Walsh & Ungson, 1991, p. 65). This logic may be called "technological knowledge". That is the knowledge about how to produce goods and services, understanding the effects of the input variables on the output (Bohn, 1994). The transformations occur throughout the organization and similarly, memory is preserved in a variety of procedures and formalized systems (Walsh & Ungson, 1991).

Next to transformations, Walsh and Ungson (1991) describe the following storage media for organizational memory: individuals, culture, structure, ecology, external archives. The term ecology refers to the actual physical structure or workplace ecology of an organization (Walsh & Ungson, 1991). Such a physical setting often reflects the status hierarchy in the organization and helps to shape and reinforce behavior prescriptions in the organization. In a broader sense, other physical artifacts existing in the organization may be considered, including, for instance, the available machines, the products and product lines. Such physical artifacts "embody, to varying degrees, the results of prior learning" (Moorman & Miner, 1997, p. 93). Additionally, information systems have been recognized as another important repository (Stein & Zwass, 1995; Wijnhoven, 1999).

> "Information technology can also capture many routines stored in memory by embedding those routines within its programs and procedures. Through electronic storage, memory may become more accessible to organizational members." (Robey *et al.*, 1995, p. 28)

Strikingly, it should be noted that these identified storage media provide a more detailed overview of the organizational resources (individuals, ecology, information systems), realm of structure (culture, structure) and realm of action (transformations) identified in structuration theory (Orlikowski & Robey, 1991). Furthermore, it also places the organization in its environmental context by adding the external archives as another retention medium. An organization is associated with a number of stakeholders and other interested parties in its environment, for example, former employees, competitors, and the government. Other parties involve companies that collect data on performance and sell this information to interested parties, news media and business historians (Walsh & Ungson, 1991).

Organizational memory processes

Organizational memory can be differentiated from general knowledge because it functions as a process and may be non-cognitive (Stein, 1995). In our opinion, this remark can be interpreted in the sense that the organizational memory base consists of the cognitive elements (memory contents). The media and the processes that operate on this memory base are non-cognitive. These defining processes of organizational memory are acquisition, retention, maintenance, and retrieval (Stein, 1995), as shown in Figure 3-1.

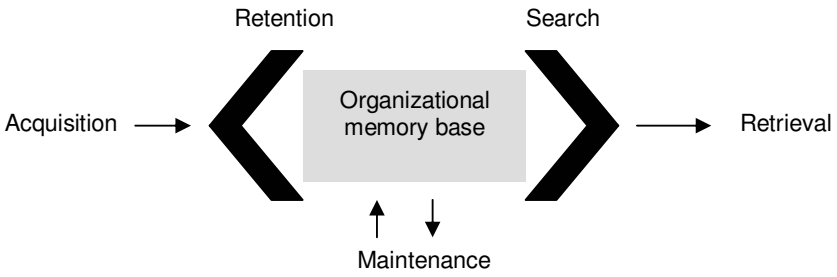

Figure 3-1. Processes of organizational memory (Stein, 1995, p. 26)

Memory acquisition is the collection of new memory contents and memory maintenance is "the process of adjusting existing memory to changed environments (application areas) in such a way that the basic part of the memory is still applicable despite these changes" (Wijnhoven, 1999, pp. 172-173). Memory maintenance, in other words, is about adapting and updating the memory. Other issues are forgetting obsolete memory, and integration of new memory with existing memory (Wijnhoven, 1999). Memory acquisition and memory maintenance together form the processes of organizational learning, for organizational learning is specifically concerned with the growth and change of organizational memory (Duncan & Weiss, 1979).

Memory retention is the storage of the memory contents in the memory media. Memory search and retrieval deals with finding and obtaining memory contents after storage.

Organizational memory mismatches

Based on the previous discussion, an ERP system may be viewed as part of the organizational memory, being a retention medium (information system) that embeds memory contents. All four types of memory contents may be embedded in the ERP system. For example, information regarding financial resources or technological knowledge regarding logistic planning is represented in the ERP system, e.g. in logistic planning modules. Paradigms also underpin the ERP system, though they may be implicit for the user organization. For instance, paradigms concerning best practices (Kumar & Van Hillegersberg, 2000) and effectiveness are included, e.g. inventory schedule modules. Skills could be included as well, either elicited in the form of routines or decision models, or in the form of a skill database in the human resource component of the ERP system, linking employees and skills.

It is our contention that organizational memory mismatches may exist between the memory contents of the ERP system and related memory

contents in other memory media (Van Stijn & Wijnhoven, 2000). For instance, the sales planning component of the ERP system (the representation of the sales planning process) may be used to predict future sales based on previous sales. However, the underlying assumption in the ERP system is that those sales in the past are representative for the future and that no specific "events" have occurred that may alter the pattern. However, the sales manager may know that another company has started selling a similar product at a much lower price, which may be regarded as one of those events that disrupt the previous pattern. As a result, a memory mismatch exists between the memory content of the ERP system and the memory content of the sales manager. Forecasts made with the ERP system may be systematically too high, which would have a negative consequence for the whole logistic and financial planning. Such a memory mismatch is very likely to lead to ERP under-performance, which means that the intended benefits of the system, and hence the organization as a whole, are not achieved.

Cognitive dissonance theory, as described by the psychologist Festinger (1957), offers a starting point for the further definition of organizational memory mismatches (Van Stijn & Wijnhoven, 2000). For our discussion of memory mismatches, two extensions are made to Festinger's approach to cognitive dissonance. First, instead of comparing memory contents of one medium (the individual's mind), the memory contents of the ERP system are compared with those of other retention media. Related contents on the different media may be dissonant or consonant to each other. The second addition we make to Festinger's analysis is that we extend the concept of dissonance to include situations where memory contents are missing where they should be present and situations where memory contents are present on both media where only one instance of the memory content should be present (Van Stijn & Wijnhoven, 2000). We refer to the former situation as one of under-redundancy and the latter as over-redundancy. Thus, we distinguish three types of organizational memory mismatches, namely under-redundancy, inconsistency, and over-redundancy, as illustrated in Figure 3-2:

- *Type I - under-redundancy*. The memory content A in Figure 3-2 is missing in the other retention medium and memory content B is missing in the ERP system, but those memory contents should be present in both media.
- *Type II - over-redundancy*. The memory content C in Figure 3-2 should not be duplicated (identical content present on both media), but should exist in either the ERP system or the other retention medium.
- *Type III - inconsistency*. If for both media, memory content D in Figure 3-2 should be the same, the memory content D in the ERP system is inconsistent with the memory content ~D (not D) in the other retention medium, and vice versa (Van Stijn & Wijnhoven, 2000).

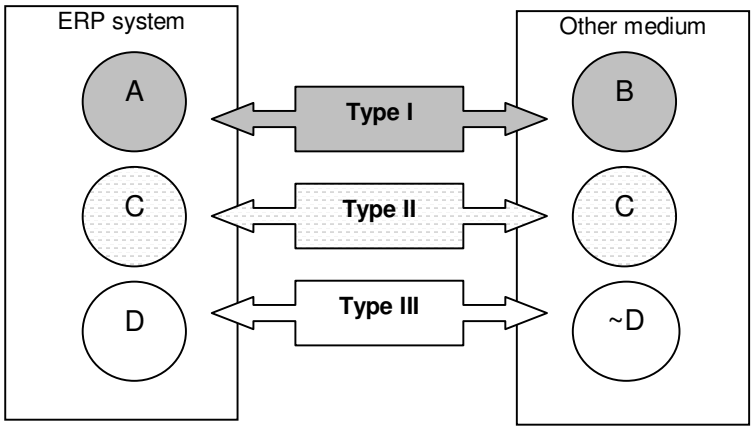

Figure 3-2. Typology of memory mismatches (Van Stijn & Wijnhoven, 2000, p. 657)

Such memory mismatches form the core of the organizational memory mismatch approach, where they are related to under-performance of the ERP system and coping behavior, i.e. further enhancement of the ERP system in a broad sense. Organizational memory mismatches may be analyzed using the decision tree depicted in Figure 3-3. The memory contents of the ERP system

are compared to the memory contents located at the other identified memory media. One can conclude that the organizational memory construct may be viewed as a further operationalization of the structuration theory, placing structuration theory from its social context to an organizational context.

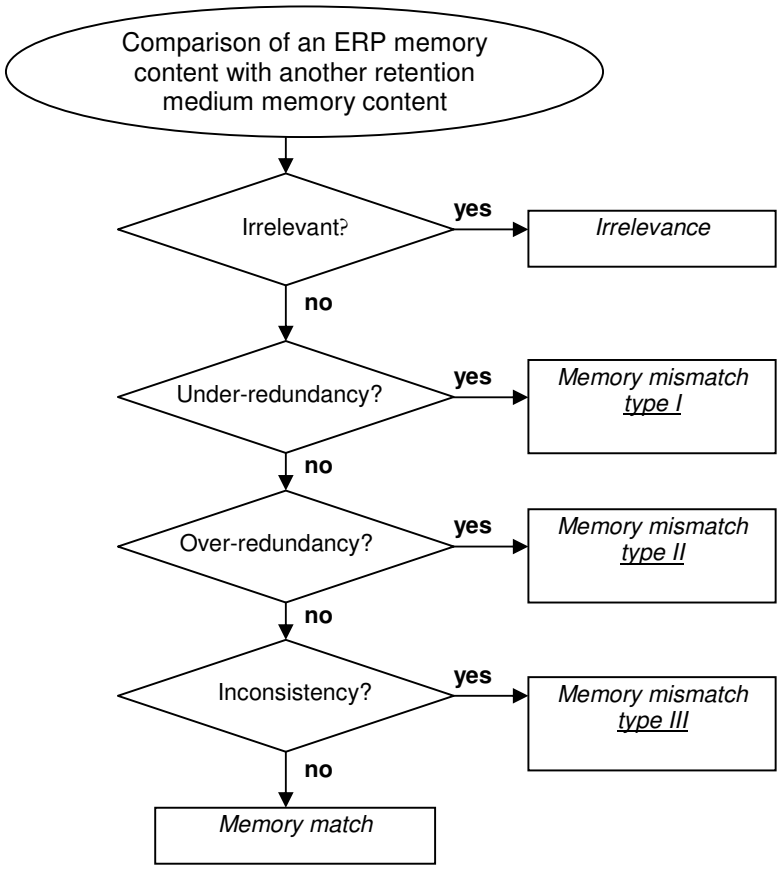

Figure 3-3. The systematic memory mismatch analysis tree (Van Stijn & Wijnhoven, 2000, p. 657)

3.5. Discussion of the organizational memory mismatch approach

The business process modeling sub-process is one of the sub-processes where it becomes particularly apparent that ERP systems and the related processes involve not only technological and organizational aspects, but also aspects that relate directly to organizational memory. In this chapter, we mean by cognitive that it is related to the organizational memory. Since a complete discussion of all concerned organizational memory is beyond the scope of the chapter, we will focus on the knowledge and paradigms with respect to the business processes and business process modeling. Process modeling translates process knowledge into models that can be used to configure the ERP system and change the organization's processes. Process knowledge relates to the know-how, or the logic of the processes. Scheer (1998) argues that by modeling the business processes using ARIS, the process knowledge of the organization is stored and can be managed accordingly. The key remark to be made here is that business process engineering knowledge, or process knowledge, may need to be interpreted in a broader sense, to include process paradigms, information and skills. All those cognitive elements are embedded in, or implied by, the ERP system as well, for instance regarding reference models, calculation methods and best practices. Process knowledge thus not only includes the know-how, or the process logic, identifying atomic tasks, when they are to be executed, and by which resources. It also includes know-why, referring to the explanations of why specifically those atomic tasks need to be executed, why in this order, and why by those resources.

As an interesting aside, a significant issue with the implementation of ERP systems is the determination of the extent to which organizational processes need to be adjusted to those represented in the ERP system and the extent to which the ERP system's representations need to be adjusted. One way of approaching this dilemma is through a clearer understanding of the relationships between the organization's structure and processes and its culture. As we have noted, organizational processes embed considerable

knowledge that can often only be "decoded" through an extensive investigation of the context within which the process operates. The nature of this "decoding" would seem to be a fruitful and creative area for future research.

As we have discussed in this chapter, process knowledge and paradigms in the organization are not necessarily the same as the process knowledge and paradigms underpinning the ERP system. When they do not match, one can speak of organizational memory mismatches (Van Stijn, 1999). If these mismatches are not reconciled, it is our contention that the organization will exhibit characteristic behaviors and is likely to under-perform in the usage stage of the ERP system (Van Stijn & Wijnhoven, 2000). One question we would like to pose here is what is effective coping behavior? In other words, when does the further development of the ERP system, in the broad sense, lead to performance improvements? This may depend on the type of memory mismatch, the nature of the memory contents, and the media involved, all of which are likely to influence the relative success of different types of coping.

Further research needs to answer questions regarding the occurrence and consequences of such organizational memory mismatches, as well as effective coping. Organizational memory mismatches can be solved in two ways (Van Stijn & Wijnhoven, 2000) by:

(1) acquiring the ERP system's process knowledge and paradigms in the organization (changing the organization accordingly);
(2) changing the ERP system in such a way that it does incorporate the organization's process knowledge and paradigms, thus, customizing the package.

This brings us to a question that is not only interesting from the organizational memory mismatch perspective, but also more in general. How to decide what aspects of the organization need to be adapted to the ERP package and what aspects of the ERP package need to be adapted to the

organization, and under which conditions? This is an important question to be answered with respect to the business process modeling sub-process, because this decision is (implicitly) reflected in the business blueprint. However, *AcceleratedSAP* and ARIS (SAP, 1999; Scheer, 1998) do not explicitly address this question of how to decide this - it appears to be "just decided…"

3.6. Conclusion

In this chapter we have provided a general discussion of issues relating to the representation of process knowledge during the implementation and in-use phase of ERP systems. We have suggested that ERP may well embed some, but by no means all, of the process knowledge that is resident in organizations. The concept of organizational memory provides an indication of the variety of memory media that are present in organizations and that potentially act as storage media for process knowledge.

It is our contention that considerable care should be exercised to identify exactly where different types of process knowledge reside in organizations. During implementation of ERP systems or other complex information systems decisions will have to be made as to what types of process knowledge can be represented in the ERP system and what types will continue to reside in other memory media. As we have noted, it is important to recognize that the process knowledge stored on different memory media has to interact in order that decisions can be taken and the knowledge refined and updated.

Given that many organizations are likely to have implemented ERP systems with only limited consideration of the above issues, we have suggested that it will often be the case that what we have called memory mismatches are likely to arise during and after the implementation of an ERP system. Further research is necessary to identify system behaviors that are likely to have arisen

from such mismatches and the appropriate coping behaviors for the different types of mismatch.

We hope that this chapter stimulates more research into the use of an organizational memory perspective in the development of ERP and other complex information systems that embed some types of organizational knowledge, but by no means all of an organization's knowledge. In addition to ERP systems providing fertile ground for further research into organizational memory and knowledge management, we believe that organizational memory and structuration theory provide a rich foundation for much of this research.

3.7. Acknowledgements

This chapter is based on the previously published journal paper of the same name (Van Stijn & Wensley, 2001, see List of related publications). It has won an outstanding paper award for the 2001 volume of the Business Process Management Journal and we presented our work at the Emerald award ceremony in London (England), April 2002. Only some minor textual and reference errors have been corrected.

Further reading[6]

Chan, R. (1999). Knowledge management for implementing ERP in SMES. *SAPPHIRE'99*, pp. 21-39.

Davenport, T.H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review*, July/August, pp. 104 -12.

[6] As per the original paper, these are additional sources that are not referenced in the chapter. For completeness purposes, they have also been added to the full list of references in this thesis.

Käkölä, T.K. and Koota, K.I. (1999). Redesigning computer-supported work processes with dual information systems: the work process benchmarking service. *Journal of Management Information Systems*, 16(1), pp. 87-119.

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4. Adding the notion of conflicting memories to the story of ERP 'best' practices

The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.

F. Scott Fitzgerald

4.1. Abstract

One of the premises that Enterprise Resource Planning (ERP) systems are sold on, is that they embody preferred ways of doing business in the form of so-called "best practices". However we are concerned with the fact that throughout the cycles of development, implementation and use of such 'best' practices, significant problems occur with their identification, representation, interpretation and enactment. In this chapter, we explore how our approach on memory mismatches, or conflicting memories, helps to explain such problems from a knowledge perspective. An analysis of a (secondary) ERP case study at a UK university is presented to supplement our account empirically. Whereas we conclude that quite some 'old' information systems issues re-occur in the context of ERP systems, we also argue that our frame enables us to contribute a further unifying understanding of such issues – and identifies additional challenges with the ERP 'best' practices rhetoric.

Keywords: Enterprise Resource Planning, ERP systems, 'best' practices, organizational memory, organizational memory mismatches, conflicts.

4.2. Introduction

Nowadays, some of the most pervasive and invasive information systems that are being implemented by and made use of in organizations are those referred to as Enterprise Resource Planning (ERP) systems. The launch of ERP systems has spawned a multi-billion dollar global supplier and consulting industry (Gosain, 2004; Ko *et al.*, 2005; Umble *et al.*, 2003). In parallel, academic concern with ERP systems, in teaching and research, has been increasing (Becerra-Fernandez *et al.*, 2000; Davis & Comeau, 2004; Hawking *et al.*, 2004; Howcroft *et al.*, 2004; Joseph & George, 2002; Ragowsky & Somers, 2002; Van Stijn, 2002). By adopting a process orientation and consequently integrating business processes by means of pre-engineered packaged software applications, the stated goals of adopting ERP systems are to obtain organizational benefits such as lower inventory costs and shorter

cycle times (Davenport, 1998; Gattiker & Goodhue, 2004; Holsapple & Sena, 2005; Markus & Tanis, 2000; Olhager & Selldin, 2003; Spathis & Constantinides, 2003). In addition, it is increasingly the case that organizations are seeking to embed much of their organizational knowledge in complex information systems such as ERP systems. Adopting this perspective, these systems are presented as more effective and efficient ways of representing the knowledge necessary to manage the contemporary organization (Davenport *et al.*, 2004; Van Stijn & Wensley, 2001). Thus, they tend to impose a specific logic relating to preferred ways of doing business, which is particularly shaped by the 'best' practices that ERP systems seek to bring with them (Kraemmerand *et al.*, 2003; Wagner & Newell, 2004).

Prior research has suggested that the idea of these so-called 'best' practices is problematic, even illusory (Swan *et al.*, 2000). There is, as with other information technologies, a noted gap between the designed and espoused practices and the actualized ones. One may argue that this is due to an inability to faithfully represent and subsequently appropriate 'best' practices. Based on their study of Ivy (a US University), Wagner and Newell (2004) point at the fact that a 'best' practice necessarily pertains to a single dominant perspective on what is 'best', silencing views of others and not supporting the epistemic diversity and plurality of perspectives amongst groups within an organization. Indeed our findings in this chapter support this. Yet we think that a further discussion is beneficial for a richer understanding of ERP 'best' practices and the problems associated with putting them into action. To start this discussion we provide a further background on the rich variety of what constitutes "ERP 'best' practices", a variety that may get hidden through the use of the single term 'best practice'. We will argue in this chapter that it is important to explicitly recognize their existence throughout the ERP cycle of development, implementation, and use – stressing the different interrelated contexts they "live in" and refer to. Next, we propose an integrated perspective that includes actions and individuals within their broader physical, technological and social setting through the notion of conflicting memories.

Our key interest here concerns the fact that in the different phases multiple interpretations, cognitions, conceptualizations, and understandings of 'best' practices will exist across webs of memories that are likely to be conflicting. These conflicts potentially further enlarge the gaps between design and use. In our analysis, we make use of the previously published case of a European university, namely the British *Big Civic* (e.g. Pollock, 2000; Pollock & Cornford, 2004), that partnered with a large supplier in the development of an ERP package and subsequently introduced the ERP system in its organization.

The remainder of this chapter is structured as follows. We start with a background of ERP 'best' practices related to the different phases of development, implementation and use. Next, we introduce and explain our notion of conflicting memories followed by some methodological remarks discussing our research approach and the secondary case we refer to in this chapter. Then we reanalyze the Big Civic case making use of the conflicting memories notion. In our discussion, we outline how our perspective contributes to our understanding of ERP 'best' practices and the noted 'gaps', suggesting novel directions for ERP research and practice. In the final section we present our conclusions.

4.3. Background: ERP 'best' practices

'Best' practices as generic ideals[7]

> "ERP products offer the integration of business processes and functions across the organization based on a way of working deemed 'the best' for

[7] We focus here on literature specifically addressing ERP systems and associated 'best' practices represented in the ERP system, as we try to cover the story told in this area. Therefore we have chosen not to discuss work regarding, for example, transferring internal 'best' practices (Szulanski, 1996; Szulanski & Winter, 2002) or 'best' practices in healthcare settings (Newell *et al.*, 2003; Perleth *et al.*, 2001).

> particular industries by software vendors, management consultants and industry-based experts." (Wagner & Newell, 2004, p. 306)

A prime connotation of ERP 'best' practices is that they reflect generic and universal ideals concerning how organizations may be most successful. Such norms of what is 'best' prevail within a large network comprised of consultants, suppliers, user organizations, academics, journalists, government agencies and professional societies (Swanson & Ramiller, 1997; Wagner & Newell, 2004). Currently, we see that 'best' is reflected in terms of competitiveness that has to be achieved for an organization to be successful in adapting to globalizing and rapidly changing times. In the context of ERP, recurring characteristics of these 'best' practices are, for instance, professionalization and modernization, integration of all information, the adoption of a process perspective, and changing control regimes (e.g. Elmes et al., 2005; Gosain, 2004; Soh & Sia, 2004). As such, the 'best' practices are often organizational principles at a very generic, universal level, as they are considered to be important for any organization, or they become manifest in the form of "industry solutions' that are suggested to be superior for a whole (global) "industry" (An "industry" is not only automotive manufacturing and so on but also for instance refers to the setting of universities or higher education institutions). 'Best' practices should represent "state-of-the-art" approaches and techniques for running successful contemporary businesses, and their enactment should enable the realization of a multitude of organizational benefits (Davenport, 2000; Holsapple & Sena, 2005; Markus & Tanis, 2000). Thus, 'best' practices here are normative in the sense that ideals reflect how things should be done in the organization. The rhetoric is e.g. that without a process perspective, a contemporary organization cannot survive, it is necessary for the company to be successful. Given the general nature of these 'best' practices it is often difficult to specify how they should be enacted. There is considerable flexibility in the manner in which, for example, an organization is transformed into a 'process-based' organization.

Development and ERP 'best' practices

ERP suppliers claim to develop their software so as to package 'best' practices. At the very least this would suggest that they are able to identify and represent 'best practices' in their software and are able to re-create appropriate 'best' practices in their chosen 'target' organizations. In particular, they concentrate on supporting and automating organizational processes as much as possible with the ERP system (Kumar & Van Hillegersberg, 2000; Soh *et al.*, 2000). "SAP for higher education" for instance focuses on e-procurement, knowledge management, e-learning, financial administration and human resources. More details are provided in Table 4-1.

An important issue here is the extent to which attempts are made to standardize the ERP system. First, standardization is promoted as being useful for organizations in terms of uniformity (especially in large and/ or multinational companies). Second, standardization is also essential for the suppliers as it enables them to sell their product across a wide array of organizations, trying to minimize the adaptations to local contextual situations (Pollock & Cornford, 2004; Wagner & Newell, 2004). This enables vendors to market their products as broadly applicable to firms particularly within an industry. As a consequence, suppliers need to de-contextualize and generalize the 'best' practices and the concepts that underpin them in order to be able to make them suitable for adopting organizations, where subsequently the practices need to be re-contextualized within those organizations (Van Stijn & Wensley, 2005b).

While they have often started in a particular industry setting, companies such as SAP and Oracle nowadays market their products to a wide variety of industries, including government and educational institutions. In order to expand into new areas, suppliers have used a number of strategies. One of these strategies is the under-recognized and under-investigated aggressive acquisition strategy that some of them deploy. Suppliers (try to) acquire competitors and small organizations that have specialized in certain functionality, and assimilate the technology into their own package(s).

E-procurement	• Intelligent procurement and materials management • Requirements planning, purchasing, invoice verification, inventory management, and warehouse management • Direct links with funds management, financial accounting, and managerial accounting capabilities
Knowledge Management	• Web check-in, authoring, and editing • Performance assessment workbench • Integration with document management
E-Learning	• Personalized online educational offerings to match student needs and eligibility • Tailored learning paths to match student profiles • Student accounts and progress tracking • Assessment results integrated with ERP systems
Financial Management	• Comprehensive budget and finance management across the institution • Optimized budget formulation processes • Managerial accounting tools and decision support for cost control of processes, products, and services • Return on investment (ROI) analyses • Comprehensive accounting functions for increased efficiency of accounts payable and accounts receivable accounting
Human Resources	• Organization and position management, linking personnel budgets with work areas and employees • Recruitment processes for managing open positions, applicant screening, reporting, and cost analysis • Time and leave management • Personnel administration

Table 4-1. Process support packaged in SAP for higher education (SAP, 2005)

For example, in 2004 Oracle has bought PeopleSoft that had previously acquired J.D. Edwards. Because of their different origins and the settings within which they have been developed, it could be argued that they face a difficult challenge in combining the different vendors' 'best' practices and their associated concepts in a conflict-free manner. Some of the

incommensurability – or conflicts – associated with developing 'best' practices may originate here.

Another tactic for ERP suppliers to expand and further develop their software is to partner with "a key industry consumer to develop a package to meet the unique requirements of a particular industry" (Wagner & Newell, 2004, p. 306). These consumers are seen as reference organizations that can be used as a source from which to 'copy' the best ways to perform the practices and on which subsequently the software package's content can be modeled. This means that the best practices are replicated or copied into the software package as it were, and when the ERP practices are interpreted and enacted, another replication process takes place and the best practices "come to life" in another setting (Winter & Szulanski, 2001). In other words, the reference organizations are like "models" that show their practices (which are alleged to be exemplary!) to the ERP supplier, and through this co-operation, the supplier is able to further package the best practices into the software. One of the selling ideas is that those organizations are "benchmarked", but investigations on how this is actually taking place are lacking, except for Ivy and Big Civic, where we have caught an interesting glimpse of how arbitrary or dominated the developing of 'best' practices can be (e.g. Pollock *et al.*, 2003; Wagner & Newell, 2004).

Implementation and ERP 'best' practices

When organizations introduce ERP 'best' practices, they configure and customize the package to suit their contextual and situational needs (in terms of the practices) as much as possible (Soh & Sia, 2004). Obviously it is difficult (if not utopian) to accommodate to the full variety of needs that potential consumers may have. However, there is a considerable degree of freedom with the configuration of the 'best' practices within the ERP packages as the configuration of ERP packages such as SAP entails the selection of thousands of features and many different 'best' practices have been incorporated over time (Koch, 2001). An important aspect of this configuration process is modeling or representing the 'best' practices and

their associated processes. This representation requires both the concept formation within the organization, as well as translation of concepts from the supplier's worldview (as embodied in the package) towards the organizational setting (Ko *et al.*, 2005; Pawlowski & Robey, 2004). In addition, we consider that the organization will also undertake a change program (including training of the future users) in order to be able to put the ERP system and practices into action upon "go live".

Customization of the package can be applied to further adapt the 'best' practices to the organization (Soh & Sia, 2004). This means that the software is adapted to the situation, modified by changing code, so that the practices that result as being implemented fit (better) with what the organization wants and needs. However, it is strongly recommended that organizations implement a "vanilla system" without modifications that are costly and sometimes difficult to maintain. Indeed, it is interesting to observe that Wagner and Newell (2004) note that even in the case of Ivy, which was a partner in developing the 'best' practices did not always end up with "vanilla" solutions, but often actually customized these so-called 'best' practices as well.

'Best' practices in the ERP use phase

When the ERP packages and their new 'best' practices begin to be used in the organization, we see that the prescriptive and proscriptive compliance nature of 'best' practices restricts the ways in which people are able to interpret and enact them. However, we simultaneously see that through interpretive flexibility and workarounds, there is more actual plasticity and local adaptation than is often acknowledged (Pinch & Bijker, 1987; Swan *et al.*, 2000). It is important to recognize the fact that some individuals (through agency) have a choice as to whether to enact routines differently or resist acting altogether (Feldman & Pentland, 2003; Vaast & Walsham, 2005).

> "While users can and do use technologies as they were designed, they also can and do circumvent inscribed ways of using the technologies - either ignoring certain properties of the technology, working around them, or

> inventing new ones that may go beyond or even contradict designers' expectations and inscriptions." (Orlikowski, 2000, p. 407)

Thus, users do not always comply with the prescribed and proscribed 'best' practices, following the "rules" of what is 'best' (in terms of the generic ideal). Instead, when practices are in-use, they are still open to improvisations and change, especially considering the multitude of people who are involved in interpreting and enacting the practices (Feldman & Pentland, 2003; Moorman & Miner, 1998).

In their discussion of the use of an ERP system at a government institution, Boudreau and Robey (2005) describe how end-users were "tweaking" the ERP system and maintained workaround practices rather than precisely following the prescribed practices.

> "One instance of reinvention was the use of a field (the statistical code) to capture information of another nature (a credit card payment). Although not intended for credit card information, the statistical code field's purpose was reinvented by a user to work around an assumed system deficiency." (Boudreau & Robey, 2005, p. 13)

As we will discuss later, workarounds were important at Big Civic too, in order to make the practices work, especially in an ad-hoc and flexible manner.

This section has addressed 'best' practices as they are part of different settings and contexts throughout the lifecycle of ERP systems. We have seen that where they have been promoted as generic and universal 'ideals' they are in fact characterized by varying levels of generality and locality while they are invoked in the processes related to development, implementation, and use. Indeed different (groups of) people engage with the 'best' practices in different situations. As such, we have detailed the multi-faceted and context-sensitive nature of 'best' practices and provided some initial pointers to their problematic aspects.

Next, we put forward our theoretical idea of conflicting memories.

4.4. Introducing the concept of conflicting memories

We have built our construct of conflicting memories on intertwined threads of thinking. One is that 'best' practices in essence are organizational routines, as we discuss first here. Understanding ERP 'best' practices as organizational routines also means that we consider them to be intrinsic to organizational memory (and vice versa). Because they are routines, they also are interpreted and enacted through the active involvement of memories. Before we define memory conflicts (we also refer to them as 'organizational memory mismatches'), we also look briefly into this thread of routines and organizational memory in order to clarify and elaborate on the theorization of our approach.

ERP 'best' practices and their relation to organizational routines

Central to our argument, we consider that ERP 'best' practices are strongly linked to organizational routines in two ways. First, ERP 'best' practices are focused on organizational actions that are strongly integrated and carried out by groups of people. They carry with them an 'ostensive' aspect that involves interpretations of the ideas and ideals of these actions (Feldman & Pentland, 2003). Second, the 'best' practices are intended to become organizational routines within the adopting organizations. As such, they also exhibit the 'performative' aspect of organizational routines, as they become part of the enacted routines (Feldman & Pentland, 2003). A consideration of 'best' practices as enacted organizational routines or interpretations of their ideas and ideals enables us to appreciate the unequivocal role of organizational memory.

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). Becker (2004) has provided an overview of the organizational routines literature, relating it back to the work of Nelson and Winter in the

early eighties (Nelson & Winter, 1982). During the same period, we also see reference being made to routines and routinization in more general social terms in the work of, for example, Giddens (1984). A striking similarity with structuration theory may be found in the recognition that organizational routines are rooted - in the middle as it were - of the action/cognition dichotomy, as they involve both enacting and interpreting, mutually shaping each other (Giddens, 1984; Vaast & Walsham, 2005).

Organizational routines exist because of the interactions of multiple individuals mediated through organizational networks. In particular, such organizational networks provide access to individual and organizational memories which are necessary for the interpretation of organizational routines. People interact in many different ways with different people in different parts of the extensive network, outside or inside the organization, accessing different memories. Thus, every time a routine is implemented 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). Contextual knowledge that is required to be replicated in order to copy the practice may be particularly unavailable in the context of ERP 'best' practice, where the source is often rather obscure and distant from the location of implementation (cf. Winter & Szulanski, 2001). Inconsistencies in interpretations of organizational routines are bound to arise in this case because of the differences in the particular organizational networks and knowledge available for interpreting the organizational routines. In this light, we also stress that organizational routines, though they may achieve some level of stability, are in essence dynamic and are likely to change over time.

Now let us look closer to the relationship with memory.

ERP 'best' practices and memories

Organizational memory[8] is often 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 wide variety of taxonomies of memory exists (Cohen & Bacdayan, 1994). For example, we may not only distinguish information, but also knowledge, paradigms and skills (Van Stijn & Wensley, 2001). Since space does not permit us to stray into this long-standing and complex area here, we use "memory" in a broad sense reflecting cognition within a web of people and other "locations". Memory may namely be thought of as stored at different locations, storage bins, or repositories (Walsh & Ungson, 1991). In this sense, routines are considered to be a key repository of organizational memory (Becker, 2004; Cohen & Bacdayan, 1994; Moorman & Miner, 1998). Table 4-2 provides a characterization of the diversity of locations and memories.

Though our discussion of organizational memory here relies heavily on the dominant information-processing metaphor of memory, we are aware that the idea of "storage bins" of memories has a problematic history.

> "Whilst such a model reflects the hybrid and fragmented nature of memory […] it does not do justice to the interconnectedness of such memory sites, nor the fact that each "storage bin" contains memories of the others. It is the interaction between the "bins" that is of key importance, as, 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 individual-social distinction is recognized within the literature on organizational routines, as Becker (2004) describes:

[8] In organizational settings, we naturally talk of 'organizational memory' as if it were a reasonably precise analogue of individual memory. However, we do not suggest such a literal transposing of metaphoric memory properties to organizations!

> "Productive knowledge (what inputs to use, how to transform them, etc.) can be held by individuals and/or the organization. Organizations structure the activity of its members, including activity in which their individually held knowledge is applied. Routines thus capture the 'individually-held-knowledge-applied-in-the-firm' at its joints, namely, in its application (rather than attempting to describe a person's 'knowledge stock', as attempted in exams). At the same time, routines also capture collectively held knowledge, i.e. that knowledge, which is held by the firm, but is more than the knowledge held by its individual members. Such knowledge could in principle be held in several knowledge repositories, for instance in documents, databases, artifacts (such as prototypes) and physical layout. Tacit knowledge, however, cannot be held in such repositories." (Becker, 2004, pp. 660-661)

Locations	**Memories**
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
Information Systems	Planning and decision systems; process control systems; GroupWare; computer aided design systems, memory-based systems; administrative systems
External	Client and market characteristics; competition profiles; list of "memory-able" people and organizations; technology of competitors

Table 4-2. Various memories and locations (Wijnhoven, 1999, p. 160)

Our notion is based on the idea that different memories are interrelated because they belong together – they are part of a "web" of memories. Furthermore, the memories are possibly mirroring each other, because they can reflect on the same practices. Our conceptualization of memories and

conflicts is based on exactly these potentially mirroring and intertwining relations between the different cognitions! That is, they are in conflict because they sometimes should relate but they do not, or because they reflect each other like a "distorting mirror".

We also want to emphasize that we are not attempting to put everything under the header of the memory metaphor, but our purpose is to show how it helps in building our understanding of complex processes such as those which relate to ERP 'best' practices. Our present analysis is in accordance with Robey *et al.* (2002) who remark that "to respondents, the primary obstacle to implementing ERP was the firm's knowledge of existing systems and business processes. In the language of organizational learning, "organizational memory" was viewed as a barrier to acquiring new knowledge. Managers trying to comprehend ERP systems and new business processes enabled by ERP needed to reconcile the demands for new knowledge with their knowledge of old systems and procedures" (Robey *et al.*, 2002, p. 27).

We further maintain that it is appropriate to investigate such concepts as knowledge, knowledge management, and indeed organizational memory at the individual and social cognitive level. The tendency is to look at aggregate levels such as culture (Jones *et al.*, 2006; Wagner & Newell, 2004). However, our theorization of memories as they are situated in networked webs across diverse 'locations' implies that if we investigate them at an aggregate level we will not be able to see the interrelatedness and interactions between the different parts of the webs and to an extent choosing an aggregate level of analysis will mask the existence of conflicting memories and the ways in which they emerge and are dealt with.

In previous work knowledge is often treated to be rather homogenous and having similar characteristics (Jones *et al.*, 2006; Ko *et al.*, 2005; Lee & Lee, 2000; Robey *et al.*, 2002). However, we believe the opposite is more accurate,

because of varying social settings as well as individual differences, as Feldman and Pentland (2003) note:

> "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. […] 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)

Our starting point, thus, lies primarily in the combination of individual and social cognitive realm with a primary focus on memories that are treated – in a manner reminiscent with Wagner and Newell's approach using epistemic cultures – as heterogeneous, diverse and, potentially, conflicting.

Defining conflicting memories

It is our central thesis that, over time, conflicts in memories originate and persist within the diverse memory networks that relate to the emerging ERP 'best' practices underpinning ERP software packages. In this context, conflicting memories or 'organizational memory mismatches', as we also refer to them, are defined as disparities between memories "located" in the ERP 'best' practices and the ERP system on one hand and related memories in other "locations", such as individuals' memories, and the structure and culture of the organization on the other. That is they arise when different memories at different locations are in conflict with each other (Van Stijn & Wensley, 2001). We thus rephrase the heterogeneity of memories in terms of conflict to keep people aware that there are elaborate accompanying processes of negotiating and re-negotiating involved.[9] Conflict in itself is not

[9] Though Wagner and Scott (2003) do describe negotiation processes regarding the Ivy case, their focus here does not explicitly lie on the cognitive or epistemic content, nor does it directly relate to what we describe here as different "locations" for such memories within the network.

negative, however if we fail to recognize conflict or if we are unable to cope with it, the consequences can be quite dramatic.

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 for instance 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) as well as the processes and the individuals that play their parts in the implementation and use of ERP '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). As such, part of 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).

4.5. Some methodological remarks

We have chosen to supplement our analysis with the case study of Big Civic, a large university in the United Kingdom. The setting of ERP at universities, a particular interesting and fruitful area because universities around the world have been involved both in development of 'best' practices and subsequently in implementing and using ERP systems and the 'best' practices they allegedly embed. As for instance the Ivy case demonstrates, developing ERP 'best' practices for and adopting them within universities is a tantalizing adventure (Wagner & Newell, 2004). We see that this also holds true for Big Civic. This ethnographic study focused on establishing a 'biography' of the ERP system (called Campus) for Big Civic, in order to understand such themes as the use of an ERP system as a means of developing an informational institution and a virtual university, fitting standard packages in a new non-standard university setting, and the tweaks and workarounds after the implementation of

Campus, when it entered into the university (Pollock, 2000, 2003; Pollock & Cornford, 2004; Pollock *et al.*, 2003). Big Civic partnered with an ERP supplier (Enterprise, a large European supplier) that wanted to develop parts of its ERP package in order to make it applicable to a university context and to include 'best' practices in the information system. Thus, Enterprise focused on incorporating higher education functionality (see Table 4-1) into Campus. Big Civic was one of the players in a global network of universities that partnered with Enterprise as "reference organizations" for its development efforts.

Pollock (2003) also refers to Big Civic as Red Brick and Enterprise is a pseudonym for the German supplier SAP AG; we will refer in a similar manner when we quote this particular paper. Table 4-3 provides a summary of the key background data relating to the Big Civic case.

	Big Civic
Country	United Kingdom
University budget	Enterprise sponsored most of the package
ERP package	Campus by Enterprise (a large European supplier)
Development partner	Yes, network of universities involved
Project start	1995
Key practice(s) focused on	Human Resources, Financial, Project Management, Student Management
Principal investigator	Neil Pollock
Duration of study	3 year period
Data collection	Meetings, interviews, observations, documentation
Data analysis	Actor Network Theory
Methodological header	Ethnographical case study
Publications on Big Civic	(Pollock, 2000, 2003; Pollock & Cornford, 2004; Pollock *et al.*, 2003)

Table 4-3. Background of the Big Civic case

Our primary goal (also in our broader research context) was to get a rich picture of how different (groups of) people experienced and interpreted the ERP system endeavor in relation to 'best' practices and to investigate how our surfacing lens of conflicting memories could illuminate our understanding. Multiple iterations, various discussions (also with Neil Pollock), earlier writings, and an extensive literature study throughout the research process together lead to the conceptualization of ERP 'best' practices and the application of the notion of conflicting memories presented in this chapter. The case study provides further evidence in order to identify and explain manifestations of memory mismatches and their consequences. The Big Civic case study is based on an interpretive stance. This was an important criterion for us in selecting it, as we wanted a case study that would fit with our own methodological orientation (Klein & Myers, 1999; Walsham, 1993).

A key limitation of our approach is that the case is a secondary re-interpretive reconstruction of what has happened based on case descriptions that have a different, though very complementary, core focus. As such we do not describe a primary longitudinal "real-time" case where we have been involved in the situations ourselves. One resulting issue relates to what we may call the "search space", where we are looking for the memory conflicts. Even though the original case analyses did not particularly look for such mismatches, we still found numerous descriptions. We have structured the selected examples here following the different settings of 'best' practices described earlier. Thus, the extensive material referring to the existing Big Civic case provides a sound basis for the analytical embedding of our work in and its linkage to practice. In addition, it also allows for the enrichment of our narrative relating to the novel conceptual perspective we introduce here.

In this section, we have briefly discussed our methodology and the case study that we have re-analyzed. In the next section, we elaborate on our analysis of Big Civic.

4.6. An analysis of conflicting memories at Big Civic

Now that we have described the basics of our concept of conflicting memories, we will use it to investigate the situation at Big Civic in more detail, structuring our discussion in concert with 'best' practices and memories, and the associated processes of development, implementation and use as described earlier in the chapter.

'Best' practices as generic ideals

At Big Civic, the generic ideal partly took on the shape of a mantra describing the need for the university to redefine itself as an "information institution", based on integrated information provided by the Campus package and consequently becoming a new organizational entity, a virtual university, based on this flexible and real-time information (Pollock, 2000). As the project director relates to the project team during an away-day meeting about their move towards partnering with Enterprise and developing and introducing Enterprise's Campus package:

> "I'd like to say a few words about where we've come from . . . [T]he World was changing, but I think the view [here] was – well, we hoped it would go away and it wouldn't change. Historically through the eighties, we underinvested in management information systems. Then MAC came along and it was seen as a panacea. It turned out not to be the magic bullet that many people had hoped, partly because the whole context in which MAC had been conceived was in the old model of higher education. The main funder was the government, and it was a 'command and control' system of reporting to government. Culturally and, also, probably technologically, it was an old model of the higher education system. And when we started moving into this new requirement for much more flexible information, MAC just didn't come up to scratch." (Pollock, 2000, p. 352)

We see here that the mantra is in keeping with the dominant ideals and memories that are prevailing within universities and suppliers. What we also see here are conflicting memories relating to the old situation, in terms of the MAC information system and the model of higher education. Big Civic's

organizational structure as a memory location did not match the mantra either, as the organization is considered to be too loosely coupled where it should be more than "just a sheltered workshop where academics pursue their particular interests" (Pollock, 2000, p. 257). Here, the conflicting memories are used as an opportunity for mobilizing people and creating momentum for change, as they form a temporal bridge between the old and new. However, we should note that the loudness of this mantra has silenced the opposing 'voices' of other memories, for instance of computer science academics who didn't agree with the Campus package implementation. Furthermore, we want to prompt awareness that such ideals of virtual and integrated informational institutions may actually be disguised programs for tightening management control!

> "[Like multi-national companies moving towards Enterprise, universities want to have] highly decentralized structures where you're giving your line managers a lot of autonomy and responsibility within a framework of an overall corporate entity; where the role of higher level managers is *to have an oversight of the business as a whole* and take strategic decisions and so on (interview with Pro-Vice Chancellor)." (Pollock & Cornford, 2004, p. 35, emphasis added)

This links to discussions of ERP as means for control, in terms of empowerment and panoptical restraining. This means that the ERP system is proposed as a means to enable employees to have more control over their day-to-day jobs because they will have the right information and process knowledge. However, the availability of all the real-time data also means that managers are able to monitor the day-to-day work in much more detail than before, which reflects the situation described about the Panopticon, with the prisoners being watched constantly, but not necessarily knowing when or where (Bentham, 1791; Foucault, 1977). At Big Civic (following the ERP supplier) the rhetoric focused on self-service, emancipation of employees by more control over transactions and information. However the availability of an abundance of information may also enable a "Big brother is watching you" environment (Dechow & Mouritsen, 2005; Elmes *et al.*, 2005; Pollock, 2003; Sia *et al.*, 2002). In this respect, we propose to consider how control thinking

has a direct impact on parts of the webs of memories. Where control for instance leads to "asymmetries" in knowledge and information, the situation becomes mismatch-prone.

Development of 'best' practices

In order to capture the 'best' practices and represent them in the software solution, suppliers will devote considerable time and effort in codifying and generalizing the concepts which underpin these best practices. For instance, people from Big Civic attended a meeting with other partnering universities and analysts of the Campus supplier where they discuss the concept of "holding status". [10]

> "In the meeting, one analyst asks for comments on what currently happens at each institution:
>
> **Supplier Analyst:** Students with bad marks. What do you do with them, leave them in limbo or give them a second chance?
>
> **Southern University:** Depends on timing, if just before a session and there is no chance of them bettering their mark, then we refuse them. Or, alternatively, we could say we've not decided yet. That is not a hold but a 'waiting status'.
>
> **Technology University:** If you're doing something that might pick up your grades?
>
> **Supplier Analyst:** I wouldn't call that a hold, that's a 'provisional situation'.
>
> **Rural University:** We have a 'partial hold', so holds affects some things. . . .
>
> **Large Campus University:** Isn't that a 'half-hold'. . . .

[10] Another issue of concern in relation to packaging 'best' practices at Big Civic was "building students into the system" (Pollock, 2003; Pollock & Cornford, 2004). Enterprise wanted to re-use parts of already developed and packaged practices (Real Estate and Training). However, the concept of "student" and certain typical student behaviors regarding for instance moving were not easy to include.

> The discussion goes on for some time and finally everyone (including the analyst) appears to be in a state of confusion as to what a hold might be (a 'waiting status', a 'provisional situation', 'a half hold…')." (Pollock *et al.*, 2003, p. 263)

In terms of conflicting memories, we consider this a mismatch at a concept-context level. In order for the supplier to package the functionality, the analyst attempts to make the concept and how it is used in different ways and across contexts explicit. This is part of the standardization effort. However, we see that such concept formation is a particular difficult and onerous process, even with a seemingly mundane and simple concept of "holding status" (Duimering *et al.*, 2003). Part of the problem lies in the fact that people do not necessarily share the same language nor do they have common understandings of terms *per se*. On the contrary, the lack of common languages and understandings is indeed an interesting theoretical conundrum underpinning our work. We pay more attention to this in the discussion section of this chapter.

There were two key motivations for Big Civic to join the Campus development network of Enterprise. First, the university saw itself at the forefront of the trend towards the use of integrated information systems across universities, as an innovator and pioneer actually playing its part in creating such a system, cooperating with "a well-respected software supplier and several prestigious universities from around the world" (Pollock, 2003, p. 108). Second, there was also an economic motivation, as the supplier would actually finance the software and part of the implementation (Pollock, 2003). We have already shown that Big Civic, as a developing partner, has been involved in assisting with the packaging of the 'best' practices within the software. We will extend this analysis here, focusing on the fact that Enterprise partnered with other universities as well.

Consider for instance the role of Large Campus (a North-American university), one of the other partner universities. Large Campus was particularly inclined "to persuade the supplier to incorporate further advanced functionality, such as credit card payment facilities and Customer

Relationship Management (CRM) software" (Pollock, 2003, p. 114). Large Campus argued that this would be more 'competitive' and thus that it would be beneficial for other universities too.

> "… [Large Campus] also plonked on the table more requests for CRM and that has blown the whole thing apart. If SAP meets this request, then that is less for us. SAP has finite support and [Large Campus's] need is more complicated than ours is. If they are going to go live with a CRM approach and we're going for a 'handicraft' approach based on our more 'handicraft' and 'paper-based' approach then this has an implication for our business processes (notes made at away day)." (Pollock, 2003, p. 114)

Big Civic questioned the usefulness of the more complex practices associated with the CRM approach. As such, we identify conflicting memories here in terms of understanding what is 'best' and how to shape the practices accordingly. In this case, the bargaining power of Large Campus appeared to be stronger, according to the internal critics because the market in the United States is significantly larger (Pollock, 2003).

The resulting referenced practices did not properly match with certain procedures at Big Civic:

> "One example, and there were many other of this kind, was the part of the system used to record applications by prospective students. This was built according to procedures common within American universities, and as applicants there are required to submit 'application fees', the system automatically generates an 'accounting record' for each new prospective student so that the appropriate information can be logged. There is no similar fee requirement in Britain therefore leaving Red Brick with the problem of deciding what to do with all the unwanted accounting records, some 30,000 being generated each academic year." (Pollock, 2003, p. 114)

According to this analysis, we emphasize that the process of selecting certain practices as reference practices to be incorporated in the package may have a highly arbitrary character, in the sense that what will be nominated "best practice" may depend upon, for instance, the negotiating power of other development partners and the market positioning of the supplier, rather than a more "objective" determination of what is 'best' as is often suggested.

Indeed the conflicting memories that result from this may have significant problematic consequences. We further explore this in the next section.

Implementation and 'best' practices

During the implementation of ERP 'best' practices, a process of re-contextualization needs to take place to transform the de-contextualized, standardized, generic 'best' practices into local work practices. As we have already mentioned, at Big Civic, some of the practices had to be configured according to the US model, and mismatches arose regarding for instance the accounting records (Pollock, 2003). We see the consequences of the choices made in the process of referencing ripple through the organization during the implementation, as the university saw itself forced to implement (and use) software functionality it did not really want (and that generated 30,000 unwanted accounting records each year) (Pollock, 2003).

This implies that a consideration of re-contextualization in terms of configuration and customization needs to be combined with an outlook on change. In other words, implementing an ERP package such as Campus necessarily entails designing changes in day-to-day processes, to accommodate for the new 'best' practices to be implemented. During initial training, a member of the focus group starts thinking about how the new practices will affect the department she works in:

> "Now when [Enterprise] comes in, the academics are going to have to conform to quite a lot of rules and regulations that they don't now. How on earth I am going to get my lot to do it, I do not know. Whether the centre has realized this, and is just not telling us what they are going to do about it, whether they are just going to trust to luck and hope that it works I just don't know. But, I am quite concerned about that. I mean it does create bad feeling if you are saying to somebody look you just can't just make an order on the phone, I won't pay for it if you do. It must come through the office, that's the system. …And I can see that they are going to start screaming, as soon as I say to them 'sorry, you can't do that anymore you have got to do that now, that's what the system is supposed to do'." (Pollock, 2000, p. 361)

In terms of conflicting memories, we see that the proposed situation does not fit with the current memories, for instance from the academics. Their individual routines have to change in the new situation, as they cannot simply pick up the phone anymore. In implementing an ERP system, certain ways of thinking and acting become privileged and others get de-legitimized. An implication of the diversity and conflicts of memory is that people are unable to fully understand and anticipate how the ERP practices that are being implemented will actually 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." [11] (Feldman, 2004, p. 307)

'Best' practices and the ERP use phase

The fact that the people enacting the routine are usually not the ones designing the routines and, further, that they may often be excluded from the implementation process, may add to the often experienced gap between design and use (Orlikowski, 2000). Over time, people learn various ways to "work the system" (Boudreau & Robey, 2005). We contend that in many situations employees develop informal ways of handling conflicts between the ERP practices and other memories. For example at Big Civic, the administrator of one of the departments found that it was impossible for people to enact the purchasing practice in urgent cases when she was away, because the implemented practice did not in principle allow for flexible adaptation.

[11] On the other hand, this inability should not be used as an excuse for leaving employees out of the process.

> "Under Enterprise, this ad hoc practice is impossible as all suppliers have received written instructions allowing them to supply goods and services only for those orders which are: (1) printed on an appropriate form (i.e. the one generated by Enterprise); and (2) bearing a unique order number (again, generated by Enterprise). In urgent cases therefore, the administrator would generate the paperwork and a ticket, for instance, could be bought the same day. When the administrator is not available, however, the remaining support staff is faced with a problem. The administrator who has designed a copy of the Enterprise order form on her word processor has circumvented this, however. The form can be printed out at any time, and adorned, not with the Enterprise order number, but with something she calls a 'pseudo number' or the 'secretarial requisition number' (a physical list of numbers kept by other members of the support staff). After this workaround has been carried out, the administrator is then free to process the order through Enterprise in her own time." (Pollock, 2000, p. 362)

In terms of conflicting memories, we see that the ERP practice as it has been implemented at Big Civic does not match with departmental routines required for urgent purchases, in particular when an individual is out of office. We see that the conflict is resolved by a workaround (i.e. adding a pseudo number on a copied order form). This enabled the staff to create the necessary flexibility. Such implications for use are potentially very difficult to recognize beforehand (during encoding in the package or implementation) because of their local and often implicit nature. We also see that these informal approaches or 'workarounds' are rarely documented within the organization and are thus often overlooked, especially where tweaks are seen as unwanted, substandard practice. On the contrary, we argue that they actually enable users to make the practices work in their local context, though they do not necessarily reflect the prescribed and proscribed situation, and as such may not be considered 'best'. Furthermore, they also provide signals for further improvement and change that should not be ignored.

We elaborate on workarounds and our other findings in the next section, where we provide a further discussion of the threads we have uncovered with the Big Civic case and our theoretical framing.

4.7. Discussion

In the previous sections we have explored the concept of 'best' practices and the notion of conflicting memories, and examined these through the re-analysis of the Big Civic case study. Table 4-4 provides an overview of the results of the analysis, highlighting the identified mismatches and issues for consideration. We further discuss the pertinent theoretical and practical implications of those issues here. The findings provide further input into the discussion of why ERP 'best' practices are not necessarily ideal and how analyzing conflicts in memories point towards problems that have a great risk to enlarge the gap between design and use even further.

'best' practice concept	**Conflicting memories**	**Identified issues**
'best' practice as generic ideal	Mantra of Big Civic (information)	Silencing and de-legitimizing perspectives Conflicts as change catalysts Control
Development and 'best' practice	Concept of 'holding student' CRM 'best' practice	Concept building Shared language and understanding Dominant partners
Implementation and 'best' practice	New individual routines	Ripple through of CRM Incompleteness of models Anticipation/ articulation of change
Use and 'best' practice	Workaround order form	Ad-hoc flexibility Attitude towards workarounds

Table 4-4. Summary of the key findings

The language of ERP 'best' practices seems to suggest that there are ideal templates for particular processes and that these templates can be developed, implemented and used in a relatively straightforward manner. On the contrary, we have seen that a variety of difficulties may arise in relation to 'best' practices and these different processes that in the end may inhibit the successful realization of 'best' practices with ERP.

Furthermore, 'best' practices are not necessarily 'best' or ideal since they are de-contextualized and re-contextualized throughout the development, implementation and use. Indeed we have to recognize that 'best' practices in their de-contextualization are subject to processes of identification and codification and subsequently that such practices will be re-contextualized, they become represented in an organization-specifically configured and customized form, and the practices are interpreted or re-interpreted when they become an integral part of the organization and are enacted and re-enacted in the organization. Our findings correspond with Orlikowski's (2002) remark that "the best" organizations may be able to achieve are "useful practices":

> "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, 2002, p. 253)

There also appears to be a trade-off between achieving standardization and accommodating the uniqueness of the company. Achievement of the former tends to undermine the ability of the organization to achieve competitive advantage based on how it operates. Standardization is meant to provide a common ground for understanding practices and for performing them in a seamless and efficient manner within and across organizations (Kallinikos, 2004). Consequently, through this strong rhetoric, organizations and their members often experience pressure to conform to these 'best' practices (Gosain, 2004). However, some will argue that if all companies were to adapt the same standardized 'best' practices, there would be no competitive advantage (Beard & Sumner, 2004). This leads us to a consideration of how standardized such 'best' practices will actually be when they are implemented and used in the adopting organizations.

To what extent are they likely to be the 'same' ERP 'best' practice as the supplier intended? Will these 'best' practices necessarily improve the performance of the organization when they are implemented and used? How will the changes that are made to adopt ERP 'best' practices impact on other parts of the organization? How does the implementation of 'best' practices change the way work is done and understood at the individual level? How does it change the way organizational memories are stored and processed? Are these changes likely to result in improved performance of the organization? And, to what extent are some of the changes that have been made by importing 'best practices' hidden? The 'best' practices underlying the ERP system have a highly integrative nature and consequences of changes in one aspect may "ripple through" the organization in unforeseen and even unseen ways.

Another thread relates to the process of packaging ERP 'best' practices in the software solution. We have discussed that the supplier is very motivated to do so in order to enlarge his opportunities for marketing the package. We are particularly interested in the standardization process that needs to take place at the same time of the packaging. The analysis of Big Civic has highlighted the difficulties with concept formation and making decisions with respect to the functionality that is necessary to make a generic, de-contextualized package. We have seen that part of this process tends to be more arbitrary and political, as for instance Large Campus managed to persuade Enterprise to include CRM. People at Big Civic feared this was because of the market potential in the USA (and thus because of the bargaining powers of the US-based Large Campus) that CRM was included, rather than that this decision was based on an "objective" analysis of what would be 'best' for the university setting. We question whether it is at all possible to have an objective de-contextualization process as is often implied.

In addition, different understandings and languages make this de-contextualization process particularly problematic. A shared understanding is often assumed but far less often achieved.

> "There is a vast difference between recognizing that individuals in a social system have a common stock of knowledge (which Giddens refers to as interpretative schemes), and assuming that those individuals have shared meanings and values." (Boland, 1996, p. 696)

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. As for instance Bechky (2003) maintains, creating a shared understanding within an organization may already be very difficult. To make things even more complicated, the whole university setting (as an "industry") is comprised of many communities of origin, within the universities themselves (with e.g. faculty and administrators) and across the different countries. 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)

Packaging for an inter-organizational, international setting is clearly a highly complex task!

Furthermore, in contrast to the governing idea that all necessary knowledge of 'best' practices will be encoded, our thinking about (re-) contextualizing stresses the idea that a certain incompleteness (and hence, inevitably, mismatches!) is inherent and even necessary in the specification of 'best' practices (Becker, 2004; Van Stijn & Wensley, 2001). This incomplete specification introduces a certain level of uncertainty and ambiguity that has to be dealt with. One also needs to pose the question as to whether these embedded 'best' practices can simply be put together and integrated. The nature of the practices at hand does not necessarily allow for the plug-and-play attitude that is adopted here. If there is a lack of insight in the 'best' practices, it becomes questionable whether any possible combination of 'best' practices accumulates in an even better 'best' practice. Do certain different practices actually rule each other out? Do they work on conflicting

assumptions? Do they require opposing skills? Could people then work with both of them or are they unable to switch back and forth?

Over and above this it becomes necessary to learn and understand how to interpret new and existing routines and enact them in day-to-day situations (Feldman & Pentland, 2003). It is interesting to contemplate to what extent the knowledge structures that have been built up by individuals prior to the implementation of the 'best' practices and the ERP system are appropriate after the implementation - do they allow individuals to behave appropriately? Can they work with the newly reconstituted processes? Are they able to diagnose process failures or performance deviations appropriately? How do memories and practices transform and evolve during the in-use phases?

Furthermore, when the 'best' practice processes are implemented, how do we know that they are consistent with the existing processes? Do the users of the new system really understand the terms and concepts that are used to construct the new processes? How can one be confident that users actually understand the processes and their operation? How does one determine the extent to which new or restructured processes are understood?

We have also investigated ERP 'best' practices in use, in particular workarounds, which are another source of uniqueness and local adaptation of practices. Workarounds potentially undermine 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. Many firms also appear to actively work to reduce or eliminate the informal mechanisms that enable users to actually use information systems and enact the 'best' practices. As Pollock (2000) notes regarding Big Civic:

> "For all the centre knows, the departments are working according to the real-time procedures, and as long as the users maintain these intricate workarounds, the university might as well be considered real-time. Thus, while the work of implementing Enterprise has involved both the production of a new model and the seeming destruction of the old, in

> many ways, the established routines, practices (i.e. the old model) carry on as before." (Pollock, 2000, p. 362)

Even if senior managers do not work against such informal mechanisms, they certainly do not value such mechanisms or provide incentives for users to make use of them. Equally seriously, important information required for interpreting the outputs and inputs of the ERP system often 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 memories need to be adapted to 'fit' into existing categories and processes. Regarding ERP 'best' practices in use, further research is needed to provide more insight in the flexibility that people have in interpreting and enacting them, the changes such flexibility leads to, and the consequences for successfully realizing "the best" practices.

In this extended discussion, we have outlined how the lens of conflicting memories unveils a set of issues that challenges the idea of 'best' practices and that illuminates our understanding of the gaps between the interpreted ideals and the enacted local practices during use. Through our lens several 'old' problems such as developing a shared language and privileging of perspectives are signaled. Our findings underscore that a revived interest in these is justified. The uniqueness of our approach lies in the fact that we are able to start developing a unified understanding of such issues by linking them to the notion of conflicting memories. Whereas our re-analysis is helpful in providing an initial empirical elaboration of the approach, we find that further development would benefit from a study where our theorizations form the primary starting point. Rather than a retrospective study it may be even more interesting to investigate conflicting memories real-time and further surface the problems they entail and examine the efficacy of coping mechanisms. This is a particular challenging task given the complexities of (investigating) networked webs of memories and the fact that we deal with conflicts that may emerge in unpredictable and even hidden ways.

In the next section, we present our conclusions.

4.8. In conclusion

Many organizations have sought to harvest organizational benefits and competitive advantage through the adoption of ERP systems in general and ERP 'best' practices in particular. In this chapter, we have identified 'best' practices as alleged generic, universal ideals that go through phases of development, implementation and use and that vary in generality/ locality when adapted in different contexts with different (groups of) people engaged with them. We have seen that they emerge within extensive, and also varying, networks.

We have investigated 'best' practices in terms of organizational routines (Becker, 2004; Feldman & Pentland, 2003). As organizational routines bridge actions and cognitions, which we have described in terms of organizational memory, this has enabled us to use the lens of conflicting memories in our subsequent analysis. Thus, we have set out to look at the problematic nature of ERP 'best' practices. In contrast to other ERP studies that often tend to view knowledge as homogeneous and shared, we have stressed diversity with respect to the memories involved. To do so we have introduced the construct of conflicting memories.

Conflicting memories are defined as deficiencies between memories related to ERP 'best' practices within a web of different "locations". Our concern is that relatively little attention has been paid to these conflicting memories both during development, implementation and as the adopting organizations and the practices evolve through use. Our discussion of conflicting memories at Big Civic also provides us with some interesting insights into the practices surrounding the development, implementation and use of ERP systems at a UK university in particular and regarding complex enterprise systems in general.

Failure to comprehend the issues that we raise, results in failure to appreciate such differences (which may be very significant) between the various ERP 'best' practices, and the underlying conflicts in individual memories and

organizational "memories". The issues that have been discussed in this chapter imply that such conflicting memories are inherent, and, indeed, innate to the complex and dynamic webs of knowing they reside in. They are important cues for both problems with ERP 'best' practices and opportunities for change in this context.

In our broader discussion, we have contributed an approach that can be used to explain some of the difficulties with ERP 'best' practices from a cognitive perspective. We raised many challenging questions that may guide further investigations and also challenged the ERP 'best' practice rationale. We would like to end with this tantalizing and thought-provoking quote by Boland (1996) to further reconsider ERP 'best' practices:

> "Practices do not derive from a well developed discursive consciousness of goals, intentions, motivations, plans and purposes, but from the practical consciousness of reacting to circumstances, correcting an error "on the fly", responding to the last thing said or done. They are built from a reflexive monitoring of conduct, making that conduct appear rational, understandable and accountable to self and other. To make oneself accountable in this way is "an endless, ongoing contingent accomplishment" (Garfinkel, 1984, p. 1)." (Boland, 1996, p. 693)

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5. Analyzing reconstructions of ERP practices

M.C. Escher's *Moebius Strip II* (1963). © 2006 The M.C. Escher Company B.V. – Baarn – The Netherlands. All rights reserved. www.mcescher.com

5.1. Abstract

Enterprise Resource Planning (ERP) systems have been widely adopted because they are considered important means to support as well as change business practices with standard software packages. In this chapter we consider how such practices are reconstructed within an adopting organization, how they are interpreted and enacted during implementation and use. To do so, we conceptualize ERP practices in terms of organizational routines, which are also understood to be "locations" of organizational memory. Memory mismatches are at the core of our lens to surface understandings of what goes wrong and how people negotiate solutions, both during the implementation and use of ERP systems. Thus, we contribute an exploration of the relations between mismatches and problems in reconstructing ERP practices from a knowledge-centric perspective. We combine our theoretical analysis with a case study of AcademCentre, a Dutch university, which provides for an empirical elaboration. Looking at the memory mismatches encountered there and the processes surrounding them yields interesting insights into the challenges and opportunities of putting ERP practices in action. Future research may investigate how our perspective can be further developed as an explanatory tool and address its development into a more pro-active approach.

Keywords: Enterprise Resource Planning, ERP systems, practices, organizational routines, organizational memory mismatches.

5.2. Introduction

Over the past decades, Enterprise Resource Planning (ERP) packages have become an integral part of many contemporary organizations around the world (Bingi *et al.*, 1998; Davenport, 1998, 2000; Kumar & Van Hillegersberg, 2000; Sarker & Lee, 2003). One of the key features of ERP systems is that they are claimed to bring with them a set of 'best' practices that support the organization in achieving a variety of benefits such as faster administrative

cycles, improved scheduling, cost efficiencies, and reduced throughput times, through standardized ways of working that use integrated and real time information (Boudreau & Robey, 2005; Davenport, 1998; Gattiker & Goodhue, 2004; Holsapple & Sena, 2005). At the core of this standardization is a de-contextualization process which is necessary to implement in order to be able to "copy and replicate" practices across organizations, enabling the spread of ERP systems (Gosain, 2004; Wagner & Newell, 2004; Winter & Szulanski, 2001).

Thus, ERP practices are necessarily standardized, generalized and de-contextualized practices that are packaged in a particular ERP 'solution'. During implementation and use, then, these practices need to be re-contextualized and in this process they will be (continuously) adapted to the local contextual situation, either through *the ways* in which the software is configured and customized, prescribing and proscribing practices, or through *the ways* in which the software is used and "tweaked", through which new practices emerge (Boudreau & Robey, 2005; Pollock *et al.*, 2003; Soh *et al.*, 2003; Van Stijn & Wensley, 2005a, 2005b; Wagner & Newell, 2004).

In the following, we use what might be termed a knowledge-centric view of processes to investigate how the processes embedded in ERP systems are reconstructed. The thread we develop in this chapter relates to how people engage with ERP practices, how they reconstruct these practices during implementation and use, and the role that memories and knowledge creation play in this reconstruction process (Bondarouk, 2004; Orlikowski, 2002; Schultze & Orlikowski, 2004; Szulanski, 1996). Central to the position adopted in this chapter is the notion that although new knowledge emerges as a result of the implementation and use of an ERP system, it is not necessarily clear how such new knowledge can, will, or should be integrated with old knowledge or with other items of new knowledge. We use the terms memory, knowing, knowledge, information and cognition interchangeably here, stressing that memory is entangled in a complex web of actions, structures, things and people. We further describe our view on memory in the next section.

We pitch the discussion in this chapter at the level of practices, making use of the literatures on organizational memory and organizational routines. Viewing ERP practices as a form of organizational routines, that need memories to be enacted and interpreted and that are also "locations" of such memories, enables us to use an organizational memory mismatch approach for our subsequent theorizing and analysis. We propose that in order to interpret and enact processes individuals need to have some knowledge of others and their knowledge, knowledge of how the activities that comprise particular processes relate together, and what parts their own actions play in relation to the actions of others. To the extent to which individuals possess inconsistent or incomplete knowledge, processes are likely to be enacted in inappropriate ways. New processes may end up being enacted as some combination of old and new processes, making use of old and new memories. Such situations further increase the likelihood that what we call memory mismatches will occur.

Our starting point for investigating the production and reproduction of practices lies primarily in the individual and social cognitive realm with a primary focus on memories. These memories are treated as diverse and, potentially, conflicting. Our concern is that relatively little attention has been paid to such mismatches both initially during implementation and, more importantly, as the organization, its members, and the ERP system co-evolve through use. Thus, we aim to explore how memory mismatches signals are signals for problems with re-constructing ERP practices during implementation and in particular the use of ERP systems. Although we predominantly focus on their negative impact here, it is our contention that organizational memory mismatches are important cues for identifying both challenges and opportunities relating to the reconstruction of ERP practices.

The remainder of this chapter is structured as follows. First, we theorize about how we may understand the reconstruction of ERP practices and how this reconstruction inherently involves reference to organizational memory and the likelihood of associated memory mismatches occurring. Then, we continue with a discussion of the methodological background to our research and introduce AcademCentre, a large Dutch University (Bondarouk, 2004,

2006). After this, we look at the case from our notion of mismatches, providing an empirical elaboration through a re-analysis of the AcademCentre case. In the discussion, we summarize our results and detail the research's implications. This is followed by our conclusion.

5.3. Theorizing about representing and recreating ERP practices

In this section we describe the way we approach ERP practices through our perspectives derived from the study of organizational routines, organizational memories, and memory mismatches.

ERP practices as organizational routines and the role of memories

Central to the analysis presented in this chapter is the notion that ERP practices are, in essence, organizational routines where people make use of ERP technology (cf. Szulanski, 1996) as an integral part of enacting such routines. Many definitions of organizational routines exist (Becker, 2004; Cohen & Bacdayan, 1994; Pentland & Rueter, 1994), focusing primarily on "recurring patterns of behavior of multiple organizational members involved in performing organizational tasks" (Feldman & Rafaeli, 2002, p. 311). These tasks are – especially in the context of ERP practices – highly integrated, both in terms of the dependency of actions that constitute any given practice and of the knowledge involved in actually enacting a practice (Boudreau & Robey, 2005).

> "An organizational routine is not a single pattern but, rather, a set of possible patterns – enabled and constrained by a variety of organizational, social, physical, and cognitive structures – from which organizational members enact particular performances." (Pentland & Rueter, 1994, p. 491)

Although with ERP systems the prevailing view is that the set of possible patterns is and should be much more restricted by the 'best practice' rules, templates and formalizations, this view has been contested in several studies that report such phenomena as "tweaking" and workarounds (Boudreau &

Robey, 2005; Pollock & Cornford, 2004; Pollock *et al.*, 2003; Wagner & Newell, 2004).

Our view of practices as routines is reminiscent of the agency and practice views (re)introduced recently (Boudreau & Robey, 2005; Emirbayer & Mische, 1998; Feldman, 2000; Feldman & Pentland, 2003; Orlikowski, 2000, 2002; Schultze & Orlikowski, 2004). Every time a practice is evoked, its precise nature is a result of a complex interaction between individual declarative and procedural knowledge and cognitive structures, organizational memory, and other aspects of organizational structure and agency. Interestingly as participants act they also help to structure the actions of others. In this context, structures are seen in a more or less similar manner as that proposed by Giddens (1984) in his discussion of structuration processes and the duality of agency and structure. Some of his ideas, in particular concerning the importance of interpretive schemes, how human action is given meaning (signification) through such schemes, and the fact that we are talking about knowledgeable agents who have a potential for exhibiting reflexivity, are indicative of the importance of memories in practices.

In the literature on organizational routines, routines are often seen as part of organizational memory (Becker, 2004; Walsh & Ungson, 1991). However, what we mean by our use of the term 'organizational memory' is not really consistent with the mainstream view of memory or knowledge. That is, the traditional approach tends to focus on "chunks" of information or knowledge being "stored" in various "repositories". It suggests a view of knowledge as being objective that can be codified and exist independently of people and manipulated in a production-like manner (Corbett, 2000; Schultze & Leidner, 2002). The way we interpret memories is much more in the line with, for instance, Orlikowski's (2002) view on knowing in practice. That is, we view memories as both individual and structural; they are networked in a complex web of interrelated and interacting knowing that derives its meaning from the use (including abuse, misuse, non-use) of the memories in people enacting ERP practices. This networked web gets dynamically shaped through such

use, because the enactment creates new memories, in the form of new representations, concepts, ideas, and so on, and enactment weakens or eliminates others and changes the individuals as well as the setting (network) within which they act.

Knowledge (interpretation) is necessary in order to be able to enact the routines and the enactment of routines shapes and modifies our knowing. This is especially true in the case of prescriptive technologies such as ERP where we want the routines to be performed in a reasonably stable manner which would imply either a reflexive understanding of these routines or their habituation. Within organizational memory theory, routines are seen as specific 'locations' of organizational memory (Becker, 2004; Cohen & Bacdayan, 1994; Moorman & Miner, 1998). In this light, they embed memory about how to do things and also contain factual memories. It is important to consider that the memory contents at different 'locations' (1) embed contents that may refer to, and derive their meaning in part from other memory contents in other 'locations' and (2) they may re-shape each other, and interact, when for instance they are simultaneously used in enacting a certain routine. However, such interactions and interrelationships of memories are often ignored in the literature (Corbett, 2000). Clearly, as we implement and use technologies that potentially change the nature, content and interrelationships between organizational and individual memories it is likely that existing practices (routines) may be modified and new practices (routines) enacted in ways that were neither intended nor are fully understood.

Reconstructing ERP practices

When we refer to "the reconstruction of ERP practices", we consider it important to recognize that different actors within networks retain and make use of multiple representations of these practices. These networks are primarily constituted of suppliers, consultants and people at different units within the organization. Next to the memories of these (groups of) individuals, the web of memories also includes the representations in e.g. the

existing routines, structures and the cultural heritages of the organizations directly and indirectly involved in the practices concerned – as suggested by organizational memory theory (Walsh & Ungson, 1991; Wijnhoven, 1999). Because a key aim is the integration of the practices supported by ERP systems, these practices are necessarily boundary-spanning in organizational and memory terms.

The reconstruction of ERP practices takes place through the implementation of an ERP system that is based on the various representations and interpretations of how the ERP practices should be shaped. In addition, the recreation of the practices is understood here as being realized through the actual enactment of the routines. When practices are enacted, existing individual and organizational memories interact dynamically with interpretations of the ERP system's representation of practices. It is our contention that careful investigation of such enactments, occurring and reoccurring as the ERP system is actually used, is necessary in order to understand the richness of the interactions between the ERP system and the organization and some of the consequences, both positive and negative, of these interactions. Implementation studies involving the identification of organizational-level critical success factors for ERP system implementation do not provide this level of detail and therefore fail to identify many challenges and opportunities associated with these complex enterprise-wide information technologies (Hong & Kim, 2002; Umble *et al.*, 2003).

In our analysis, we interpret representations primarily in terms of people's understandings – and misunderstandings – of the ERP practices. As such, learning processes and training are considered to be essential to the modification of existing representations and the creation of new representations. Indeed it is rarely the case that such re-construction takes place without some attempt to direct it through training. Through training we are trying to get people to either learn to adapt existing practices or learn new practices. This requires them to develop new understandings, new interpretations of existing knowledge or absorb and accept new knowledge.

We focus on situations where approaches to training during the implementation of ERP systems have not provided the appropriate context for learning new interpretations of knowledge or have not successfully transferred new knowledge. As Robey *et al.* (2002) note:

> "Where older processes are deeply ingrained into organizational memory they represent formidable barriers to the implementation of new knowledge associated with ERP." (Robey *et al.*, 2002, p. 37)

One might suggest that this mirrors the difficulty that individuals have in unlearning habitual behaviors and replacing them with new behaviors. Habitual behaviors are by their nature difficult to modify or unlearn and therefore robust and inflexible.

In our approach, training relates to the guided preparation to learn how to use ERP for the job tasks resulting in modification or establishment of practices. Training must take into account not just the new actions that must be performed but also facilitate the addition, modification or elimination of practices in part through the elimination or modification of existing memories and the establishment of new memories. Training must also address the need to develop new understandings of the actions of others and facilitate the creation of structures of interpretation and interaction that will allow for the enactment of new practices or the modified enactment of existing practices. Adopting this richer perspective on training allows us to highlight significantly more nuanced understandings of what is going on at this level and, in particular, identify problems with the "push button approach" to training that is often adopted as well as critically evaluate the role of manuals in the training for and reenactment of practices.

All in all, the reconstruction of ERP practices can be viewed as a continuous process of re-interpretation and re-structuring, meaning that every time people engage in the enactment of practices, they have to interpret/re-interpret the system and/or change their interaction with the system. There is a danger that, as practices become routinized, users may forget aspects of the underlying logic of the practices or forget essential flexibilities that the

practices are capable of exhibiting, as a result of not having been exposed to conditions that would evoke such flexibility. The following quote illustrates how such routinization can lead to loss of knowledge which may be critical to the appropriate enactment of a particular practice:

> "We are called upon by users to re-explain the business rules. Over time they become disconnected from how the systems function. People change in the business unit – turn over – so the knowledge of the business rules is lost or becomes distorted. Over time the knowledge diverges. The knowledge is more stable in the IR [Information Resources] group because the ultimate holder of the knowledge is the system itself. We hold the knowledge. If we don't know the business rules, we can look them up in the programs. Every six months it seems we have to do a refresher course for the user. (Group Director, Information Resources – Informant #15)" (Pawlowski & Robey, 2004, p. 656)

In the next subsection we explore the nature and significance of memory mismatches as a prelude to making use of them as an explanatory device in subsequent sections of the chapter.

Theorizing about organizational memory mismatches

In order to further understand the reconstruction of ERP practices, we make use of the concept of 'organizational memory mismatches'. Adding the notion of conflicting memories or memory mismatches to our analysis of ERP implementation and use also sheds interesting light on the reasons why certain types of problems occur and how they may be interpreted. As such we propose that they have an explanatory quality. Memory mismatches in this context are the conflicts that occur between memories at the time memories are 'activated' in use. The memories referred to here may be individual memories or other networked memories, that are for instance related to routines and culture (Van Stijn & Wensley, 2001). Thus, while it is inevitable that some mismatches exist within organizations these are likely to be reinforced because people have different experiential trajectories, knowledge

asymmetries, idiosyncrasies that are likely to lead to diverging interpretations of practices. Further, new mismatches are also likely to emerge as ERP systems provide new or modified representations and directly or indirectly cause the restructuring of existing organizational and individual memories.

We would like to state at the outset that we do not agree with the view that "early articulation, reflection, discussion, negotiation, and possibly change of inconsistencies and incongruences may reduce the likelihood of unintended misunderstandings and delusions around the implementation and use of new information technology" (Orlikowski & Gash, 1994, p. 202). Soh and Sia (2004) repeat this remark in their work on misalignments, but the key issue with this position is that it suggests a predictability and rationality underpinning the occurrence of mismatches, that it is possible and necessary to come to consensus or "closure" thus, essentially eliminating mismatches. However, our position with respect to mismatches suggests that although we may create an awareness of their existence, it is not necessarily possible to prevent mismatches from emerging in the first place. They emerge as a result of dynamic interpretations and enactments of the practices over time. This makes them difficult if not impossible to predict. Furthermore, we also argue that mismatches – though their connotation might suggest otherwise – are not necessarily good or bad for the organization, they simply occur and people may sometimes ignore them, work around them, or, indeed, act upon them. Thus, we do not regard memory mismatches only in a negative light to be eliminated wherever possible. On the contrary, we will argue that such memory mismatches may be valuable indications of the need for change and adaptation by the organization and a signal that may indicate possible actions that may be taken to bring about such change or adaptation. Thus, mismatches are also likely to bring into question interpretations of new and existing practices. Such reflexive questioning creates a space within which practices may be modified or, at least, flexibly interpreted.

The concept of memory mismatches may be compared with 'incongruent technological frames' as described by Orlikowski and Gash (1994). While

incongruent technological frames refer to the important differences in understandings and memories relating to the technology and its use, our conceptualization of memory mismatches aims to broaden this concept by taking the embeddedness of memories across the diverse 'locations' in the networked web and the linkages and interactions of these memories (both individual, organizational, and technological) into account. Our concept of memory mismatches also has resemblance with the notion of 'misalignments' (Gosain, 2004; Soh & Sia, 2004; Soh *et al.*, 2003). However, where misalignments focus on opposing institutional structures or forces, we reason about the interpretive side of the equation.

We will now briefly discuss the methodological approach that we adopt in the context of a case study conducted at AcademCentre, a Dutch University.

5.4. Methodological background

Before we make some general remarks concerning our methodological approach, we first introduce the organization (AcademCentre) which provides the data that we present and interpret throughout the remainder of this chapter. Since its beginning in the 7th century, AcademCentre has had a long history of being a centre for knowledge creation, accumulation and transfer in the fields of scientific research and higher education. At the present time, it is the largest University in the Netherlands, with more than 23 000 students, in excess of 7 000 employees and a yearly turnover of € 612 million.

Most of the faculties in AcademCentre had been using a personnel information system called COMI-P since 1994. However, it became increasingly outdated towards the end of the '90s. The supplier no longer guaranteed on-going updates or further development. As a result, in 1998 the directors of the faculties and other services collectively established the functional requirements for a future new system. In November 2000, the University Board made the decision to choose the SAP_HR personnel

management system. By then, AcademCentre had already implemented the financial module from SAP, SAP_Financial. By choosing SAP_HR, the organization hoped for a painless implementation trajectory based on their existing experience with SAP_Financial, and intended to create unproblematic interactions between HR and financial administration departments. Their approach thus essentially involved rolling out an integrated process-oriented standardized ERP system using a phased approach. The project was initiated primarily to replace an outdated system and to integrate it with the other systems at AcademCentre, in particular the finance module. In the Spring 2001, AcademCentre started to implement SAP_HR. The project was granted an initial budget of € 1 million.

The initial case data were collected in the context of another study that primarily looked into the role of group learning processes in groupware implementations. During a 6 month period in 2003, one of the authors collected data using qualitative methods, such as semi-structured interviews, observations, and document analysis. 24 interviews were conducted, each lasting from one to one-and-a-half hours.

Representatives of three groups of SAP_HR users were interviewed:

- Five employees involved in steering the project in AcademCentre. These employees were referred to as project team members. They provided support for end-users, manned the help-desk, were responsible for the functional and technical administration of the system, and monitored and analyzed the on-going use of the system.
- Four leaders of the faculties' HRM departments who were responsible for personnel policy and administration in the faculties. These individuals were not active end-users of the system themselves but the SAP implementation brought about significant changes in their departments.
- 15 end-users: four salary administrators from the central Salary Department and 11 HR specialists from five HRM departments. Individuals were selected based upon their intensity of SAP use.

Those HRM specialists, whose daily work tasks had to be performed through the system, including five key-users who were advanced users of the SAP_HR system were interviewed.

Table 5-1 shows how the different units investigated exhibit considerable diversity that led to significant variation in the ways HR information was processed.

Organizational unit	Abbreviation	Staff in a unit	HRM features of the Faculties
HRM department in the Social Sciences Faculty	SC_HRM	9 employees all make inputs in SAP_HR	The largest Faculty with 700 employees, it participates in 9 curricula, 3 of them are "mixed" with other faculties, resulting in many part-time and contracts spanning two faculties (510 employees).
HRM department in the Geographical Faculty	Geo_HRM	5 employees 3 employees make inputs in SAP_HR	320 employees, one-quarter of whom are declarants who work for short periods of time.
HRM department in the Faculty of Arts	Arts_HRM	9 employees 2 employees make inputs in SAP_HR	Includes many highly specialized external Professors who are invited to teach only one course.
Service Centre	SS_HRM	11 employees 3 employees make inputs in SAP_HR	A special structure in AcademCentre providing HRM services to more than 400 employees working for the support units (museum, communication centre, etc.).
HRM department in the Veterinary Laboratory	VL_HRM	1 employee	The unit (64 employees) provides support for three other Faculties. There are no Professors or PhD students in the unit but there are many on-call workers executing simple tasks for 1-2 days.
Central Salary Department	SAL	12 employees all make inputs in SAP_HR	Salary administrators process the salary data and then sent it to the external Governmental Salary ICT called the IPA system (or IPA).

Table 5-1. AcademCentre units participating in the research

Additionally, access was granted to relevant documents such as the project plans, detailed notes of key-user meetings, plus the main manual and 36 sub-manuals covering the use of SAP_HR for the university. These manuals were particularly interesting because they were also used as training material.

The primary goal of our re-analysis of the case study is to get a rich picture of how different people interpreted the endeavor of ERP implementation and use. We are particularly interested in the interpretations and enactments of ERP practices by people in the case organization. Many of these interpretations and enactments of practices relate to practices that were new to them and embedded in the ERP systems representing 'reference practices' or 'best practices'. In order to capture such things as representing processes and learning how to interact with the ERP system through training and use, this research is based on an interpretive stance (Klein & Myers, 1999; Walsham, 1993). Our focus is directed towards individual construction and re-construction of meanings, interpretations, codifications, and significations, learning, communicating, etc. (Schultze & Orlikowski, 2004).

Multiple iterations of interpretations, engagement in diverse discussions, reference to earlier writings, and extensive literature study throughout the research process together lead to the conceptualization of ERP practices and memory mismatches presented in this chapter. We contend that the re-analysis of case material is a fruitful way of looking at such research in a different thinking mode and can highlight new insights and reasoning that was not uncovered in prior analysis. For instance, Wagner and her colleagues investigated and elaborated on the Ivy university case through the application of various lenses (Scott & Wagner, 2003; Wagner, 2002; Wagner *et al.*, 2004; Wagner & Newell, 2004). This approach provides a counterbalance to the problems associated with finding suitable new research sites.

Because of the fact that the case data were not focused on memory mismatches per se[12], we adopted an "inside-out" approach to identify mismatches and related problems. That is, we both followed the lines of reasoning from the described practices and memories towards mismatches and problems, and the other way around we traced back the origin of some problems to conflicts that were occurring. We consider this not only appropriate because of the type of data available, but also when we consider theoretically that to a large extent memories and consequently the associated mismatches have a hidden property. Because of the complexities of the webs of memories that make it impossible for people to gather a full understanding of knowing per definition, we also argue that in addition, through the interactions of memories, mismatches are emerging in unpredictable and unseen ways – as people are not aware of them. Lastly, to the extent that people are aware of mismatches they may (consciously or not) ignore them. Thus, were we to identify mismatches and the problems they explain from reasoning "forward" or "backward" only, we would inevitably miss much more of them (taking into account that researchers will not have a complete overview of memories per definition either).

In the next section we will identify and analyze detailed observations made during the study of AcademCentre. Based on our conceptualizations we have structured our presentation of the case along the following lines. After some more general and introductory remarks, we look into the ERP practices as they are represented and recreated in terms of integrated tasks. We proceed with a further overview of mismatches and problems related to the early use of the ERP system, where mismatches and problems related to the active interpretation and enactment of the practices are detailed. Next, attention is paid to training and learning in this context – where this provides an opportunity to create and modify memories. Finally, we take the continuous

[12] It is likely that one would have a similar issue with primary case data when we consider that people do not directly converse about their day-to-day ERP practices in terms of memories and mismatches.

evolving of ERP systems into account by addressing change and improvement.

5.5. An analysis of the AcademCentre case

From the various interviews that were conducted we have gained the impression that the project history can be characterized as being very well thought out, prepared in detail (April – November 2001), followed by quick focused pilot projects that were evaluated as being very successful (November-December 2001), and finally by dramatic, seemingly endless, chaos after its introduction to all the users (since January 2002) [13, 14]. The extent of the chaos during the first 7-8 months was expressed in various ways. For example, we heard of about 3 000 mistakes being registered in the database with only a third being resolved, 450 e-mails in six months from the users reporting problems, 75 "crucial" problems to be resolved, 10 to 20 technical changes/improvements per day, and finally about 300 to 400 AcademCentre employees who experienced difficulties in getting their salaries.

> "The first months were really terrible. We made inputs in accordance with our experiences and the knowledge we got from the course, but most of the time there were mistakes, and the IPA system [external Dutch Salary ICT for government organizations] did not accept the data. As a result, the employees did not get their salary. Sometimes it went on for some months. Mistakes could be very simple and unexpected, but they took a long time to search out." (Roy, Arts_HRM, personnel administrator)
>
> "Now I am sure – if they want to do something like this again in the same way – I am leaving. I really mean that! It was just one big disaster from

[13] The project being well-thought out refers to the ways in which they organized the project, installed multiple teams with participants from the various departments and so on. However, as we argue, they did miss the crucial point that the ERP introduction was more than rolling out technology, that the introduction of such an information system also brings about many changes at the individual and social levels.

[14] Or at least until our study ended in June 2003.

> the beginning. People did not get any income for three months. It was terrible and unclear who was responsible for what. Many HRM specialists became sick…" (Erik, SS_HRM, key-user)

We did not observe a 'happy ending' to the SAP_HR implementation during our six months of involvement. However, at least we know that the number of employees experiencing problems with getting their salaries had decreased from 300-400 in Spring 2002 to 60-100 in March 2003.

ERP practices: tasks and interdependencies

Let us share the story in more detail. On January 1st 2002, SAP_HR was introduced in 12 faculties and in all the support and administrative services at AcademCentre. The targeted users were personnel and salary administrators. They had to cooperate in new integrated practices. At a task level, we found that there were about 40 tasks performed through SAP_HR that can be grouped into ten sets: (1) appointment of an employee (sub-tasks concern appointment of a new employee or an external worker, declarant, intern, and those with nil-contracts); (2) modification of basic information, payment information, working time registration, and other data; (3) relocation processing; (4) promotion; (5) work time registration; (6) administration of leave (sabbatical, sick, parental, abroad with/without conservation, and pregnancy); (7) processing the optional model for employment conditions which is only in part executed through SAP_HR; (8) administration of declarations; (9) vacation allowance; (10) making HR statistical reports and information management reports (sick leave reports, and HR financial reports).

However, SAP_HR could not support some other tasks like: communication with employees (telephone calls, e-mails, sending official letters), maintaining personnel files, and administering conference/ congress leaves. Furthermore, two faculties refused SAP_HR, and kept their old personnel systems. In this chapter we leave aside questions such as: Why did these two faculties refuse

to introduce SAP_HR? For us it is important that the HRM departments from those faculties continued to send paper-based data to the salary department, and the salary administrators had to process it in the old way. This meant that the 'old' knowledge remained relevant and had to become integral part of the 'new' knowledge.

The implementation of the ERP system resulted in radical changes in the nature of task interdependence, reflecting the integrated nature of the ERP system. Instead of being concerned only with internal paperwork in the faculties, now all the inputs made by personnel administrators became interdependent with the inputs by the salary administrators, and eventually with an IPA system that is outside the organization. Additional control had to be exercised in order to avoid on-line mistakes. It should be noted that the IPA system worked in a highly structured and standardized way, and therefore would not accept incorrect or unknown inputs. Consequently, extra checks and extra controls were necessary for both personnel and salary administrators. It was decided that it was necessary to double check all the inputs made in the HRM departments. This decision was implemented in various ways. For example, in the SC_HRM, all users were equally qualified and were engaged in the same tasks and, as a result, there were no strict rules about who should check inputs – any available user could do this and was encouraged to do so. In contrast, in the Geo_HRM, the inputs went through a triple control: a user, then a key-user, and then the head of the department. In the VL_HRM, where one employee carried out all the HR administration, that person had to double check his own work.

Next, we further address the complexities of enacting the new integrated ways of working and the problems encountered with the novel system.

Usage problems and pointers towards memory mismatches

We argue in this chapter that the difficulties encountered as a result of implementing an integrated system are, to a large extent, due to the former

'contents' of the organizational memory of the AcademCentre – that is the memories of individual people in the different departments, the way the organization traditionally structured itself in the different departments, faculties and schools, and the way the processes (in particular here the administrative processes) had been organized. The new ways of structuring integrated practices were not easy to learn as the focus was only on the process memories – a restructuring of practices on a process modeling level – and did not address the need for potentially modifying or eliminating existing individual memories, supporting the development of new ones nor consider the structures surrounding the practices. The different groups of users referred to this phenomenon in a general way by mentioning "the others" who were never accurate, satisfied, or stable in their expectations of what the other groups should do with the system and so on. For example, a salary administrator said:

> "It was terrible that we had to correct inputs, and we did not have enough knowledge about the system and how to work with it. We did not even have an image of a good input, and how a correct input should look. It was very confusing for us because one month an input "A" was good and accepted by the IPA system, but the next month the same input "A" was certified as bad and rejected by the same IPA system. It was not clear what was behind the screen." (Karen, salary administrator, P-13)

These issues were compounded because users from the different units were not willing to communicate and share experiences for at least two reasons. Firstly, they did not know each other; and secondly, they had no time to communicate because of the sheer number of problems. Further, it was apparent that no-one wanted to admit actually making mistakes, they always tended to blame others. For example:

> "We try to solve many difficulties by phone with the Salary Department, but it is not always easy; our collaboration with the Salary Department could be better. Sometimes they blame us for their mistakes, sometimes the other way around. It irritates a lot, especially when you think you did your job correctly." (Lucie, Geo_HRM, key-user)

> "Sometimes it was not only technical difficulties that caused the problematic situations. Correct and timely communication is very important. Even within those groups closely related to the salary administration groups we cannot always find consensus: when anything goes wrong, everybody is sure that they did their own job well, and the problem must be elsewhere. Such communication doesn't help to improve the situation, and we might face a similar difficulty in the future." (Daniel, SAP technical administrator)

However, within the units, there were active discussions about problems with the SAP_HR administration. In the Arts_HRM unit, meetings took place biweekly, and in SS_HRM weekly. The personnel administrator from Geo_HRM described the situation as follows:

> "We worked together (Personnel Department) very well. We discussed difficulties, and helped each other with this system. We made reports about mistakes ourselves, and the key-user took them to the regular meetings. In our faculty, we are lucky to have such a strong team. During all those SAP problems we became even closer to each other." (Tom, Geo_HRM, personnel administrator)

Such interactions helped users to develop a deeper understanding of the system and modify or eliminate existing individual memories or, where appropriate, develop new ones.

Where the SAP_HR did not fit the needs of the users, as was often the case, they did not trust the new system or they failed to see any real usefulness or value in the system. As one of the users commented:

> "I think SAP_HR is a good system. You can do many things with it, but I don't need many things. For example, we have our own system for sick leave administration. The same applies to time registration, there is our internal ATREA system. This contains various special items such as overtime, working during the weekends or holidays, and evening work. It has existed for ten years already. Maybe it can be incorporated into SAP, I don't know. Therefore, I don't use the sick leave administration and time registration components in SAP_HR. I don't use the "arrangements" application. They do this in the R&O files [for personnel evaluation] and

> keep them on paper. In SAP, this would be extra work for me. Other examples of useless applications are the "previous employer" field, and the "children" and "subscriptions" fields. I don't need them." (Monique, VL_HRM personnel administrator)

As a result, employees actually kept shadow systems running, avoiding the ERP system. Subversive behavior in the eyes of management, but it is considered necessary in order to "tweak" the ERP system to the situational and contextual situation in a way that only the real process owners may do.

The interviews with the SAP_HR users have shown that an apparently straightforward technical intention – as communicated by management and consultants – tends to bring with it many social changes, which was largely unexpected by them because they had approached the project as a "mere" replacement of the old system. HRM administrators got increased responsibilities for the transactions they completed. As one of the personnel administrators noted:

> "With SAP we got extra control, and more responsibilities. We have to be very careful with all inputs. Earlier everything was on paper, but now we have to concentrate more intensively in order to avoid faults." (Roy, Arts_HRM, personnel administrator)

The new situation also required changes in the mental frames of the personnel administrators:

> "The preciseness, control and calculations were never the strongest point of the personnel specialists. Their work was not about salaries or calculations but about the personnel policies in the faculties. The SAP_HR demanded from them to be accurate and exact in filling in all the small details… That was out of their ordinary way of working. Such calculations and preciseness were more usual for the salary people." (Joost, former leader of the project)

Indeed this is one of the indicators of memory mismatches as we understand them, and the trigger for a learning process that enabled users to become more adapted to the system. We would like to observe that the formalizations prompted by the development and implementation of an ERP system can be

very problematic as people are often imprecise, informal, and to a certain extent intuitive – not mindless but more subconscious – while they are immersed in the practices as they know them. As a result, when that changes they do not always know how to adapt.

With respect to memories it is also intriguing to note that all 24 interviewees commented that they lacked an understanding of the logic of the system. The main complaints were about the lack of understanding of what was "behind the screen". They observed that it was not difficult to click the buttons, but they needed to foresee the outputs of the transactions: the connection with the IPA system which, at the beginning, seemed to be a big black box.

> "In fact, none of the project leaders realized that we – the HRMers – did not know about IPA. We had never worked with it. The end-users in their day-to-day work see only SAP screens. We were confused a lot because sometimes SAP_HR allowed us to input a number (as a code), but it was then forbidden by IPA, etc." (Lucie, Geo_HRM, key-user)

Most mistakes and their understanding became apparent through the experiences with using the ERP system, which people could not predict in advance:

> "The situation at the beginning could, in general, be characterized as one of high uncertainty – COMI-P was very quickly replaced with SAP_HR. We got a new system, and we did not know sufficiently what to do. The biggest problem, and the highest priority, was to keep to the deadlines for all transactions." (Sandra, SS_HRM, head of the department)

> "Most of the mistakes are only recognized after an employee complains. We don't know about them "in advance". People inform us about mistakes in the personnel documents or in the salary administration." (Hans, Arts_HRM, head of the department)

Another thing that the interviewees emphasized was that operating the ERP system was not easy and generally slowed them down. Again, we see that there are mismatches arising:

> Personnel numbers were linked with the family names that were, in turn, placed in alphabetical order and "if you wanted to search for a name in the system, the system gave you hundreds of people with the same names with a rather complex classification, you have to spend quite some time to find the right person." (Vivienne, SC_HRM, personnel administrator)

In this case it is a problem with classification of knowledge – an important aspect of representation – that inhibited fast access to the information.

Correcting mistakes took a lot of effort at AcademCentre. The salary administrators told us a story about changes in the salary savings scheme for the employees at AcademCentre that they had to process due to government policy. They tried to input all the changes at once for all employees but the system collapsed and they had to begin from the beginning and do it for one employee at a time. Spelling mistakes were difficult to discover and even more difficult to resolve:

> "In fact, since the introduction of the system we started getting more and more mistakes in the database. The SAP application didn't allow you go further unless you left the existing mistakes." (Hans, SC_HRM, head of the department)

Sick leave administration required processing the same transactions in several sub-fields and all appointments of an employee required additional time:

> "I would like to work out the information about one person only once without wasting time on the same administration steps several times!" (Betsy, SS_HRM, personnel administrator)

> "If a person stopped working, I had to go through all his/her information fields to cancel them: salary, using the train card, and CAO à la carte. It didn't block them all automatically." (Monique, VL_HRM, personnel administrator)

Many interviewees shared the opinion that the system did not improve their task performance.

> "I think the results of using SAP_HR were not that enthusiastic. We didn't perform quicker or better. In my view, we even started providing fewer reports than before. For example, earlier I could give the

> management prognoses about financial costs until the end of the year (with COMI-P). But now I am not doing that." (Sandra, SS_HRM, head of the department)

The users also doubted the reliability of the information in SAP_HR. For example, a year after the introduction, a user

> "discovered a very big mistake. If a person worked for the company in different departments (part-time), he/she got double all premiums: personnel administrators made inputs independently, and the system thus doubled the amount. It was difficult to estimate the financial losses of this situation over the whole year." (Vivienne, SC_HRM, personnel administrator)

The interviewees gave us other examples of when they discovered mistakes in the output reports from SAP_HR such as wrong totals of sick employees or new workers. This made them question the quality and reliability of the output information in general.

One of the personnel administrators described her attitudes towards SAP_HR as follows:

> "In April 2002 I started to hate the system and working with it. I had a feeling that everything I did went wrong, and that it was all about salaries and bonuses." (Monique, VL_HRM, personnel administrator)

The interviewees highlighted several mismatches between their traditional way of working and the "SAP" situation:

- CAO à la carte [the collective labor agreement of Dutch universities] was executed partly in SAP_HR, partly in another automated system, and partly manually.
- Administration of declarants required special tricks to be utilized in order that they were processed appropriately:

  "You register him/her on date 'A', however we cannot pay the salary from that day but only from later. You have to do special tricks in the system in order to get the salary on time" (Lucie, Geo_HRM, key-user).

- The system did not recognize the difference between two types of professors, and that again required adaptation of the system from the users.
- The system could not cope with transactions if they were input immediately one after another. The users usually had an additional schedule for 'on-going' transactions.
- All transactions that were sent to the Salary Department were held for about two weeks. During that time, any personnel administrative processes concerning an 'unlucky' employee were blocked in the system.
- If an employee had multiple appointments (part-time) or 'jumped' from one unit to another (on a project basis, for example) then, each time, the system created a new personnel number for that employee. As a result, a SAP_HR user could be faced with the same employee name ten times over without knowing 'which one' was really active.
- The VL_HRM had their own IT for sick leave administration that required working with two different systems.
- The codes for salary administration in SAP_HR and in the IPA system were different, and this again called for adaptation.

According to the heads of the HRM departments, one result of the introduction of the system was significant damage to the image of the HRM departments in the units:

> "The most awful result, in my view, was that during the first months of struggling with the system, the HRM department lost its good image in the faculty. All the credit that we had built up through our good work for the employees was lost. We were already trying to achieve the grander HRM goals such as improving situations in different departments and social issues. We achieved this from a stable base: good and reliable administration of the personnel data and salaries. It was a very pitiful situation, having attained a higher level, to find the basis – the salary administration – destroyed and the rest becoming irrelevant…" (Andre, head of the Arts_HRM)

In the following subsection we will consider the role of training and learning in more detail. As we have noted above one of the functions of training and learning is the modification, elimination or creation of memories to support the modified or new processes that are required by the ERP system.

The role of training and learning

Let us look into the training that took place at AcademCentre. Before SAP_HR was introduced, the consultants provided employees with a course about the system. Interviewees were all of the opinion that this was not sufficient and did not give any idea about actually using SAP_HR. They recalled that they were instructed only how to 'click the buttons', but lacked knowledge about the main principles of SAP, its connection to the IPA system, and the outcomes of incorrect inputs. In some situations, during the course, there was only one PC available for three learners. The content of the instructions also seemed to be unrealistic:

> "During the first day of the course they explained to us how to click the buttons but it was too simplistic. The second day was a bit better - about the administration of basic employee appointments. But, in reality, all the appointments include so many special details and different personal situations that when I came to do the work, I felt lost with my limited knowledge from the course." (Marijke, Arts_HRM, personnel administrator)

> "We had a training course on how to use SAP_HR, but it was not enough. It was too short and mostly related to the technical characteristics of the system, while we needed explanations about what to fill in, why, and when. Immediately after this, from January 2002, we had to work with the full responsibility of the new system". (Roy, Arts_HRM, personnel administrator)

> "The training course was too complex for us. It was quick but not efficient. I did not have a clue about how to make inputs, or where, or why. We did not practice with the system. They decided to introduce it and let us learn from the experience. But, in such a case, you need highly

> qualified teachers. In my view, the reality was far from this." (Erik, SS_HRM, key-user)

The course was not oriented towards the specific individual situations of the end-users, but had a general content. A personnel administrator from the VL_HRM emphasized that:

> "They gave training about SAP use. I cannot say that it was a very fruitful session. We, the users, are very different. For those who work eight hours a day with SAP there was a need for advanced skills and knowledge. But I only work with the system for two hours per week, not more. It makes things different! My questions may seem quite basic for the advanced users but I am not a computer person at all." (Monique, VL_HRM, personnel administrator)

Our document analysis has shown that there were about 40 manuals and sub-manuals. The interviewees stated that these were not helpful and, in particular, they were too long. Nobody could find time during their usual working days to study these SAP_HR "encyclopedias". The first "good" manual was released on CD in July 2002 (half a year after SAP_HR's introduction), and the best in February 2003 (a year after its introduction). Both manuals were the joint product of the salary and personnel departments. In some units, employees developed internal instructions.

However, we did not discover any special on-going education, or courses, for new employees. Moreover, we did not find any arrangements or agreements about instructing new users in SAP_HR: those who joined after the introduction of the system had to learn it from their own on-the-job experiences. What did happen was that almost weekly the system administrators would send e-mails to all the users detailing the discovered small tricks – such as how to handle SAP_HR and the IPA system. Some of the users didn't read them (relying on the key-users), some printed all the notes and put them on their whiteboards and tried to memorize the latest news.

Clearly, the training provided was not at the appropriate level. It did not facilitate the modification, elimination or creation of new memories. Such

outcomes are only likely to occur when individuals are actually engaged in enacting the process themselves or realistic simulations of them.

Improvement efforts

We did not find any policies or arrangements for recognizing improvements in performance of the users of the system. In all units, during the departmental meetings, they discussed "bad" cases in the use of SAP_HR – i.e. when employees did not get their salaries. In addition, reward schemes did not exist to provide incentives for improved performance or compensation where the system reduced their productivity. In the units, the heads of the departments, on their own initiative, financially rewarded users for their troubles with SAP_HR. However, we did not discover initiatives to reward the users from the project team, or from 'top' managers.

> "We never got any feedback from the SAP_HR project team – no encouraging comments, enthusiastic letters, or feedback notes during key-user meetings. No financial support for our troubles. But our direct boss, the head of the P&O department in the faculty, paid us special bonuses to compensate for our hard work with SAP." (Lucie, Geo_HRM, key-user)

The implementation essentially challenged users to try and work around the system in order to cope with all the errors that emerged. Users tried to get the senior management to improve the system, suggesting many improvements for the system and its usage, like:

- using the numbering scale for employees (to put the names in alphabetical order)
- regular meetings about working with "Query" and possible reports
- generating an error message instead of sending e-mails to each other
- the introduction of a mailing list for all users
- employing strong IT professionals in the project team
- composing a sub-manual about the registration of maternity leave
- special registration of ADV hours (reduction in working hours)
- separate registration of the basic specialization of employees

- registration of the division of working hours between teaching and research
- integrating dates about reports on extended sick cases

These ideas were discussed during the key-user meetings, but only two of them were implemented – arranging regular meetings about the "Query" module, and writing an additional sub-manual about maternity leave. The members of the project team commented that they were restricted in improving the system by SAP's functionality:

> "It is a standard system. You may make improvements within its functionality. However, if you overrule the system and build additional functions on top of it, you will lose support from the supplier. That's why we have to be careful." (Erika, SAP administrator)

In this section, we have provided a rich account of how practices have been reconstructed in the context of AcademCentre. The introduction of its ERP system has been considered particularly problematic. We have explored a set of problems that relate to what we have termed 'memory mismatches'. In the next section we elaborate on our findings.

5.6. Discussion of the results

In our conceptualization, we have described that ERP practices are reconstructed within adopting organizations through processes of representation and re-creation. These processes are likely to involve memory mismatches, that is, conflicts in the memories that are used for interpreting and enacting the ERP practices. We conjecture that the memory cmismatches are important mechanisms that uncover the ways through which employees enact ERP practices. They thus provide an important linkage between the actions and cognitions involved, helping us further explain knowledge-related problems inherent in ERP practices. In a similar way to the way systems failures often provide a rich analytic basis for understanding the functioning of complex systems, the concept of memory mismatches allows us to analyze

and thus articulate these processes of representation and re-creation of ERP practices.

Our empirical analysis has been limited to the re-analysis of the AcademCentre case study. There are two major limitations to this approach. First, the case study is to a large extent retrospective, certainly in respect to the implementation and initial use of the system when a lot of the problems were experienced. In the future, it would be preferable to conduct a 'real-time' longitudinal study to capture the situation as it develops. Second, the original study has been conducted from a different theoretical approach (group learning). It means that we have been unable to study AcademCentre's web of memories in the full detail that is suggested theoretically. It is appropriate to assume that more mismatches arose than we have signaled from the available data. However, our material has still provided us with ample examples of mismatches and helps us to elaborate our mismatch approach for understanding the reconstruction of ERP practices. In addition, we acknowledge that the discussed ERP experiences at AcademCentre did not entail a 'full-fledged' version of such a package, but rather focused on the HRM functionality. Though the university did not implement a system with more elaborate functionality as common in business organizations, management did intend to make use of the ERP system's standardization and integration capabilities. We would suggest that an extended ERP package (also in relation to trends like supply chain management and customer relationship management) means that the complexities with ERP practices and associated memories become even greater and likely more problematic.

Understanding ERP practices as organizational routines directs us towards considering the role of tasks and task-interdependence, or integration. Our analysis implies that to achieve the introduction of an integrated and standardized system as envisaged by the ERP vendors and consultants is difficult – if not impossible. The case shows that management and users were unable to reconstruct the practices that are consistent with the ERP system because they did not have a pre-defined idea of the ways in which the system

could work for them. It would appear that management determined that they could not afford a failure of the project and avoided at all costs to tamper with the SAP methods. Thus, there was little understanding of the likely changes in the relationships between departments or the consequences of actions undertaken by one department on another. Such understanding, arising out of practices becoming re-embedded and new relationships becoming understood arose only after implementation and often only within the groups that we identified in the case. In other words, they did not have the memories of an integrated view – as their way of operating was very departmentally focused and had never been seriously challenged before.
The difficulties in integrating a new way of thinking with old memories thus becomes very clear in this case and in our opinion it provides an instructive lesson as about how (not!) to re-contextualize systems when they are implemented. Our theorizations imply that it is not merely a question of "task-fit" that the ERP system should be able to provide. Where users lack the required understandings, where they have difficulties in knowing how to provide the correct inputs, and how they are dependent upon each other, we see that diverse memories can play a role. Not only individual ones, but also knowing that is represented through group mindsets, and processual or structural aspects of the organization.

It is clear that individuals need to be actively involved in the recreation or reconstruction of the practices that they will subsequently participate in. However, participation is often limited to a select group of so-called key-users. As a result processes are likely to be enacted with an unpredictable combination of 'old' memories and 'new' memories which are likely to lead to unpredictable outcomes. This arises as a result of the emerging nature of these complex interactions of networked memories. Knowledge and understanding in enactment and habituation of practices is essential, but it becomes a real challenge for users to form such new memories. Limited knowing, especially together with little user participation, may likely become a source of mismatches when the ERP becomes in use. In our case we have

described several major problems that arise from organizational memory mismatches, as for instance the payment of salaries.

Where an ERP system brings with it stress, greater responsibilities, and uncertainty in making inputs, we have seen that this stimulates negative interpretative schemes about the technology among the users. At AcademCentre they did not want to invest a lot of effort and were disappointed by the technology. Right from the beginning, the users perceived the system as not being worth learning and worse than the previous technology. These negative opinions increased daily as the users collected and accumulated disappointments, including small details and misunderstandings with the project team. Even after eight months of using SAP_HR, they still perceived it as difficult to understand, difficult to work with, and had difficulty learning new applications. In addition, mistakes were difficult to find and correct in the system as its logic was not clear, especially with respect to its connection with the IPA system. The increasingly negative image of the HR departments, due to the problems with SAP_HR, contributed to the poor attitudes of the users towards the technology.

This also brings in the question as to how emotions play a part in the process, as for instance mentioned by Boudreau and Robey (2005) and Vaast and Walsham (2005). We agree with these researchers that this is an interesting area for further research. Indeed, since ERP methodologies are often very rationalistic they tend not to recognize the role played by emotions or provide any good advice as to how to deal with them. In particular, our work provides interesting input for establishing a further understanding how memories and emotions are linked. To the extent that mismatches imply that people have inadequate or lack of understanding of the new processes, mismatches may be understood as an important source of emotional stress. In addition, we are concerned with the potential impacts of mismatches on the identity of individual departments and the attitudes of others to these departments. We are aware that the self-identity of departments may be modified and potentially weakened as a result of memory conflicts. In addition, memory

conflicts may result in negative emotions being directed towards departments that are seen to be instrumental in creating these memory conflicts.

Another area of concern relates to training and learning. We see that the 'push-button' approach to training is not adequate to form the appropriate understandings of the ERP practices and integrate those with the 'old' memories. This type of training does not help to 'see the logic' behind the system, and in particular fails to convey a realistic comprehension on how the practices are integrated. Experiential learning could be an interesting alternative approach that realizes such learning outcomes.

At AcademCentre, improvement efforts that were initiated by users were mostly ignored by top management as they considered that the ERP system should be kept as unmodified or standardized as possible ("vanilla"). Though this makes sense when we consider the difficulties with customizations (e.g., costs, updates), it becomes problematic when at the same time management strongly opposes the workarounds and "tweaking" that turn out to be necessary to accommodate for working practices. This is also reflected in the fact that experiential learning – which could be used to circumvent ways for dealing more successfully with the ERP system – is generally ignored as a possible solution, adapting to the emerging nature of mismatches. Rather than considered to be examples of sloppy or inaccurate working, these mismatches could be a source of ideas and inspiration for change.

Where we have established an initial examination of the role of mismatches in reconstructing ERP practices, we recommend that future research focuses on furthering our understanding of the discussed issues and threads, developing this conceptual work into a pro-active approach. Such an approach would obviously need to be based on more insights as to how mismatches may be dealt with appropriately. In that respect it makes sense to further classify mismatches where different types are expected to benefit from different coping behaviors.

5.7. In conclusion

This chapter added to the continuing narratives about Enterprise Resource Planning systems a story that demonstrates the extent to which the introduction and use of ERP systems can be a discombobulating task. The suppliers and consultants sell the packages based on the 'fact' that they enable organizations to implement a set of integrated standardized practices that support the improved (or optimal) functioning of the organizations. However, the same consultants rarely explain the difficulties that are associated with the implementation and use of such systems, nor do they take appropriate measures in their project and program set-up. Indeed, top management at AcademCentre thought they could easily replace the existing system with the proposed SAP_HR system.

We conclude that the recognition of the importance of organizational memory and organizational routines allows for us to focus our analysis and discussion at the level of practices. We have thus focused our theorization in this chapter on the integration of old and new memories in order to support new practices and, where necessary, provide continuing support to existing ones. We have demonstrated how memory mismatches may lead to significant problems and uncertainties in implementing practices. In addition, we have suggested that such mismatches may also be indicative of the need to modify standardized practices as embedded in the ERP system. Finally, failure to consider the importance of organizational memory, and, in particular, individual memories, can lead to significant problems in the use of complex information systems.

ERP systems bring with them many preconceptions and representations of what organizational practices should look like. However, there is often (as with many other prescriptive technologies) a disconnect between what you intend to bring into the organization, and what one is actually able to enact and re-enact in the organization. In addition, there is likely to be a 'gap' between the rational explanations of how practices are enacted and the actual enactment of these practices. This 'gap' is typically filled with less rational and social aspects of enactment that are also embedded in a web of people, structures (social, physical, and technical) and memories.

We have attempted to give a more detailed picture of how "knowledge" does not stay abstract and it is necessarily contextualized. Such contextualization may be informed by memory mismatches which also play a key role in the development of individual understanding. In particular, we have discussed the way people tried to learn how to use the ERP system in order to be able to interpret and enact the new practices. We have related this to training issues, in terms of the 'push-button' approach to training and the use of manuals. The need to contextualize knowledge with respect to organizational memory makes it important to recognize that both individual learning with the social learning play a part in the successful implementation and use of complex information systems. We also need to ask questions regarding the nature of the material that is used for the training. It seems clear that when users are trained to work with a new system they should be provided with as 'natural' a setting as possible that reflects the practical situation, in the form of experiential learning. Such an approach to training is likely to lead to the modification or elimination of existing memories and the creation of new ones in ways more consistent with the enactment of the practices embedded in the new system.

In all new implementations there is an intriguing question as to how to integrate old and new memories and how to enact new practices based on interpreting these memories. Our study resonates with the work of Boland and Tenkasi (1995) on perspective making and perspective taking, stressing that the diversity – in our terms mismatches – is both sometimes problematic and also the essential source for further improvements.

> "The problem of integration of knowledge in knowledge-intensive firms is not a problem of simply combining, sharing, or making data commonly available. It is a problem of perspective taking in which the unique thought worlds of different communities of knowing are made visible and accessible to others. Making explicit representations of one's knowledge and understandings to exchange with others enables one to better appreciate the distinct ways of knowing that those others will attempt to communicate. In order to integrate knowledge through perspective taking, communication systems must first support diversity of knowledge through the differentiation provided by perspective making within communities of knowing. Only after a perspective is differentiated and

strengthened can it be reflected upon and represented so the actors in other communities of knowing have something to integrate through a perspective taking communication." (Boland & Tenkasi, 1995, p. 359)

5.8. Acknowledgements

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6. Investigating ERP systems through a 'lens of memory'

What's in a name? That which we call a rose
By any other name would smell as sweet,

William Shakespeare, *Romeo and Juliet*

6.1. Abstract

In this chapter we present what we have called a 'lens of memory' perspective which we use to investigate ERP systems when they are implemented and used in organizations, particularly focusing on exploring how such a lens can be used to explain memory-related issues. We postulate that memory mismatches are an interesting way to articulate and explain problems that arise due to the fact that the memories involved have an inherent degree of "mismatch". We elaborate our conceptualizations empirically with our investigations of an ERP introduction at a Dutch manufacturing company. From a practical perspective, our 'lens of memory' perspective sheds additional light on a variety of important issues such as the role played by shared language and understanding, training and learning, workarounds, and change during the implementation and use of ERP systems. Our findings suggest the urgent need for a critical reappraisal and reinterpretation of the current principal approaches to ERP systems implementation and use. In contrast with these approaches, our 'lens of memory' perspective emphasizes the importance of concept learning and hands-on experiential learning rather than 'push-button' training; it sees workarounds as enabling the enactment of sustainable routines rather than as subversive behavior; and it aims to support reflexive questioning, learning and change during ERP system use. We argue that memory mismatches are not only indications of problems but are also pointers towards necessary adaptations that are likely to result in improved performance and organizational flexibility.

Keywords: Enterprise Resource Planning, ERP systems, organizational memory, memory conflicts, mismatches.

6.2. Introduction

Particularly since the mid-nineties, Enterprise Resource Planning (ERP) systems have been introduced in many organizations around the world. By focusing on increased standardization and formalization of internal

administrative and logistic processes such as finance, human resource management, and materials management (nowadays also complemented with more externally focused functionality like customer relationship and supply chain management), organizations have sought to capture the benefits proposed by these complex information systems such as more efficient business processes, cost reductions, improved steering and control, and improved information and communication (Beard & Sumner, 2004; Davenport, 2000; Gattiker & Goodhue, 2004; Klaus *et al.*, 2000; Trott & Hoecht, 2004). In addition to the suppliers of these ERP packages other third parties, as, for example, consultants who assist with the implementation process, and application hosts (or application service providers) to whom the package may be outsourced become involved during the implementation and use phases respectively.

As a result of the significant investments that have been made in ERP systems and the continuing need to improve business results with them, ERP systems remain a highly relevant topic of interest and inquiry for practitioners and researchers alike. Indeed, the general question as to how we may develop, implement and use ERP systems efficiently and effectively, to improve our business and gain competitive advantage, still has not lost its relevance and, therefore, there is a continuing need to further our understanding of the difficulties with ERP implementation and use.

In this chapter we propose what we have termed a 'lens of memory' perspective to further investigate ERP systems, focusing on memory-related issues associated with their implementation and use. Many ERP studies have suggested the importance of adequate knowledge, communication, and proper training or learning (Al-Mashari & Al-Mudimigh, 2003; Alvarez & Urla, 2002; Davenport *et al.*, 2004; Markus & Tanis, 2000; Sarker & Lee, 2003). In turn, several studies have adopted a knowledge-centric perspective for their subsequent investigations (Hislop *et al.*, 2000; Jones *et al.*, 2006; Ko *et al.*, 2005; Kraemmerand *et al.*, 2003; Lee & Lee, 2000; Lengnick-Hall *et al.*, 2004; Newell *et al.*, 2004; Robey *et al.*, 2002; Van Stijn & Wensley, 2001;

Wagner & Newell, 2004). For instance, Ko et al. (2005) have investigated the knowledge transfer between consultants and clients in the ERP setting, analyzing a combination of communication and motivational antecedents. This type of knowledge transfer is particularly relevant as consultants are often hired to guide the implementation process. Other researchers also address the topic of knowledge integration and learning in the ERP setting (Newell *et al.*, 2004; Robey *et al.*, 2002). Where some researchers look at the cultural level of knowledge, we theorize about both the social and individual levels as they dynamically interact in the processes of ERP system implementation or use (Jones *et al.*, 2006; Wagner & Newell, 2004). Hislop et al. (2000) describe how the interactions of people in networks, and the relative power they are able to exert, cannot be seen apart from the knowledge present in the network and how knowledge sharing takes place during the implementation of an ERP system.

We build on and elaborate prior research by addressing how it is difficult to represent practices, learn how to work with them, and how workarounds and learning can form an important source of on-going improvement and change. Centrally, we also build upon work that highlights the diversity and conflicting nature of memories and how this can lead to memory mismatches (a term that we use to refer to situations in which individual or organizational memories fail to be consistent or coherent) (Van Stijn & Wensley, 2001; Wagner & Newell, 2004). We emphasize the nature and content of individual and organizational memories and their interactions with ERP systems and ERP-related organizational practices. In particular we are concerned with the manner in which the implementation and use of such practices make use of individual and organizational memory. This allows us to explore and explain memory-related issues relating to the implementation and use of ERP systems through what we have termed the 'lens of memory' perspective.

Whereas, in the past, researchers have dealt with questions as to how new knowledge is transferred, shared, and integrated with existing knowledge in the setting of ERP systems, such investigations have provided only a limited

understanding as to how difficulties arise from the fact that such knowledge is often diverse, ambiguous, vague, unshared, or indeed conflicting, and how this influences the ways in which people are able to construct and reconstruct the practices represented by ERP systems when these practices are re-contextualized during implementation and use.

In this chapter, we specifically raise the question as to how we may make use of the 'lens of memory' perspective as an explanatory tool in a retrospective case study of the introduction and use of an ERP system. We address the role that memories play throughout the introduction and use of an ERP system and the parallel role that the implementation and use of ERP systems have on the creation and interpretation of memories. In particular, we focus on how the enactment of such roles may result in memories that conflict (memory mismatches). Thus, our lens, with its focus on the interpretation and re-interpretation of memories, yields unique insights into cognitive aspects relating to the implementation and use of ERP systems In addition we seek to renew interest in other more generic discourses as, for instance, those relating to the representation of practices, the role of consultants, the questionable nature of shared languages, and issues concerning training and workarounds. Additionally, our theorizations are informed by insights derived from our case study of Electro, a small electronics firm in the Netherlands. Our findings demonstrate several practical issues that, in our opinion, present challenges to mainstream thinking about the implementation and use of ERP systems. Our approach also provides a starting point from which to further understand the connected nature and dynamics of the set of problems we describe below.

In the remainder of this chapter, we first address our theoretical approach as framed in our 'lens of memory' perspective. Next, we introduce and discuss our case study and research methodology. Then, we examine the Electro case in further detail and follow this with a discussion of our findings. In the final section, we present our conclusions.

6.3. Conceptualization of the 'lens of memory'

In this section we describe the principal concepts that constitute our 'lens of memory' as depicted in Figure 6-1. We would argue that memories cannot be considered independently from each other. They exist in different networked 'webs' of interrelated and interacting memories. Also these 'webs of memories' further influence and are influenced by current experience. We focus here on experiences that are in particular related to the ERP practices. Such experience, to the extent that it involves engaging in direct action with or action mediated through a technology, shapes and is also shaped by associated memories and the technology.

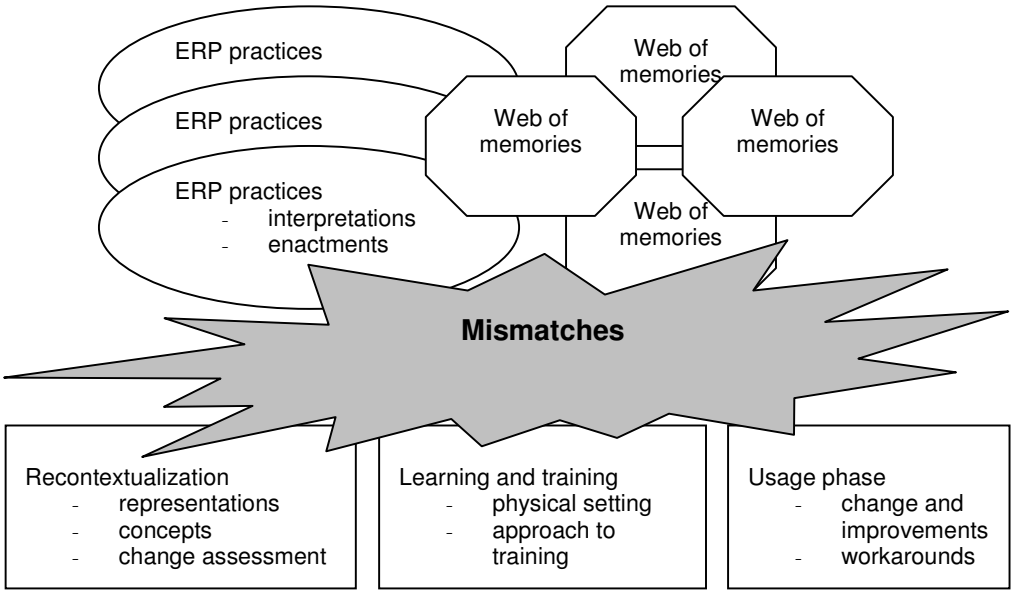

Figure 6-1. Constructing our 'lens of memory'

Interacting and interrelated webs exist across a number of memory 'structures' or locations. Table 6-1 provides an overview of these locations. Rather than investigating all aspects of memory webs in the following sections we will highlight several of the problematic areas in relation to the

implementation and use of ERP systems and subsequently link these to our case data.

Locations	Memories
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
Information Systems	Planning and decision systems; process control systems; GroupWare; computer aided design systems, memory-based systems; administrative systems
External	Client and market characteristics; competition profiles; list of "memory-able" people and organizations; technology of competitors

Table 6-1. Various memories and locations (Wijnhoven, 1999, p. 160)

Memories are seen as essential in understanding and interpreting practices and they form the basis for their enactment. Feldman and Pentland (2003) distinguish between the ostensive and performative aspects of organizational routines, as they state:

> "The ostensive aspect is the ideal or schematic form of a routine. It is the abstract, generalized idea of the routine, or the routine in principle. The performative aspect of the routine consists of specific actions, by specific people, in specific places and times. It is the routine in practice. Both of these aspects are necessary for an organizational routine to exist." (Feldman & Pentland, 2003, p. 101)

In a parallel fashion we distinguish between the performative and ostensive aspects of practices. Thus, we may state that the ostensive aspects of ERP practices cover the ideas, models and other representations of ERP practices

whereas the performative aspects deal with the actual enactment of the practices with the ERP package in place.[15]

Conflicting memories have been described in terms of organizational memory mismatches. Those refer to disparities between organizational memory contents implied by ERP practices and related memories, such as individuals' memories, and memories "located" in organizational structure and culture, i.e. they arise when memories at different "locations" are missing or in conflict with each other (Van Stijn & Wensley, 2001).

For example, consider the ERP project at Big Civic, a British university who partnered with a supplier to develop additional ERP 'best' practices and to adapt software functionality for the "higher education industry" (Pollock & Cornford, 2004). Mismatches arose with respect to for instance students and how they needed to be conceptualized. The supplier as well as other partners in the network had different memories of what constituted a 'student' and it was difficult (if not impossible) to reach a consensus understanding. Added to that, within the ERP system a 'student' was, also because the modules were 'reworked', for instance sometimes conceptualized as a special type of employee. That meant within the system the student could be registered for training (teaching) and for renting a room. However:

> "University staff rejected this conceptualization pointing out that it did not capture the complexity of the student-university relationship: at some pilots, for instance, students do not 'rent' rooms but receive accommodation as part of wider aid packages." (Pollock & Cornford, 2004, p. 45)

[15] We acknowledge that organizational routines are distinct from practices, though they are closely related. However space does not permit us to closely analyze the similarities and differences between organizational routines and practices. The key suggestion that we want to make here is that recognizing the roles of both interpretations and enactment deepens our understanding of the relationships between ERP practices and the webs of memories.

Thus we may say that during implementation and use, interactions take place between people, the ERP system, and a variety of webs of memories. These webs are likely to evidence inconsistency, incoherency, incommensurability, and conflicts. Distinguishing between the ostensive (idea) and the performative (enactment) aspects of routines helps to remind us that part of our conceptualizing of such 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). Identifying these mismatch 'pathologies' is itself a challenging research task. Additionally, we stress that some are actually valuable sources of alternative perspectives, adaptation, and creative tension, whilst others are genuinely dysfunctional.

To understand how we are able to act in any situation requires understanding how we pay attention to some memories and ignore others. 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. There are likely to be many different process models that co-exist and that need to be made sense of. People may have difficulties with understanding the "de-coding" and "re-contextualizing" of business process models. Because these process models are abstract and codified, and because they tend to describe complex processes in detail, it can be difficult for people to match them with their understandings of the situated processes they are enacting. An added problem is that people may not be able to grasp how changes that are made to old processes will actually affect them in their day-to-day work. That is, it may be difficult to translate changes in the way in which processes are modeled into changes in the way processes are actually enacted.

Indeed, an implication of the diversity of memory and certain knowledge "asymmetries" and knowledge inconsistencies that exist among people is that

they are often unable to fully understand and anticipate how an ERP system which has been implemented 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)

This is particularly true of understanding interconnectedness and the integration of processes, especially when people in the organization have not been working in a "process oriented" manner before the introduction of the ERP system and its attendant integrated processes. 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).

From our perspective on memories that reside in a variety of locations and interact in diverse ways, it is interesting to investigate some of the material aspects of ERP implementation and use. For instance, physical setting may contribute (or fail to do so) to the learning process, assist in shaping memories of users or inhibit them to gain the necessary understanding of the package, concepts and integrated nature of ERP practices. In addition to a 'push-button' approach towards ERP training, it can be important to stage training in the form of experiential learning and learning-by-doing, in a more 'natural' setting. Understanding physical settings as a 'locations' in the webs of memories helps to appreciate that they can play an important part in enabling or disabling the shaping and re-shaping of memories that are foundations for the representation, interpretation, and enactment of practices associated with

the ERP system, precisely because these settings themselves provide a source of interrelated and interacting memories and enable the interpretation and reinterpretation of practices.

> "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)

Another thread that relates to the materiality of memories is explored by Bechky (2003). In her case study of the production work she describes that often physical objects were used to define and clarify problems in situations where the abstract engineering drawings or users' explanations were much more difficult to use or understand. This may be related to the difficulties people seem to have with understanding ERP process models, how to integrate this new understanding with their understanding of pre-existing processes and recognizing what changes are necessary in order to transform the pre-existing into the new.

We are further concerned that however information systems and their routines are initially developed, shared understandings are seldom transmitted to the actual users of the information system. As a result users develop their own understandings and ways of interacting with the system. Rarely do researchers investigate the ways in which users are forced to dynamically interpret the system and routines in order to enable them to interact and enact specific practices successfully. Indeed, even the concept of the

successful enactment of a specific practice would seem to admit of considerable complexity – successful for whom, successful once-only or successful on repeat performance, and so on.

Actually, it strikes us that, as we perform ERP practices and interact with ERP systems, our individual conception and our understanding of them becomes richer and more nuanced. Our performance of practices results in cognitive adaptation which, in turn, may result in practices being modified and adapted. Repeat performance of practices may result in the routinization of all or part of the practice. In order to deal with the associated complexity we often rely on making use of informal mechanisms such as story telling, training by example and so on (Bechky, 2003). In the context of ERP systems, the flexible enactment of the new practices in terms of workarounds is of particular interest. These workarounds are a source of variety that allows for the enabling of "going on" with the practices, their routinization, as well as for the development of new practices.

> "Senior managers tend to exert pressure on subordinates to use the software package for their daily office work (if the employee, on whom the pressure is being put, does a job that requires ERP package usage). Users who would benefit from using ERP are not given the option of choosing whether or not to use the ERP system. Bypassing ERP is not an available option regardless of any inadequacies in the ERP system. Given the high costs of changing software, most organizations use 'workarounds' to customize the software." (Bagchi *et al.*, 2003, p. 150)

This 'customization through workarounds' sounds useful, but it appears that a negative attitude towards workarounds prevails. Workarounds are often seen as subversive behavior as they form a threat against the standardization and formalization efforts of the organization. In the following discussion we raise some considerations to rethink this approach.

In this section we have introduced our 'lens of memory' perspective. Our perspective addresses the role of individual and organizational memories as they exist in networked webs that relate to each other and dynamically interact with each other. In the context of ERP systems implementation and

use, we have further addressed that these memories are necessary to re-contextualize and learn to work with the ERP practices, and subsequently to interpret and enact these practices on an ongoing basis. Centrally, we have proposed to view memories from the premise that it is in their nature to conflict or mismatch. Our theorizations suggest how such mismatches may be problematic. We propose the 'lens of memory' perspective here to develop further understanding of the character and role of mismatches in the implementation and use of ERP systems. Furthermore, we use our lens to establish themes that – to the degree that they have not been ignored – hitherto have not been treated in the unifying manner that the 'lens of memory' perspective seeks to do. Next, we discuss our empirical-based elaboration of this perspective and further explore how our lens may identify and explain memory-related problems in relation to our study of Electro.

6.4. Methodological background: the Electro case

We start with the introduction of our case company. Electro is an SME (about 100 employees) located in the Netherlands which produces printed circuit boards (PCBs) and Customer Specific Products (CSPs). The company has a subsidiary referred to as ElecSubCo here that produces and sells emergency lighting products. Electro's revenue totals 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 involved the introduction of an ERP system, SAP R/3. That project started June 2000, with the system going live in December 2001. The functionality focused on processes related to Sales & Distribution (SD), Material Management (MM), Planning & Production Control (PP), and Finance & Controlling (FI/CO).

The primary goal of our case research was to get a rich picture of how different people interpreted the endeavor of ERP implementation and use and the role of memories therein. Our research adopts an interpretive stance, where our focus lies on people's meanings, interpretations, codifications,

significations, learning, communicating, etc. (Klein & Myers, 1999; Schultze & Orlikowski, 2004; Walsham, 1993). Multiple iterations, various discussions, earlier writings (international conferences), and extensive literature study throughout the research process, together lead to our description of the memory lens perspective and the conceptualization of ERP systems, ERP practices and memories, and memory mismatches presented in this chapter.

Our study of Electro's ERP introduction took place in October 2002. After an initial interview with the chief of operations, all project documentation was made available and arrangements were made for interviews with 10 of the 28 current users. The documentation consisted of such material as project plans, minutes of meetings, blueprint designs, training material, and issue lists. The 10 users represented members of the steering committee (2), key-users (5) as well as end-users (3) from the implementation process. As Electro made use of an application host (PCCons), they did not establish a separate IT department, so no IT specialists were interviewed. Interviews with key-users and end-users averaged 1 hour each, the 2 members of the steering committee were interviewed together for approximately 1 ½ hour. The interviews were captured in extended notes. All material used in this chapter has been translated from Dutch by one of the authors. Before the interviews took place, the available documentation was studied in order for the researcher to become familiarize with the setting and to pre-structure the interviews. The interviews were structured primarily to address the different phases of the implementation process as well as the go-live and in-use phases. Where some gaps in the documentation were apparent, additional questions were asked in order to provide clarification. Though we did not have the opportunity to study Electro longitudinally, the interview subjects' experiences from both before and after ERP system introduction were solicited.

With respect to the analysis of the data, we have followed what may be termed an 'inside-out' approach. On the one hand, we looked at "memory instances" where we could reason from the associated memories towards

mismatches and problems. On the other hand, we also analyzed "problem instances" to see whether and how problems were related to mismatches and memories. We considered this two-pronged approach essential for two main reasons. One, the nature of memories and subsequently mismatches is such that to a certain degree, they are invisible or unseen, and impossible to elicit. Thus, it is also important to look at the "problem instances" to at least aim to capture those mismatches that are considered to have a problematic nature. Second, people are less accustomed to talk about memories, and they are, as mentioned above, to a degree unable to articulate them. However, people are very much problem-oriented and much of the interview data provided ample detail of problems with both the ERP system implementation and its daily use. These memory-related problems have subsequently been illuminated by aspects of our 'lens of memory' perspective.

We acknowledge two key limitations here. First, the case is a retrospective reconstruction of what has already occurred rather than a longitudinal "real-time" case where the researcher has lived in the situation and conducted the research while the implementation and use phases were in progress. Furthermore, participants in the process were not interviewed on multiple occasions nor were they observed at work, before or after the implementation, to actively see how they interpreted and enacted ERP practices. Future research could benefit from parallel longitudinal studies that investigate the processes of change in accordance with ethnographic, interpretive, and action research. We also acknowledge that Electro primarily focused on internal ERP processes. We would like to note that the issues we raise with respect to ERP practices and webs of memories become both more significant and also more complex where ERP systems span organizations and practices become inter-organizational (Kumar & Van Hillegersberg, 2000).

In the next section, we narrate the story of Electro's choice, development, implementation and early use of an ERP system.

6.5. An account of Electro's SAP R/3 endeavors

We have structured our narrative as follows. First we look at the high-level objective and chosen focus of the ERP introduction. Next, we talk about how the key-users together with the consultants engaged in a process of re-contextualization of practices that were codified in the chosen ERP system. We further discuss issues that were encountered in representing the new ERP practices and the ways in which it was difficult for people to understand new concepts. One overall 'concept' referred to the integration of processes through ERP. We address this in relation to the training that took place before the system went live. Then we shift to the use phase of the SAP R/3 system, where we talk about change and improvement efforts and highlight experiences with workarounds. After this account, we provide a discussion of the findings in which we also pay attention to the question as to how our 'lens of memory' perspective sheds a unifying light on the issues that we have uncovered through its use.

Project objective and selection of a package

At Electro, the introduction of SAP R/3 fit well with the efforts of the new director to modernize and professionalize the organization, aiming at better information to control and steer the organization's finances and logistics by formalizing and standardizing the practices. As one of the key-users put it:

> "Electro has grown from a small family company with a lot of informal procedures, which makes processes not always orderly. So, the purpose of the ERP project was to achieve a better internal controllability, especially with respect to the logistic and financial procedures. Furthermore, the added value for the customers of Electro appeared to lie foremost in the production of small series, so Electro must be capable to switch back and forth quickly." – *Key-user SD/MM (October 2002)*

Such flexibility was considered very important, as the organization was perceived as a "chameleon" that has to adapt to its environment and customers in a rapid and successful manner (steering committee). As we share later, with the arrival of the ERP this flexibility was not always preserved.

The selection procedure for the ERP system was guided by a small consultancy firm. Only a few Electro members (7 in total) were involved in the selection process. Though the consultant approached the task in a thorough manner, with elaborate lists of criteria, visits to other companies, and so on, the actual decision for SAP was rather arbitrary. Some may argue that SAP R/3 is not really a package that is suited for such a small company, because this is one of the very elaborate and complex ERP packages. However the company's director was impressed by SAP R/3 in previous encounters and when the scores tied with another supplier, the choice was made in favor of SAP – a potentially cumbersome solution for Electro.

> "We didn't choose for [the other package] because this was only a small company with one consultant in the Netherlands. They also had limited implementation experience in Holland. In [another option], the financial component was not integrated. The weight of SAP has not been taken into account." – *Steering committee (October 2002)*

The core SAP processes that were focused on were: Sales & Distribution (SD), Material Management (MM), Planning & Production Control (PP), Finance & Controlling (FI/CO). Through the new ERP practices, Electro focused on formalizing, standardizing, and integrating internal processes. For each of these application areas, project groups were installed and key-users were appointed. A steering committee was tasked with formally overseeing the project. This approach was proposed and supported by consultants from PCCons, the implementation partner and SAP application host. In the course of the project, another consultant (BearCo) was brought into the organization to support the steering committee in the management of the project and to assist in the decisions regarding some logistical methods.

Re-contextualization of ERP practices

In the case of Electro the consultants played an important role in both the representation and recreation of the ERP practices (not to mention that they also consumed over half of the total implementation budget). During the

phase that involved the development of blueprints at Electro, the primary task of the consultants with PCCons was considered to be the translation of the processes codified in 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 effort at Electro was not regarded as 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 the employees at Electro. This was in spite of the fact that during the kick-off meeting in December 2001 (for all users when the ERP was going live) the issue of potential terminology confusion was raised and the end-users were shown some of the terms in the old system, and how they could be translated into the terminology used in the SAP system. For example, 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 misunderstandings (mismatches) arose regarding such instances as the distinction between "stock" and "work-in-progress". As members of the steering committee at Electro recollected:

> "We have lost about € 200 000 because of the way the inventory is characterized in the old and new system. With one system it is 'Work in Progress' while in the other it is 'Stock'. Now, we maintain the work in progress inventory in a separate location and it is kept up-to-date manually, with dummy registrations." – *Steering committee (October 2002)*

Another problem that was signaled by Electro referred to the fact that some people were having difficulties balancing the extent to which Electro could

introduce more sophisticated and extended functionality with the fact that they had to consider that the users (both key-users and end-users) might not be able to fully grasp such functionality.

> "The distance between the coaches and project members has become too big. Based on the detailed wishes and demands, various topics are more extensively introduced than was assessed in the Project Plan. PCCons warns that much of the desired functionality can be realized in SAP, but that the final result is achieved through the 'understanding and application capabilities' of the key-user and end-user. This is also important for the commitment. The idea exists that some key-users have already called it a day. However, they will need to 'carry' the realization." – *Project documentation*

Concern was also expressed that as a large group of people in the organization did not have advanced education and, as a result, they would not be able to make full use of the advanced functionality of the ERP system. It is important to note that although this was raised as an issue it was not actively dealt with by Electro.

When contextualization and re-contextualization are considered from the 'lens of memory' perspective the central role of individual and organizational memories is brought into relief. In interpreting and re-contextualizing ERP practices individuals rely on their own individual memories which leads to potential differences in the way different individual interpret and enact practices. What may seem to one individual as an obvious way to enact a practice may seem obscure or even inappropriate to another. In addition, ERP technology may create new linkages between individual and organizational memories and thus change the context within which practices are enacted. In addition, the enactment of new practices will require the integration of new experiences with both organizational and individual memories. Such integration is not easily accomplished and is unlikely to take place simply as a result of learning the software or working on limited component tasks that comprise complex practices. Finally, the routinization of practices requires some degree of stabilization of memories and the webs

within which memories are embedded. Again, such routinization is unlikely to result from performance of a limited number of tasks alone.

Building representations: understanding concepts

Implementing and using an ERP system does not merely involve the learning of new terms and terminology, in the sense of translation. In addition, new concepts that underlie the practices ERP systems bring with them need to be learned and, often, old (related) concepts need to be modified or forgotten. Although this may seem to be a straightforward process, the adoption of an ERP system is likely to require fundamental changes which include modifying deep understandings of many relevant concepts.

> "We have constructed the steering concepts as best we could, but the consequences were not very clear. These have been discovered along the way. The explication by [a third consultant] was too short in my opinion." – *SD & SM key-user (October 2002)*

In learning to enact a new practice, essential changes in understanding of language, concepts and context are required in order to develop the capabilities necessary to deal successfully with the extensive integration and routinization of the practices 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", that there "wasn't enough testing broadly" and that "everything would fall in its place automatically".

> "I remember a great amount of tests. However, the integrative test has lacked attention. There is too little knowledge on the other departments and modules. That makes you miss the "jargon". Some implications cannot be foreseen because of misunderstanding. The knowledge is divided in two. I am one of the few that has made process schemes; others haven't done that, not even now. The starting-point of most has been the implementation (the system, the screens, and how does that work). My point-of-departure was the construction of processes with the

> system as support. This difference in viewpoint has stayed with me." – *Key-user PP (October 2002)*

The 'lens of memory' perspective highlights the part played by memory in the learning and application of concepts. To the extent that people do not grasp the complex interplay between learning and memory there is likely to be confusion as to the nature of the practices that are implemented and in use in the organization. Signals of such confusion, following our earlier arguments, are provided by memory mismatches.

Integration efforts and training

To make matters worse, during training the focus was on SAP's transactions and screens, rather than the interdependency of the different processes in the various departments. 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 the 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)*

> "I think that when you want to implement SAP, you have to involve employees and they have to be able to ask questions. Now, there is insufficient knowledge and information, for instance, you don't know what the consequences are of an error in the data input." – *End-user ElecSubCo (October 2002)*

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 communication during the project was characterized by a big knowledge gap between the key-users and end-users. A lot of things were difficult to understand. I felt like I joined in the middle of a conversation. I don't think it would have mattered if the frequency of the meetings had been increased towards the end of the project. Only if we had really been involved in the project, would the knowledge have been easier and faster to acquire." – *MM end-user (October 2002)*

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)*

The end-users' lack of understanding became essentially a self-fulfilling prophecy! As a result of users not having been trained appropriately and lacking a thorough understanding, one of the issues at Electro was "tuning at the end of the line". As the MM key-user mentioned:

> "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)*

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 a while, the main excuse being that "the ERP system said so". This latter situation is one of the indications of the loss of flexibility after the implementation.

Change and improvement

The formal procedure for problem-solving and improvement after the introduction of the ERP system was that end-users may call upon key-users when errors or problems occur, who brought them to the SAP team. The SAP team was also responsible for the maintenance of the ERP system.

> "At this moment, the improvement procedure exists of notifying errors to the key users and he tries to do something about it or to escalate it. Sometimes this works, sometimes problems have to be solved with workarounds." – *End-user MM (October 2002)*

One of the key-users maintained the issue list that had around 80 problems noted at the time of our study. These varied from problems with printing forms to invoices not being generated automatically as mentioned in Exhibit 6-1.

Description:
Various invoices stay "open" and no accounting documents are generated (so invoices are NOT sent off!). For example, release for accounting is not generated for invoice 90000062 and it comes with an error message.
Solution:
This problem is super-urgent.

Exhibit 6-1. Problem with invoices (from Electro's issue list, 2002)

It appeared that most efforts focused on ad hoc problem-solving where the role for end-users again was very limited.

> "I am a bit disappointed with the realization [of the ERP system]. The processes are not clear and there is insufficient access. The bills of material from SAP do not always match the final products and this gives rise to problems. Furthermore, messages in the system are not or barely dealt with, and problems are not solved structurally. With remarks, problems and questions, you can go to the key user, but it is unclear what happens next." – *End-user ElecSubCo (October 2002)*

On-going training efforts were not mentioned. A further formal evaluation was scheduled for after our interviews. In addition, management did plan on several other re-organizations, among which the introduction of multidisciplinary teams. To us this signals that they were willing to change and trying to improve the organization further, at least at the management level, but they seemed to lack an integrated approach where in parallel with such managerially oriented initiatives ERP practices were further developed and enhanced.

In our view it is critically important for organizations, large and small, to avoid the 'fossilization' of practices. They must continually assess whether practices are appropriate and modify them where necessary. We observed a tendency at Electro to consider new practices derived from the ERP system as to be essentially fixed once they were in use. We argue that mismatches need to be identified and acted on as these may be signals that existing instantiations of particular practices may no longer be appropriate. We have also noted that often individuals within organizations informally modify ERP practices through the use of 'workarounds'. We discuss this further in the next subsection.

The role of workarounds

Workarounds were also present at Electro, as one of its end-users commented:

> "During the use of the system, the old ways of working, as used to be done with FINAS a, have returned. For example, checking product numbers and writing them down, calculating things manually because the composition and output of SAP did not fit the task at hand. These are actually all workarounds to get the job done. Also, the system is complex to use for the execution of the tasks, it does not provide a good overview and it is tedious (you need to have too many screens open at once)." – *MM end-user (October 2002)*

Interestingly, in contrast, workarounds may also be fed back into the routines and the ERP system, as shown in Exhibit 6-2 and, as a result modify, the routines. This means that the "deviant" interpretation gets added to the system and the likelihood exists that in case of updates or migrations towards newer versions of the ERP, these modifications have to be done all over again, or, worse, that they are not identified as modifications anymore.

Description:
In the delivery monitor, deliveries are unjustly shown that are selected in the sales order on the following Monday, while the delivery monitor is set for deliveries today (e.g. Thursday). Also, other deliveries are rescheduled earlier with respect to the date in the sales order. E.g. 77 and 84.
Solution:
This arises because of 1 extra day in the route planning. In the determination of the "goods-availability-date" (visible in MD04) and the determination of the "goods-delivery-date" (visible in VC10C) something goes wrong sometimes. (It appears to have to do with the combination strategy and need transfer). As a solution, the whole planning steering of these data has been removed. Now all 5 dates in the sales order are always equal. We don't do anything with this anyway.

Exhibit 6-2. Workaround in the system (from Electro's issue list, 2002)

6.6. Discussion of the findings

In this section we further discuss and generalize our findings in relation to the Electro case and our construction of the 'lens of memory' perspective. Our understanding of ERP practices as having an ostensive and performative aspect similarly to organizational routines and practices, draws our attention to the fact that we should not only consider the actions or processes that are focused on, but also the 'ideals' they are based on, the memories that people invoke to interpret and enact them. In addition, we need to consider that

introducing an ERP system not only brings about changes in ways of working, it also changes the ways in which the webs of memories are structured and restructured through the implementation and subsequent use of ERP systems. This inevitably leads to the occurrence of mismatches. Our findings support that such mismatches are indicative of issues such as summarized in Table 6-2. We will further discuss these findings here and also pay attention to the ways in which our 'lens of memory' perspective not only allows us to articulate and explore these issues as we set out to do, but how it is also unique and unifying in how it directs us to their practical linkages and dynamics, indeed pointing to interesting areas for future investigation as well.

At Electro, we find that the ERP system and the standardized, formalized practices were somewhat oversold when it was suggested that the necessary flexibility – as the organization saw itself as a chameleon – would be preserved or enhanced. However, the nature of ERP systems would suggest that flexibility is likely to diminish. Indeed, the packages are often sold as 'ideal' or 'best' solutions, but research has shown that – even in organizations that were referenced for the ERP practices and assisted in development – such ideals are not necessarily realized (Wagner & Newell, 2004).
Another topic concerns questions to the extent to which people's knowledge is shared, can be shared, or, indeed needs to be shared, etc. As Tushman and Scalan (1981) state:

> "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)

Even if it were possible to establish a common language, not all necessary knowledge of ERP practices can be encoded in, for instance, the blueprints that are used to represent processes. Indeed, Electro's worries about the "dyslectic consultants" were not only a question of a new language and issues of translation.

Theoretical notion	Results at Electro
ERP practices	Focused at internal practices: Sales & Distribution (SD), Material Management (MM), Planning & Production Control (PP) and Finance & Controlling (FI/CO). Aimed at control, formalization, standardization, integration and flexibility. Mismatches: There is a natural tension between an ERP package and flexibility; they usually restrict rather than enhance flexibility. This was not well understood at Electro.
Re-contextualization representations concepts change assessment	'Dyslectic' consultants that had to assist building representations. Difficulties understanding concepts such as steering concepts and understanding integration. End-users were hardly involved and possible changes in their daily work were not adequately assessed as a result. Mismatches: We particularly notice that it is difficult to 'shift' between webs of memories like the consultants are supposed to do. They are likely to share neither the same language nor the detailed knowledge of the organization. This makes sharing concepts extra challenging. The same goes for a lack of involvement of people.
Learning and training physical setting push-button	There was a knowledge gap that was accentuated by the use of a separate location ('The House'). Opportunities for proper re-contextualization were missed because of a push-button approach. Experiential learning or training-on-the-job were not considered. Mismatches: Their physical separation hindered the end-users to form similar experiences and memories in comparison to key-users. They had difficulties understanding representations and concepts; that was not stimulated with the push-button training.
Use phase Change/ improvements workarounds	A 'SAP team' was installed, but the procedure was unclear and un-satisfying for end-users. No extensive improvement efforts took place around the time of our study. Several workarounds existed as people tried to go back to their prior ways of working, and attempted to solve problems. Mismatches: Again, lack of involvement created a disconnect of people enacting the practices versus implementers. The workarounds could be signals for future improvements but were seen as rather subversive.

Table 6-2. Summary of the results

Even more so, it was unclear whether the consultants had actually understood the context of Electro and whether the routines had been appropriately contextualized.

Our thinking about representations and contextualization stresses the idea that a certain incompleteness (hence mismatches!) is inherent and even necessary in the specification of 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 new practices. Alvarez and Urla (2002) detail the role of narratives in requirement analysis during the implementation of ERP systems. Instead of analysts (IS specialists and consultants) focusing only on the formalized, coded aspects of knowledge, they argue that important knowledge should be elicited through informal stories and narratives, rather than being dismissed as 'messy'. However, we should note that this way of working runs counter to the current approaches for ERP process representation and modeling that stress formalization and rationalization.

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)

On the other hand, this difficulty with conveying information verbally should not be used as an excuse for leaving employees out of the process, as was the case with Electro's end-users.

At Electro, there was no sense of integration before the ERP implementation and the whole strategy to implement the system reflected this. The consultant who guided this process did not have such an overview either, which to us is somewhat worrying. With ERP implementations involving SMEs the

consultants can often exert considerable power when they are seen as the experts who bring in the necessary know-how that is required for the implementation. In addition, where the consultants played a role in clarifying the processes – mostly in terms of eliciting and codifying – at least in the case of Electro they were not always very competent. We would refer the reader back to the characterization of "dyslectic consultants" discussed to earlier in this chapter. In relation to integrating old and new knowledge it is also important to see that with a third party supplying and another party assisting in the process, people will also need to integrate knowledge from different parts of the network (Hislop *et al.*, 2000).

During the implementation, the different project members focused on their own activities and responsibilities and they disregarded or abandoned midway many things that could have been done to facilitate or safeguard integration, or that could have assisted people in understanding how their activities fit together (or did not fit together) and interacted with each other (or were independent of each other). For instance, there was only one person seriously involved in drawing process schemes to assist in visualizing what practices looked like and to design the new ones. Such process models could have been used for learning (perhaps also as a form of "boundary objects"). In the case of Electro, the idea of the models did not catch on. Where they mentioned that they should use them to identify changes and so on, they actually got quite lost in all kinds of technical details, instead of establishing a process orientation. This concurs with earlier findings (Kumar *et al.*, 2003).

Bagchi et al. (2003) in their case describe that the training was able to go beyond, creating consensus, eliciting requirements, involving users, and so on, but it unfortunately seems to describe the exception rather than the rule in training during the implementation processes. A 'push-button approach' to training is more generally the case (Amoako-Gyampah & Salam, 2004). We assert that this training approach did not help to alleviate problems at Electro either. With such 'push button' training, people are likely unable to integrate the memories implied by the system with their own memories appropriately,

or they interpret the memories and hence the system differently than intended.

The implementation approach adopted by Electro did not seem to accommodate for people really learning how to work with the ERP system and enact the new practices. This problem was magnified because of the total lack of participation of users in the implementation process. Additionally, the physical distance between the implementation team and the users at Electro reduced even further the likelihood of any meaningful communication taking place. This lack of communication inevitably made it very difficult for users or implementers to re-contextualize processes appropriately. Indeed, it also made it very likely that process would be re-contextualized in different ways – a situation that was likely to lead to the occurrence of significant mismatches. It is not surprising that Electro experienced the problems that it did with implementing and using the ERP system since the failure of users to understand the system and the associated processes was virtually inevitable. It is also likely that the lack of communication during the implementation process led to increased resistance to the new system – both covert and overt.

At Electro, we find that although some initial flexibility is preserved through the use of workarounds, it becomes almost impossible to challenge the new status quo, and there is a marked lack of questioning or concern as to whether the practices and routines continue to be appropriate. It also seems likely that they either have lost the knowledge necessary to know how to modify practices or routines or have not had the opportunity to develop the necessary new knowledge.

It is important to recognize that workarounds are often seen as unacceptable and potentially subversive because they directly undermine the standardized and prescriptive ways of enacting the routines and processes that result from the re-contextualization of the processes codified in the ERP system. However, we argue that the local adaptation of practices which is facilitated by these workarounds may be viewed as being a source of variety that actually

allows for the appropriate enactment of a particular practice. These local adaptations may also form the basis for the development of new practices and routines. Workarounds may provide subtle different understandings of the terms and nuanced enactment of practices to reflect rich or changing information concerning the organizations' internal or external environment. This information is typically not captured by the organization in a formal manner.

We argue that when we are looking at information systems adaptation, much of this adaptation, particularly with respect to enterprise systems, has to take place through modification of the ways in which people interact with the system. An extended understanding of such interpretation of ERP practices (from an organizational memory and organizational learning perspective) is needed, to further answer the question as to how these practices are modified and questioned.

In implementing ERP systems we encounter what we refer to as the sustainability/ flexibility paradox. When the ERP system is implemented, there is a need to interpret and enact ERP practices in a stable and sustainable way. Paradoxically, the successful on-going interpretation and enactment of practices also depends on the ability to modify these practices over time as internal and external conditions change. Working against such modifications is the perception that ERP systems are essentially 'fossilized' once they have been implemented. This perception is reinforced by the difficulties in the adaptation and customization of the system with the suppliers making this even less attractive (i.e. by making it very costly). Our analysis shows that once the first mismatches are solved, often through the creation of workarounds or tweaking, it becomes increasingly difficult to question the ERP practices status quo, and even though successive interaction with dynamic internal and external environments gives rise to new mismatches these may be ignored and not used as the basis for reflection and inquiry. Thus implementing an ERP system may result in increasing organizational inertia. We would suggest that the use of the 'lens of memory' perspective

provides a way of talking about and investigating ERP practices that can provide a fertile approach to identifying such phenomena and suggesting ways in which an appropriate balance between flexibility and stability can be conceptualized and implemented.

We cannot formally state whether some of the observed problems and mistakes at Electro were deliberate, people did not make such confessions to us. However, our intuitive answer to that is that they sometimes they were deliberate. Employees of Electro did acknowledge that they sacrificed the flexibility that they actually needed for their practices (i.e., they stopped doing simple things as phoning or talking to people face-to-face) in order to 'hide behind' the system. Part of this disconnection may be explained from the fact that people used to be very engaged in the processes but after the implementation of the ERP system they felt cut off, they did not feel actively involved in the processes anymore. This lack of emotional involvement may be partially explained by their lack of understanding the new situation and the mismatches that arose as a result. Future research may further explore the linkages between memories and the social-emotional situations that occur. Adopting a 'lens of memory' perspective allows us to begin to conceptualize the nature and importance of the part played by emotions during the implementation and use of ERP systems. Memories associated with strong emotions are recalled more reliably than memories that do not have such associations. Thus, we would posit that new practices are more likely to become routinized if individuals engaging in them do so with positive emotions. Similarly, if individuals develop negative emotions with respect to the implementation of new practices they are less likely to implement them in a reliable and stable way.

Our 'lens of memory' perspective puts memory mismatches at the core of exploring the dynamic linkages between ERP practices, webs of memories and ERP introduction processes – in terms of re-contextualization, learning and training, and improvement and workarounds – and through this lens we have aimed to provide a means for understanding and explaining extensive

memory-related problems that arise from introducing ERP systems into organizations. The 'lens of memory' perspective also provides an opportunity to bring together these practical problems in a novel manner. Space does not permit a detailed analysis, but we do want to exemplify this unifying characteristic of our lens. If we are for instance talking about understanding the concepts that underpin ERP practices, we can now reason that how people understand these concepts will impact the ways in which they choose to represent such concepts in the ERP system. This implies that, as we have suggested, people need to form new memories associated with the concepts and that they have to assess how such concepts differ from those they utilized in the situation preceding the implementation of the ERP system.

Memory mismatches are understood to arise to the extent that people for instance interpret and understand concepts that are encoded in an ERP system in different ways. If consultants are hired to assist in the re-contextualization process, it is important that they are able to re-contextualize the practices that are encoded in the ERP system and assist users in their own re-contextualization efforts. Training and learning are important for individual users to come to understand concepts and form appropriate memories. However, training often takes the form of instructions which buttons to push rather than addressing the concepts behind such actions. Further, training rarely engages users in an inquiry concerning the dynamics of processes or the interaction between one process and another – key requirements for understanding integrated processes and practices. As we have seen in the Electro case, misunderstanding concepts as well as their interdependencies may create severe problems. Also, a lack of understanding of the concepts makes it difficult to assess whether workarounds that need to be created for "making the system work" at a local level are actually inappropriate at an integrated and aggregate level. For instance workarounds that 'adjust' the characteristics of orders so that they may be entered into the system at the operational level may lead to inappropriate interpretations at the managerial level where the use of workarounds will not be recognized. A final issue our 'lens of memory' perspective draws attention to about 'concepts'

and which we mention here concerns the premise that a more thorough understanding of concepts may provide a basis for reflective questioning and so would enable the continuing improvement and flexibility that organizations seek to successfully exploit their ERP system.

Whereas we acknowledge the role of the described problems in potential failure to achieve successful ERP practices and realizing the benefits ERP systems are sold on, we have only begun to explore the precise nature of how mismatches exactly contribute to such failure. Indeed we consider investigation of the connection between memory mismatches and failures in implementation and use of ERP systems as an important next step in the development of our 'lens of memory' perspective. However, we want to stress again that though we have set out to explore their problematic nature, we argue that mismatches are not necessarily to be interpreted in a negative fashion. Indeed, they may be considered part of the 'natural state' of memories, arising out of their richness and innate 'confusion', and form an important source of creative reflexivity that enables successful adaptation and change. Thus it is in the nature of memory mismatches (in particular their inevitability) that they cannot be controlled in a rational-prescriptive manner, which is counter-intuitive to the ERP philosophy. In our view, it is therefore necessary to create organizational environments within which mismatches are actively recognized and reflected on. This allows for the development – or preservation – of an organization's ability to deal with their occurrence in the day-to-day interpretation and enactment of ERP practices.

6.7. In conclusion

This chapter has contributed an in-depth examination of our 'lens of memory' perspective and has provided an indication as to how it can be used as an analytical tool in a practical setting. Our 'lens of memory' perspective integrates the individual and collective, as well as actions and memories, broadening our understanding of organizational practices, in particular those mediated by ERP systems. Considering the implementation and use of an

ERP system from the perspective of interpreting and enacting practices enables us to contribute to an articulation of the part played by individual and organizational memories, related processes, and problems that have not been addressed extensively in the ERP literature. We have presented our explorations of the use of a unifying approach to further our understandings of the complex interactions and dynamic relationships among existing memories and memories that arise with the introduction and use of an ERP system. Thus, we have expanded earlier work on ERP systems from a knowledge-centric perspective by revealing several issues that have remained largely unexplored so far. These issues are grounded in both our theoretical conceptualizations and the empirically-based elaboration that we have introduced in this chapter.

A central notion in our 'lens of memory' perspective is that of memory mismatches, or memory conflicts. Mismatches may indicate limits of codifying our knowing as well as the contextual, situational nature of organizational practices. Indeed, we want to stress that there is a certain need for 'common understanding' as well as shared languages in order to be able to re-contextualize the practices and processes that are encoded in ERP systems in a reasonably consistent manner. However, the interrelatedness of the webs of memories, the fact that they are to a certain extent vague, ambiguous, diverse and conflicting, and their dynamic and interacting nature makes eliminating mismatches a utopian challenge and a questionable task. Rather, we suggest that organizations learn to embrace such diversity and learn how to deal with conflict in possibly less frustrating and more fruitful ways than described by the Electro case.

We have discussed several issues that relate to the mismatches and other concepts that are utilized in our 'lens of memory' perspective. One such distinct issue relates to concept formation and how the interpretations of these concepts are necessary in order to re-contextualize processes and practices that are encoded in ERP systems during the implementation and use of such systems. Our research at Electro has shown that people encountered

severe difficulties understanding concepts – especially those related to the process reference models and those related to integrated processes. Related to this is the observation that any particular practice cannot be represented fully in terms of the representation approaches that are available in ERP systems. When ERP practices are 'imported' into an organization they are not accompanied with appropriate memories that are necessary in order to interpret and enact them successfully. Consultants are not necessarily able to provide this knowledge either. As a result memory mismatches will occur. Training should provide more hands-on rather than push-button learning to cope with such problems. Our research indicates that the role of training can be further complemented by teaching people the relevant concepts, providing them with an understanding of complete processes and their interdependencies, and stimulating informal learning and working with the system. A proposition is that better understanding of relevant concepts would also enable people to create meaningful workarounds. This is especially important since we consider that workarounds should be fostered by the organization as a means to preserve agility.

Our analysis of Electro and our conceptualizations warrant an interest in a more pro-active approach to the handling of mismatches and the preservation of organizational flexibility. We do not unequivocally advocate the elimination of memory mismatches. Not only may this turn out to be too costly an option but it may be impossible to achieve. As memory mismatches emerge through the complex interactions of wide-ranging webs of memories, ERP practices, and processes of implementation and use, they are likely to be very difficult to predict also because they are very situationally dependent. Thus, we would not take the path of developing a predictive tool for predicting and subsequently eradicating mismatches, but rather we propose a pro-active approach which would identify mismatches when they occur and use them as the basis for further reflection. In some cases such reflection would lead to actions that would tend to eliminate such mismatches while in other cases we might well seek to maintain such mismatches in order to stimulate organizational creativity and adaptability. Thus, such a pro-active

approach should be based on how we may '*treat*' conflicts in memories on an ongoing basis.

6.8. Acknowledgements

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Summary

This dissertation explores the phenomenon of Enterprise Resource Planning (ERP) systems. This type of complex information systems, focusing on the support of a wide variety of administrative, logistic, and managerial business processes, has been heavily introduced in organizations around the world, particularly since the mid-nineties. The introduction of ERP systems in an organization will purposely *and* inadvertently bring about changes in the ways in which people interpret and enact processes. ERP systems – through the prescription and proscription of practices – bring with them new ways of working and also new representations and understandings of these work processes that are to a certain extent unforeseen and even unseen.

Whereas, in the past, researchers have dealt with questions as to how new knowledge is transferred, shared and integrated with existing knowledge in the setting of ERP systems, such investigations have provided only limited understanding as to how difficulties arise from such knowledge being ambiguous, vague, unshared, or indeed mismatching and conflicting. That is, the networked 'webs of memories', the interrelated and interacting individual and organizational memories, are by nature to an extent incomplete, inconsistent, and incoherent. ERP systems are considered a new 'player' in terms of becoming part of the 'webs of memories' and the additional mismatches they may bring about. It is not yet clear how this influences the ways in which people are able to construct and reconstruct ERP practices when they are re-contextualized during implementation and use. Given their potentially very problematic nature, there is a need to further our understanding as to how "memory mismatches" occur throughout the ERP life cycle and how these mismatches affect the processes mediated by ERP systems (and vice versa).

The overall objective of this research has been to construct the 'lens of memory' perspective - as being built up from different partial investigations into the ways in which the 'lens of memory' perspective helps us understand ERP systems and their memory-related problems. In the five papers collected for this thesis, this 'lens of memory' perspective is developed and I have explored its central notion of "conflicting memories" both at a conceptual level and empirically through the re-analysis of two university case studies – Big Civic and AcademCentre – and the retrospective examination of the ERP introduction at Electro, a small Dutch electronics company.

The research has linked the problems with mismatches throughout the development, implementation and use of ERP systems. Looking through the 'lens of memory' entails investigating how people come to understand processes, how they gather information and knowledge about them, and how they integrate new process understanding with their existing memories. Knowing is necessary to interpret and enact practices and is also shaped by such interpretation and enactment. Furthermore, the 'lens of memory' perspective provides a way to articulate how changes in the networked individual and organizational memories give rise to mismatches. Those mismatches are interpreted to be important signals of problems and also may be regarded as cues for reflective questioning and change.

The 'lens of memory' perspective puts memory mismatches at the core of exploring the dynamic linkages between ERP practices, webs of memories and ERP introduction processes and as such provides a means to understand and explain the extensive knowledge-related problems that arise from introducing ERP systems into organizations. Whereas I acknowledge the role of such problems in potential failure to achieve successful ERP practices and realizing the benefits ERP systems are sold on, we have only begun to explore the precise nature of how mismatches exactly contribute to such failure.

Together, the papers provide a detailed exploration of conflicting memories at a conceptual level and I have suggested several directions towards rethinking current ERP approaches. Basically, we see that a rationalistic view

of the world – as adopted in the ERP system context – may render organizations much less sensitive of the informal, personal, contextual, emerging and interacting ways in which many of their processes actually take place and memories get shaped.

As part of the implementation, an important function of process modeling is to "translate" process knowledge into models to design the ERP system and as a basis for change. Some mismatches indicate difficulties with incomplete process understanding that make it problematic to compare representations of processes in the ERP system with representations of processes in the organization. If such inherent incompleteness is not taken into account, we see that people are likely to experience significant problems with enacting the represented practices properly during the usage stage.

Training is often applied in an (implicit) attempt to overcome this problem. However, training can only roughly approximate what these practical situations will look like. If these training contexts are too unrealistic, users will obviously have difficulty in adjusting quickly after the system has gone live. Nor does it help them to form memories of doing the tasks beforehand, but rather, we see that experiential learning becomes critical.

Where memory mismatches indicate problems with enactment of the practices and are signals of the continuous co-evolvement of the ERP system within the networked web of memories, we see that people will invent new ways to 'work the system'. Workarounds are seen as ways to evade or sabotage the system, rather than as opportunities for learning, creating better understandings, or securing an environment in which change is emerging and realized through evolving. It follows from the research that those behaviors are essential and by prohibiting them, they will become 'undercover' behaviors that management is not likely to be aware of. This can create serious problems.

Future research should address the strategies that are adopted to identify and address incoherence with respect to memories and memory webs at all

relevant stages of the ERP systems life cycle. This does not imply avoiding mismatches at all costs. Indeed I propose not to take the path of developing a predictive tool asking how to eradicate mismatches, but rather I suggest creating a pro-active approach that would further ask the question as to how people '*treat*' such conflicts in memories on an ongoing basis in their day-to-day organizational life successfully.

Samenvatting

Mirakel of Morgana?
Een verkenning van het wijdverspreide ERP systeem fenomeen belicht vanuit het idee van conflicterende geheugens

In dit proefschrift beschrijf ik de resultaten van mijn verkenning van het fenomeen *Enterprise Resource Planning* (ERP) systemen. Dit type complexe informatie systemen richt zich op het ondersteunen van een brede variëteit aan administratieve, logistieke, en management bedrijfsprocessen. ERP systemen zijn op wereldwijde schaal en in allerlei soorten en maten van organisaties geïntroduceerd, vooral sinds het midden van de jaren negentig. De introductie van een ERP systeem in een organisatie leidt doelbewust *en* onbedoeld tot veranderingen in de manieren waarop mensen processen interpreteren en uitvoeren. ERP systemen brengen een (grotendeels) nieuwe manier van werken met zich mee, doordat ze bepaalde nieuwe bedrijfsprocessen voorschrijven, wijzigingen vereisen, en andere processen zelfs verbieden. Ook leidt het invoeren van een ERP systeem tot nieuwe representaties en kennis van processen. Deze veranderingen zijn (in zekere mate) niet te voorzien en ze kunnen zelfs onzichtbaar blijven.

Het stellen van de vraag "Mirakel of Morgana?" brengt ons bij het punt dat informatie systemen zoals ERP systemen vaak worden verkocht als '*magic bullets*' oftewel ideale oplossingen voor organisatorische problemen. In het geval van ERP systemen krijgt dit gestalte in de claim dat ze '*best' practices* met zich meebrengen, zogenaamde voorkeursmanieren om het bedrijf te runnen. Maar de serieuze problemen met het in werking krijgen van deze 'beste' processen en vervolgens met het realiseren van de beloofde voordelen, maken dat ERP succes bovenal een 'luchtkasteel' (b)lijkt. De duidelijke behoefte om deze situatie te verbeteren terwijl ERP systemen co-bestaan en co-evolueren in het organisatorisch leven, rechtvaardigt onze voortdurende aandacht voor ERP systemen in onderzoek en praktijk.

Er is al wel onderzoek gedaan naar hoe nieuwe kennis wordt overgebracht, gedeeld, en geïntegreerd met bestaande kennis in de setting van ERP systemen. Maar zulke analyses hebben slechts een beperkt begrip opgeleverd hoe en waarom problemen ontstaan doordat zulke kennis (hier: geheugens), ambigu, vaag, ongedeeld, of inderdaad conflicterend is. Met 'geheugenconflicten' of *mismatches* bedoel ik dat – doordat de individuele en organisatorische geheugens met betrekking tot bedrijfsprocessen divers en diffuus zijn – er van nature inconsistenties en incoherenties optreden. Een ERP systeem is een relatief nieuwe 'speler' binnen deze geheugens. Het is daarom nog niet duidelijk wat voor invloed zulke 'geheugenconflicten' hebben op de manier waarop mensen in staat zijn om ERP processen te construeren en te reconstrueren wanneer geheugens in context worden (her)plaatst tijdens ERP implementatie en gebruik. Vanwege hun mogelijk zeer problematische karakter heb ik verder onderzoek gedaan naar 'geheugenconflicten' tijdens de levenscyclus van ERP systemen, in het bijzonder tijdens implementatie en gebruik.

Het overall doel van mijn onderzoek was het ontwikkelen van het 'geheugenlens' perspectief waarin het idee 'geheugenconflicten' een centrale rol speelt. Dit perspectief is samengesteld op basis van de verschillende deelonderzoeken naar de manier waarop het 'geheugenlens' perspectief ons helpt om ERP systemen en geheugengerelateerde problemen verder te begrijpen. Vanwege het explorerende karakter van het onderzoek is de nadruk geplaatst op de conceptuele ontwikkeling van het perspectief en daarnaast heb ik een empirische verkenning gedaan door het heranalyseren van twee universiteitscases (Big Civic en AcademCentre) en door een retrospectieve analyse van de ERP introductie bij Electro, een klein Nederlands elektronicabedrijf. Samen met een begeleidend hoofdstuk presenteren de vijf artikelen verzameld voor dit proefschrift de resultaten van mijn exploratie.

Het onderzoek heeft de problemen met mismatches gekoppeld met de fasen van ontwikkeling, implementatie, en gebruik van ERP systemen. Kijken door de geheugenlens houdt in dat we onderzoeken hoe mensen processen (leren) begrijpen, hoe ze informatie en kennis over de processen verzamelen, en hoe ze nieuw procesbegrip integreren met bestaande geheugens. Geheugens zijn noodzakelijk om de processen te interpreteren en uit te voeren en worden aan de andere kant ook gevormd door deze interpretaties en uitvoeringen. Verder geeft de geheugenlens ons een mogelijkheid om onder woorden te brengen hoe veranderingen in de netwerken van individuele en organisatorische geheugens aanleiding geven tot mismatches. Zulke mismatches worden geïnterpreteerd als zijnde belangrijke signalen voor problemen en ze kunnen mogelijk ook beschouwd worden als aanwijzingen voor reflectief vragenstellen en verandering.

Het 'geheugenlens' perspectief plaatst geheugenconflicten centraal in de verkenning van de dynamische verbanden tussen ERP processen, 'geheugenwebben' en ERP introductie fasen. Op die manier vormt de lens een middel om de uitgebreide geheugengerelateerde problemen die ontstaan door het introduceren van ERP systemen in organisaties te begrijpen en uit te leggen. Ik onderschrijf dat deze geheugengerelateerde problemen veroorzaakt door mismatches inderdaad een rol spelen in de mogelijke mislukking om ERP processen goed uit te voeren en vervolgens om de voordelen waarop ERP systemen verkocht worden te realiseren. Maar ik wil benadrukken dat deze studie pas een begin heeft gemaakt met het verkennen van het precieze karakter hoe mismatches bijdragen aan onsuccesvolle ERP systemen.

Samen leveren de artikelen een gedetailleerde exploratie op van geheugenconflicten op een conceptueel niveau. Daarnaast heb ik verschillende richtingen aangegeven waarin we bestaande ERP benaderingen zouden moeten heroverwegen. In de kern zien we dat een rationalistische blik op de wereld, zoals die in de ERP context vaak overheerst, organisaties veel minder gevoelig maakt voor de informele, persoonlijke, contextuele, *emerging*

(het spontaan te voorschijn komen), en interacterende manier waarop veel bedrijfsprocessen eigenlijk plaatsvinden en geheugens gevormd worden.

Als onderdeel van de implementatie vindt er procesmodellering plaats om proceskennis te 'vertalen' in modellen die nodig zijn voor het ontwerp van het ERP systeem en die gebruikt kunnen worden als een basis voor verandering. Mismatches geven soms aan dat er problemen zijn om te begrijpen hoe processen in elkaar zitten, er kan dan sprake zijn van inconsistent of incompleet procesbegrip. Dat maakt het problematisch om bijvoorbeeld representaties van processen in het ERP systeem goed te vergelijken met processen in de organisatie en de consequenties van implementatiekeuzes te overzien. Zulke mismatches zijn voor een deel onvermijdelijk. Zeker wanneer hier geen rekening mee wordt gehouden, zien we dat dit ook later problemen oplevert voor het interpreteren en uitvoeren van de gerepresenteerde processen tijdens de gebruiksfase.

Training wordt vaak toegepast in een (impliciete) poging om dit probleem aan te pakken. Maar training kan slechts ruwweg benaderen hoe deze praktische situaties er uit zullen zien. Als de kaders van de training te onrealistisch zijn, zullen gebruikers uiteraard problemen hebben om zich snel aan te passen als het systeem in werking treedt. Het helpt gebruikers ook niet met het vooraf vormen van geheugens hoe ze de taken kunnen uitvoeren. In plaats daarvan is een belangrijke suggestie om in deze context verder te kijken naar de mogelijkheden van 'ervaringsgebaseerd leren'.

Waar geheugenconflicten een indicatie zijn voor problemen met het uitvoeren van processen, en signalen zijn van het continu co-evolueren van het ERP systeem binnen de geheugenwebben, zien we dat mensen nieuwe manieren uitvinden om het systeem te laten doen wat ze willen. Dergelijke kunstgrepen worden gezien als een manier om het ERP systeem te ontduiken of zelfs te saboteren, in plaats van ervan uit te gaan dat deze *workarounds* mogelijkheden bieden om te leren, om beter begrip te creëren, of om een omgeving veilig te stellen waar veranderingen en evolutie plaats kunnen vinden. Uit het

onderzoek blijkt dat zulke gedragingen essentieel zijn en door ze te verbieden worden workarounds 'undercover' gedrag waarvan het management meestal niet op de hoogte is. Dit kan grote problemen veroorzaken.

Verder onderzoek zou moeten ingaan op de strategieën die worden gebruikt om incoherenties wat betreft geheugens en geheugenwebben te bekijken in alle relevante fases van de ERP systeem levenscyclus. Dit betekent niet: proberen mismatches koste wat het kost te vermijden. Inderdaad, ik stel voor om niet het pad te nemen van het ontwikkelen van een voorspellend instrument vanuit de vraag hoe mismatches uit te roeien, maar in plaats daarvan, dat we een proactieve benadering creëren die verder ingaat op de vraag hoe mensen met succes voortdurend omgaan met geheugenconflicten in hun dagelijks organisatorisch leven waarin ERP systemen zo'n belangrijke rol spelen.

List of related publications

Submitted journal papers

Van Stijn, E., & Wensley, A. K. P. (2006c). Investigating ERP systems through a 'lens of memory'. *Information Technology & People*.

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Van Stijn, E., & Wensley, A. K. P. (2006). *The construction and reconstruction of practice: An examination of the effects of the implementation and use of ERP systems*. Paper presented at the International conference on Organizational Learning, Knowledge and Capabilities (OLKC), Warwick (UK).

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Miracle or Mirage?

An exploration of the pervasive ERP system phenomenon informed by the notion of conflicting memories

This dissertation consists of a set of papers that together develop what is termed the 'lens of memory' through which I explore how looking at Enterprise Resource Planning (ERP) systems from a knowledge-centric perspective explains a set of cognitive problems that prevails in the development, implementation and use of these complex information systems. Whereas researchers have dealt with questions as to how new knowledge is transferred, shared and integrated with existing knowledge in the setting of ERP systems, such investigations have provided only limited understanding as to how difficulties arise from such knowledge – or rather, I refer to interacting and interrelated 'webs of memories' – being diverse, ambiguous, vague, unshared, or indeed conflicting.

Asking the question "Miracle or Mirage?" redirects us to the issue that information systems like ERP systems have often been sold as 'magic bullets' or ideal solutions to organizational problems. In the case of ERP systems this gets form in the claim that they bring with them so-called 'best' practices, alleged preferred ways of doing business. However, the profound difficulties with putting such 'best' practices into action and subsequently with realizing the promised benefits make ERP success appear to be a 'castle in the air' rather than anything else. The apparent need for improvement of this situation, while ERP systems co-exist and co-evolve in our organizational life, warrants our continuing attention for ERP systems in research and practice.

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