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Abstract

The activity of developing high-quality information systems (IS) is a highly volatile and knowledge-intensive process. Nonetheless, only few IS developing companies seem to be advanced in evaluating and processing their knowledge. Despite a variety of existing approaches, there is no systematic overview of these and how far they support organisational learning. We conduct a systematic literature review of highly ranked journals and relevant textbooks to provide such an overview. We provide a list of eight systematic learning approaches and analyse how they contribute to the activities of knowledge creation, retention and transfer. Thereby, we aim to improve the current situation of organisational learning in IS developing companies. Whereas organisations need to become more open to systematic organisational learning approaches, research is in need to evaluate existing approaches and develop holistic strategies for building learning organisations.

Keywords: organisational learning, knowledge management, information systems development, literature review, learning effects.

1   Introduction

The activity of developing high-quality information systems (IS) represents a knowledge-intensive and highly volatile process (Desouza et al., 2006). Emergent technologies and the involvement of numerous stakeholders in different activities of the IS development cause rapid changes (Rus and Lindvall, 2002). Individual experiences thus need to be shared across an organisation to optimise technical and managerial decisions (Courtney, 2001). Hence, it is essential that IS developing companies systematically manage their knowledge throughout the development process (Desouza et al., 2006).

Senior managers experience difficulties to effectively apply practices supporting the management of knowledge (Gold et al., 2001). Moreover, IS developing companies can avoid project failure by applying more effective knowledge management (KM) practices (Desouza et al., 2006). Without reflecting previous developments, learning effects for future projects cannot be sufficiently derived. Learning effects are thus necessary conditions for methodological structures to optimise the organisations' processes and to develop high-quality IS (Rus and Lindvall, 2002).

Organisations learn regardless of whether systematic learning approaches exist (Kim, 1993). However, this does not imply that unsystematic approaches lead to a high effectiveness of organisations' processes. Inadequate learning processes may result in misleading implications. To reach competitive advantages, organisations need to learn systematically while considering knowledge as a strategic resource (du Plessis, 2005; Garvin, 2000). In times of frequently changing technologies and shorter product cycle times, organisations even more depend on their ability to create and manage knowledge (Davenport and Prusak, 1998). Approaches to gain such ability can be found in the organisational learning (OL) discipline (e.g. Schneider et al., 2002).

OL is closely related to the research stream of KM. Taking a look at the interrelations between OL and KM, OL "can be defined in terms of the processes of knowledge creation, retention, [and] transfer" (Vera and Crossan, 2007, p. 137). Following this definition, managing (sustaining and transferring) knowledge requires preliminary processes of creating knowledge within an organisation. Accordingly, Garvin (1993, p. 80) defines in his pioneer article a learning organisation as "an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights". Thus, we understand a learning organisation as the result of an organisation passing the process of OL.

Many systematic learning approaches exist in literature (e.g. Fægri et al., 2010; Basili and Seaman, 2003; Birk et al., 2002). Despite our extensive literature review (cf. section 3), we only identified articles focussing on one or few of these approaches. We did neither find an article providing a systematic overview of the approaches nor a study linking the approaches to learning organisations. To provide an overview of systematic approaches for improving OL in IS developing companies, we aim to answer the following two research questions (RQs):

(RQ1) Which approaches for systematic learning in IS developing companies are proposed in literature?

(RQ2) In which way do these approaches contribute to the processes of organisational learning (knowledge creation, retention and transfer)?

In order to answer these research questions, we conduct a systematic literature review by following the concept-driven approach proposed by Webster and Watson (2002). We review textbooks and 12 highly ranked journals related to the topics of OL and KM published since 1993 (publication year of Garvin's pioneer article; cf. Garvin, 1993) to identify systematic approaches and their contribution to learning processes. Our study's contribution is twofold. On the one hand, IS professionals in companies should be able to decide which techniques most suitably fit their contextual needs concerning learning processes and KM. On the other hand, researchers can use our overview as a map

of existing research. Based on our findings, the need for developing further approaches as well as evaluations of existing ones can be derived.

The remainder of this paper is organized as follows. In section 2, we provide an overview of the concepts of OL, KM and related research. We describe our approach to systematically review existing research studies concerning our research questions in section 3. We present our findings in section 4 and discuss these in section 5. In the last section, we draw general conclusions and provide implications for researchers and practitioners.

2 Theoretical Background

2.1 Organisational knowledge, knowledge management, organisational learning and learning organisations

According to Easterby-Smith and Lyles (2007), there is a coherence between organisational knowledge, knowledge management, organisational learning and learning organisations. Figure 1 illustrates this coherence in terms of theory and practice (X-axis) as well as process and content (Y-axis). In the following, we describe each of these concepts and draw conclusions for our study.
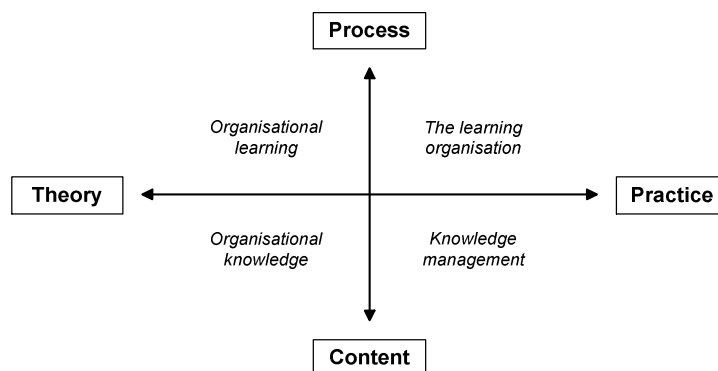
Figure 1.   *Coherence of organisational knowledge, knowledge management, organisational learning and the learning organisation (Easterby-Smith and Lyles, 2007).*

Knowledge in general is "information possessed in the mind of individuals: it is personalised information (which may or may not be new, unique, useful, or accurate) related to facts, procedures, concepts, interpretations, ideas, observations, and judgments" (Alavi and Leidner, 2001, p. 109). We denote organisational knowledge as knowledge that results from combining existing and newly generated knowledge by bringing individuals or sub-organisations together. Organisations realise that it is helpful if not essential for their success to generate a systematic KM (Alhashmi et al., 2006). Through rapid developments in the field of KM, many organisations nowadays use IS to administer their knowledge (Small and Sage, 2005/2006). However, KM is more than simple storage of knowledge; it also entails the knowledge transfer between the organisation's members (Davenport and Prusak, 1998). According to Alavi and Leidner (1999), KM is a systematic process to improve productivity and effectiveness of organisation members through systematically acquiring (creating new knowledge from scratch or processing experiences), organising and communicating knowledge.

OL aims to change organisational processes through targeted activities (e.g. Templeton et al., 2002). As mentioned in the introductory section, OL and KM are closely related. Considering these concepts' common grounds, OL can be defined "in terms of the processes of knowledge creation, retention, [and] transfer" (Vera and Crossan, 2007, p. 137). However, it is not easy to establish such processes in an organisation. A premise for successful OL is the learning of the organisation's individuals (Senge, 2006). Moreover, organisations need to actively support their individuals in gathering knowledge.

They should develop processes to increase the learning ability of individuals and thus permanently establish knowledge (knowledge creation). However, OL should not be equated with the learning of the organisation's individuals (Marquardt, 2002) as in specific cases an organisation may own more or less knowledge than its individuals (Argyris and Schön, 1996). Managing knowledge is thereby more than storage of information (knowledge retention; cf. Davenport and Prusak, 1998). An essential condition for OL is that individuals systematically spread their knowledge (knowledge transfer) throughout the organisation (Chen et al., 2003). Thus, individual learning is a necessary but not a sufficient condition for OL.

Whereas OL aims to investigate how organisations learn (Vera and Crossan, 2007), the comprehensive discipline of building learning organisations (cf. section 2.2) is concerned with designing "an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights" (Garvin, 1993, p. 80). It discusses related principles, systems and characteristics (Marquardt, 2002). A learning organisation actively supports the learning of its individuals to generate competitive advantages or higher effectiveness (cf. section 2.2 for approaches which support building a learning organisation). In our study, we provide an overview of systematic learning approaches that help to enable OL and thus building a learning organisation.

2.2   Building the learning organisation

Different approaches (and their extensions) exist for building a learning organisation and KM. In the following, we refer to those which have been most often cited by the studies identified in our literature review: Garvin's (1993) five building blocks, single- and double-loop learning (Argyris and Schön, 1996) and the knowledge spiral of Nonaka (2007). We evaluate the systematic learning approaches identified in our literature review with regard to these approaches for building a learning organisation (cf. section 5).

Garvin (1993) defines the five following practitioner-oriented activities that an organisation should follow to enable successful learning:

- *Systematic problem solving* means that decisions are based on statistical analyses of data and information. Organisation members must be more disciplined and more focused on details.
- *Experimentation with new approaches* includes the systematic search for and systematic testing of new knowledge. This activity comprises one-time (e.g. projects to demonstrate principles or approaches) and continuous (e.g. research and development facilities) experiments.
- *Learning from their own experience and past history* requires all individuals to constantly reflect successes and failures to provide implications to all individuals. So-called postmortem evaluations (cf. section 4.1) provide a good opportunity.
- *Learning from the experiences and best practices of others* comprises benchmarking with clients or other organisations to develop new ideas. Managers need to be open for criticism and new ideas.
- *Transferring knowledge quickly and efficiently throughout the organisation* can be accomplished through written or oral reports or trainings. It should be acknowledged that an active process leads to the best learning effects.

Argyris and Schön (1996) differentiate the two concepts single-loop learning and double-loop learning. For successful OL these concepts need to be combined.

- *Single-loop learning* uses the comparison of existing problems and the organisation's vision to develop an adequate solution. Single-loop learning is a fundamental concept that mainly enhances existing processes' efficiency.
- *Double-loop learning* in contrast causes changes of an organisation's standards and values as in some cases it may not be sufficient to change a single process. Continuous progress might require the replacement of existing standards and visions.

Contrarily to the western approach of managing explicit knowledge, which is written and codified, solely Nonaka (2007) recommends considering implicit knowledge. Analysing Japanese KM

initiatives, Nonaka (2007) describes the transformation of the two fundamental knowledge types (explicit / implicit) within a knowledge spiral (the following activities are continuously repeated). Nonaka (2007) states four activities that organisations should establish in their daily work:

- *Socialisation* means adopting implicit knowledge from other individuals. A trainee learns by observing his/her mentor in daily work and therefore imitating the mentor's skills. A trainee creates his/her own implicit knowledge on the basis of other persons' experiences.
- Converting this personalised implicit knowledge to an explicit or written form is the next phase of the knowledge spiral. *Articulation* describes capturing implicit knowledge in any understandable format and providing this knowledge to the rest of the organisation.
- The *combination* of explicit knowledge is the next step of knowledge transformation. Recombining, sorting or categorising existing explicit knowledge leads to new knowledge items which can be transferred between employees.
- Within the process of *internalisation*, an organisation's members gather explicit knowledge extending their own implicit knowledge and may apply it to solve new problems.

3 Literature Review

To answer our research questions stated above, we conducted a concept-driven systematic literature review (Webster and Watson, 2002). As David Garvin published his pioneer article in the field of OL in 1993, we chose that year as starting point. Following Webster and Watson (2002), we defined a selection of top IS, software engineering and management journals as our basis. Due to their position in the AIS ranking (http://ais.affiniscape.com/displaycommon.cfm?an=1&subarticlenbr=432) and/or their high relevance for the field of OL, we selected the following journals: *MIS Quarterly*, *Information Systems Research*, *Communications of the ACM*, *Management Science*, *Journal of Management Information Systems*, *Harvard Business Review*, *European Journal of Information Systems*, *IEEE Software*, *Information & Management*, *IEEE Transactions on Software Engineering*, *Organization Science*, *Information and Software Technology*.

We relied on EBSCOhost due to the selected publications' availability in that database system. We considered articles relevant that met the following search pattern (resulting from a pilot search) in title, abstract or keywords: ("*software engineering*" OR "*systems development*" OR "*software development*") AND (*organisational learning*" OR "*knowledge management*") AND ("*lessons learned*" OR "*learning*")). Besides EBSCOhost, we used our university's catalogue to identify relevant international textbooks by applying the same search pattern.

Afterwards, the identified journal articles and textbooks were reviewed in a two-step procedure. (1) A parallel approach was applied. Two researchers independently identified publications considering their title and abstract. We focussed on publications in relation to the research area of OL or KM describing learning approaches that are applicable in organisations. If the abstract was unavailable or insufficiently revealing, we read the article in detail. (2) We combined the two lists. Diverging views concerning the relevance of a publication were discussed after analysing the publications in more detail. Our approach finally led to a set of 20 publications. The identified approaches are presented in section 4.

4 Systematic Approaches for Organisational Learning

Table 1 provides an overview of the identified systematic learning approaches and the according publications. In the following subsections, we provide a description of these approaches whereas Table 2 illustrates the results and categorises them according to their contribution to the three activities of OL and KM: knowledge creation, retention and transfer. The mapping of the approaches on the three activities results from the publications and our analyses of the approaches' characteristics. Although we focus on approaches for systematic learning in IS developing companies (RQ1), the eight

approaches support the activities of OL in general, that is they are applicable in companies across different industries. However, especially IS developing companies should adopt such approaches since they are subject to a knowledge-intensive process (cf. section 1) and intellectual capital is their most important asset (Rus and Lindvall, 2002).

	Postmortem Evaluations	Communities of Practice	Knowledge Repositories	Experience Factory	Skills Management	Knowledge Manager	Research & Development	Job Rotation
(Baaz et al., 2010)	X							
(Basili and Seaman, 2003)				X				
(Birk et al., 2002)	X							
(Brazelton and Gorry, 2003)		X						
(Brown and Duguid, 1991)		X						
(Davenport and Prusak, 1998)		X	X				X	
(Desouza, 2003)			X					
(Desouza et al., 2006)	X							
(Dingsøyr and Conradi, 2003)					X			
(Dingsøyr, 2005)	X		X					
(Dingsøyr et al., 2009)	X							
(Fægri et al., 2010)								X
(Foray, 2004)						X		
(García et al., 2011)			X					
(Garud and Kumaraswamy, 2005)			X		X	X		
(Knight and Howes, 2003)						X		
(Lindvall and Rus, 2003)			X		X	X		
(Pasher and Ronen, 2011)							X	
(Rus and Lindvall, 2002)		X	X	X	X			
(Schneider et al., 2002)				X				

Table 1.   Concept-Author-Matrix: Systematic approaches for organisational learning.

Approach	Creation	Retention	Transfer
Postmortem evaluations	X	X	X
Communities of practice	X	X	X
Knowledge repositories			X
Experience factory	X	X	X
Skills management			X
Knowledge manager			X
Research & development	X	X	
Job rotation			X

Table 2.   Systematic learning approaches' contribution to organisational learning.

4.1   Postmortem evaluations

One of the most important and most often applied approaches for knowledge *creation* are postmortem evaluations (Birk et al., 2002). These are events after project completion where project members meet in a workshop to discuss their experiences and lessons learned (Dingsøyr, 2005; Birk et al., 2002). By reflecting previous work, possibilities for improvement of future projects are identified. It is important that positive and negative experiences are regarded in the same manner. For *retention* and *transfer* (cf. Table 2) of the results and implications, postmortem reports (structured and standardised) or

postmortem stories (semi-structured and subjective) should be composed (Baaz et al., 2010; Desouza et al., 2006). Such reports entail all lessons learned and expatiate the knowledge.

4.2   Communities of practice

Communities of practice are groups of individuals who voluntarily meet due to same interests or areas of expertise (Davenport and Prusak, 1998). These groups meet to exchange experiences and knowledge (*retention* and *transfer*), to identify or develop best practices (*creation*) and establish new inter-individual relations (cf. Table 2; Brazelton and Gorry, 2003). It is one of the most often applied approaches for OL (Rus and Lindvall, 2002). Face-to-face meetings are auxiliary for communities of practice (Brazelton and Gorry, 2003). It is essential that one of the group members is elected as knowledge steward. A knowledge steward organises regular meetings, motivates the group members and acts as steering committee for new ideas. Organisations need to support communities of practice, for example by providing technical infrastructure like wikis, chat rooms and video conferences (Brazelton and Gorry, 2003; Brown and Duguid, 1991). This support is meant to improve the communication, no matter if it is content-related or the foundation for socialising.

4.3   Knowledge repositories

Knowledge repositories are digital knowledge storages in terms of data warehouses (Desouza, 2003), wikis (García et al., 2011) or intranets (Garud and Kumaraswamy, 2005). These different types have the long-term storage of for example experiences, documents and reusable code in common (Dingsøyr, 2005; Garud and Kumaraswamy, 2005). Such experiences may result from postmortem evaluations or single programmer reports. For this knowledge *transfer* (cf. Table 2), it is important that the repository is easily accessible and its content reusable. Repositories are especially helpful in case of code reuse (Desouza, 2003; Lindvall and Rus, 2003). One of the pitfalls is the problem of information overload (Garud and Kumaraswamy, 2005; Davenport and Prusak, 1998). In such cases, the effort to find the relevant information might be higher than creating knowledge from scratch. Furthermore, individuals might fear losing their expert status when sharing their knowledge with others and thus boycott the repository.

4.4   Experience factory

The concept of an experience factory is similar to knowledge repositories as experiences and knowledge are managed in a central repository (Basili and Seaman, 2003). The difference is that this knowledge repository is accounted for by a separate organisational unit: the experience factory (Schneider et al., 2002). This unit supports project management and project execution with tailored experience (Basili and Seaman, 2003). The experience factory manages an experience base in terms of a knowledge repository (Basili and Seaman, 2003; Schneider et al., 2002). While the experience factory uses its experience throughout planning and execution of on-going projects (*retention* and *transfer*), project teams report their experiences and documents throughout the course of their projects for future ones (*creation* and *transfer*). Implementing an experience factory requires organisational change as individuals need to actively share their knowledge and consult the experience factory.

4.5   Skills management

As IS development is a knowledge-intensive process, it is challenging to transfer the knowledge into an explicit and written form (Lindvall and Rus, 2003, Rus and Lindvall, 2002). Skills management is an organisation-wide approach for knowledge *transfer* (cf. Table 2) and aims to retrace the skills each individual masters. Expert catalogues (Garud and Kumaraswamy, 2005) or expert profiles (Lindvall and Rus, 2003) are examples for skills management. All individuals are meant to describe their areas

of expertise so that other individuals can identify and contact experts for specific problems (Dingsøyr and Conradi, 2003; Rus and Lindvall, 2002). These catalogues can be extended by cooperation partners and clients (Lindvall and Rus, 2003) and realised in terms of self-contained software systems (Dingsøyr and Conradi, 2003) or organisation-wide intranets (Garud and Kumaraswamy, 2005). Skills management is useful for organisations that are widely spread around the globe as it is almost impossible to know all individuals and their area of expertise in this setting (Lindvall and Rus, 2003).

4.6 Knowledge manager

As described in section 2, all members of an organisation need to be willing to adapt their work processes to enable knowledge interchange (*transfer*). Management needs to motivate active participation by providing incentives. Hence, it is suitable to define positions solely to account for the application of learning approaches. One of these positions is the chief knowledge officer (Knight and Howes, 2003). This officer develops learning strategies and aligns these to the overall organisational strategy. The position is meant to promote the benefits associated with OL. A knowledge program manager is responsible for enabling knowledge transfer (cf. Table 2) by applying the overall learning strategy to single projects. Other researchers define the role of a KM prime or champion (Garud and Kumaraswamy, 2005; Lindvall and Rus, 2003). It is cutting-edge for OL and needs to control that all individuals fulfil their tasks according to the learning strategy. A KM champion can be assigned to a single project or the overall organisation. The champion is also responsible for the application of postmortem evaluations (cf. section 4.1) after project completion (Knight and Howes, 2003).

4.7 Research & development

Considering Garvin (1993), organisations should be able to conduct experiments. One typical way to guarantee this ability is the introduction of an independent organisational unit: research and development (Foray, 2004; Davenport and Prusak, 1998). This unit's independence enables the creation of new knowledge irrespective of on-going projects and time pressure (*creation*). In this context, two different types of research and development are feasible. Single research and development endeavours might demonstrate the effects of new knowledge on an on-going project. In contrast, controlled experiments enable the creation of new knowledge if no suitable project is available. Research and development supports the development of innovations and creation of knowledge (Pasher and Ronen, 2011; Foray, 2004). Its activities might develop new technologies, define new quality standards or improve current processes (*creation* and *retention*).

4.8 Job rotation

Job rotation denotes processes in which members of an organisation change their projects, positions and areas of responsibilities in unsteady time intervals (Fægri et al., 2010). Thus, they gather experience in different knowledge domains (e.g. technologies or techniques) and positions. This approach aims to establish a knowledge redundancy in the organisation (*transfer)*. Consequently, organisation members' skills are more diversified and are available for more than one position. The organisation is more independent from single individuals (sticky knowledge) and does not need to fear individuals quitting. Employees benefit from their colleagues' experiences while knowledge more easily spreads (cf. Table 2) throughout the organisation (Prusak, 1997).

5 Summary and Discussion

In our study, we conducted a systematic literature review of international textbooks and leading IS, software and management journals (cf. section 3). Thereby, we answered RQ1 and contribute to existing literature by providing a list of eight systematic learning approaches (cf. Table 1). Moreover,

we answered RQ2 by analysing to which extent these approaches contribute to knowledge creation, retention and transfer (cf. Table 2).

Analysing the distribution of the identified results (cf. Table 2) leads to our central finding: Only few approaches (3/8) support all three activities of OL and KM (knowledge creation, retention and transfer). Hence, it is important to mostly adapt several approaches to cover all concepts of OL. Our analysis of the proposed approaches has shown that there are several opportunities for auspicious combinations of two or more systematic learning approaches. For example, the approaches knowledge manager and skills management can be applied to intensify the knowledge transfer of postmortem evaluations. Communities of practice can be seen as support for experience factories due to their specialised knowledge and can thus act as consultants in specific contexts. The existing approaches for knowledge creation and retention (cf. Table 2) should be combined to intensify these activities.

Staff of IS development projects is usually reassigned to other projects right after project completion. In such cases, postmortem evaluations are not feasible. In order to countervail this problem, a knowledge champion might impose the obligation to conduct such evaluations before the staff is transferred. The infrastructure of communities of practice might then even extend the benefit of such meetings to other members of the community.

There are also shortcomings that might limit the potential of OL. For example, along with the positive effects, job rotations might lead to social problems. As job rotations are meant to exchange staff through projects, positions and responsibilities (cf. section 4.8), frustration might occur due to lack of sufficient and adequate education or the need to steadily work with different colleagues.

Considering the activities for building a learning organisation (cf. section 2.2), we provide insights into the capabilities of the approaches for systematic learning with regard to organisations' strategic development. Table 3 shows to what extent the described approaches for OL in IS developing companies contribute to the activity of building the learning organisation. We analysed and mapped the approaches according to their characteristics on the activities for building learning organisations.

Approach	(Garvin, 1993)	(Argyris and Schön, 1996)	(Nonaka, 2007)
Postmortem Evaluations	Learning from own experience, knowledge transfer	Single-loop	Socialisation, articulation
Communities of Practice	Learning from others, knowledge transfer, learning from own experience	Single-loop	Socialisation, articulation, combination, internalisation
Knowledge Repositories	Knowledge transfer	Single-loop	Combination, internalisation
Experience Factory	Knowledge transfer, learning from own experience, learning from others	Single-loop, double-loop	Articulation, combination, internalisation
Skills Management	Learning from others, learning from own experience	Single-loop	Socialisation
Knowledge Manager	Knowledge transfer	Double-loop	Socialisation
Research & Development	Systematic problem solving, Experimentation	Single-loop	Combination, internalisation
Job Rotation	Knowledge transfer, learning from own experience	Single-loop	Socialisation

Table 3.   *Systematic learning approaches and their coherence to activities for building a learning organisation.*

Taking a look at the fundamentals of building a learning organisation (cf. section 2.2), the identified approaches are adequate for the building process. Considering single-loop learning and double-loop learning (Argyris and Schön, 1996), postmortem evaluations and knowledge repositories appear suitable to solve short-term problems (single-loop learning) whereas an experience factory might

change an organisation's standards and values due to its continuous knowledge gathering and sharing (double-loop learning). Table 3 demonstrates which disciplines for building a learning organisation need further improvements. Double-loop learning, that is the ability to cause fundamental change for an organisation, is only covered by two systematic learning approaches. This can be attributed to the problem of change management in general. OL itself requires an organisation and its individuals to adapt the processes. If further changes are caused by the learning processes, resistance might be too strong. As research and development does not cover the activity of transferring knowledge, skills management, knowledge managers and job rotations are good complements (cf. Table 2).

With regard to Garvin (1993), communities of practice, experience factories and skills management might help learning from experiences and best practices of others (cf. section 2.2). Systematic problem solving and experimentation with new approaches might be accomplished through experiments of a research and development unit (cf. section 4.7) or an experience factory (cf. section 4.4). Whereas systematic problem solving approaches and approaches for experimentation are rare, most approaches (6/8) support knowledge transfer. Besides the experience factory as activity for learning from own experience, postmortem evaluations, communities of practice, skills management and job rotations provide this opportunity. As such, it should be ensured that such activities are considered important. Otherwise, knowledge transfer only leads to redundancies.

Considering Nonaka (2007), process socialisation (5/8 approaches), articulation (3/8), combination (4/8) and internalisation (5/8) are almost equally represented. Whereas communities of practice fulfil all essential activities, combinations of these approaches allow building a learning organisation. Job rotation in combination with experience factories is only one of many examples.

6 Conclusions

According to our answer to RQ1, a variety of approaches for systematic learning in IS developing organisations (cf. section 4) exist. These approaches contribute in different ways to the activities of OL (cf. RQ2 and Table 2). Thereby, companies cope with the problem of applying proposed approaches to enable sustainable learning. Researchers need to find ways to more systematically develop this research field. Our literature review contains a limitation as its focus is on top journals and textbooks without searching backward and forward (cf. for a similar approach Joachim, 2011). Nevertheless, we believe our systematic literature review to be an adequate basis for future research due to the variety of studies included, the transparency of the search process and our linkage to the activities of building learning organisations.

6.1 Implications for researchers

Evaluate existing approaches for OL. The articles identified in our literature review mainly present theoretical approaches. There is lack of empirical evidence to which extent the approaches support holistic learning in IS developing companies. Therefore, the presented approaches need to be evaluated in organisations to clearly assess the effectiveness on the IS development process. It is necessary to develop processes and metrics to evaluate the approaches' usefulness.

Develop holistic approaches for OL. Most publications focus on single approaches for OL (cf. Table 1). However, organisations will need to combine several of these approaches to a holistic process in order to build a learning organisation. Researchers can help IS developing companies to identify specific approaches which best fit their organisational structure and therefore have the strongest impact on learning efficiency. Future research should compare the different approaches for building learning organisations. For example, it depends on the perspective whether communities of practice include all essential activities or are in need of additional learning approaches (cf. Table 3).

Differentiate between concepts of OL and KM more clearly. Although research in both disciplines continues over the past decades, we found that many existing studies make no clear distinction

between the concepts of OL and KM. We believe the distinction by Easterby-Smith and Lyles (2007) to be a good starting point (cf. Figure 1). Future research will probably profit from providing a clearer separation of these concepts and related approaches.

6.2   Implications for practitioners

Combine different OL approaches. Using only one approach is not promising. As most approaches only cover one or few of the essential activities of OL, a combination of different approaches is the best way to go. Although three approaches consider knowledge creation, retention and transfer (cf. Table 2), combinations may lead to synergetic effects as different approaches use different ways of learning. Thereby, single approaches might be independently evaluated in different organisational units and later on combined to holistic OL.

Motivate and advance awareness for OL. An organisation's individuals need to be aware of the advantages that come along with the use of OL approaches. This awareness is the foundation for individuals' motivation to actively engage in the organisation's learning process. Introducing knowledge managers (cf. section 4.6) is a simple means to improve the motivation of organisational members to become actively involved in specific knowledge initiatives.

Consciously adapt and actively promote OL approaches. OL is more than the raw storage of data (cf. section 2.1). Organisations need to actively advance OL and the management should be cutting-edge. In detail, management needs to establish a central unit that actively encourages the application of learning approaches throughout the organisation. While implementing the postmortem evaluation, for example, it would be useful to allocate additional time to the initial project plan. Hence, the management can be certain that project team members will reflect their experiences after project completion.

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