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PRACTICAL SUPPORT FOR UNLEARNING – A SYSTEMATIC REVIEW TO ORGANIZE THE FIELD

Research in Progress

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Abstract

Organizations are increasingly concerned with the continuous reassessment and redesign of their products, processes, and business models to remain competitive in uncertain environments. Thereby, mental models, routines, and behaviors of individuals and entire organizations need to be updated to fit changing demands and environmental factors. 'Unlearning' is a promising approach to achieve this because it allows knowledge to be refined and adapted to novel situations. Unlearning established ways of thinking and doing effectively poses, however, several challenges that could be mitigated by an appropriate tool support. By following a qualitative systematic review of literature from Information Systems and adjacent disciplines, we identified and synthesized existing tools and guidance to assist individuals, teams, and organizations in unlearning. With our study, we contribute to an integrated overview of practical support for unlearning based on a sample of 41 papers as well as useful guidance for practitioners, designers, and researchers.

Keywords: Organizational Unlearning, Individual Unlearning, Tool Support, Literature Review.

1 Introduction

“You must unlearn what you have learned.” –Yoda | Star Wars, Episode V

It is becoming increasingly important for organizations in dynamic markets to create innovative solutions and adapt their structures in order to survive (e.g., Santanen, Briggs and Vreede, 2004; Brown, 2008). Organizations are forced to continuously (re-)evaluate and change their existing business processes, product portfolio, and even entire business models (Matt, Hess and Benlian, 2015; Schoormann, Hofer and Knackstedt, 2020). Thereby, knowledge serves as a key resource to build resilience and exploit opportunities in times of change (March, 1991). This is particularly important in knowledge-intensive industries, such as those that are concerned with quickly evolving information technologies. Sustainable knowledge management is therefore a vital prerequisite to respond to today's challenges. However, given the accompanying level of complexity and uncertainty, innovating intra- and inter-organizational-wide structures can often not be resolved with knowledge and approaches that worked in the past; instead, new knowledge is required. As incumbent business models, existing structures, commitments, and cognitive constraints prevent explorative turns (Christensen, 1997; Desai, 2013), there is a growing demand for approaches that help to break out of old routines and be open-minded about new ways of thinking and doing.

Against this backdrop, we observe a growing interest in facilitating 'unlearning' as part of useful knowledge management, such as in the digital age. Its promising role is supported by both academia

(e.g., Fiol and O'Connor, 2017) and practice (e.g., World Economic Forum and Boston Consulting Group, 2019). In broad terms, unlearning can be seen as an adaptation process where new knowledge and knowledge structures have to replace old knowledge structures (Nonaka, Toyama and Byosiere, 2001; Akgün, Byrne, Lynn and Keskin, 2007). It thereby supports individuals and organizations to critically reflect on taken-for-granted assumptions, values, and norms (Hedberg, 1981). In this paper, we focus on the positive meaning and potential of unlearning and do not refer to unlearning as an activity of unintentional forgetting; a failure to become mindful at a proper time (De Holan and Phillips, 2004). Although unlearning has great potential, it is not easy to operationalize and translate into real practice (e.g., Becker, Hyland and Acutt, 2006). Organizations and individuals need to unlearn behaviors that might be used for several years before establishing target behaviors. So, learn how to unlearn. Referring to knowledge management, this means that employees have to cope with additional challenges, such as changing the way they use knowledge, adapting their attitude towards transformation and innovation, being prepared for uncertain risks, and developing new skills. Besides, as their knowledge is sometimes not enough, cooperation with other industries and ecosystems needs to be considered (e.g., Azkan, Möller, Meisel and Otto, 2020). Given that prior research in related fields has already stressed that, for example, creative and collaborative tasks can benefit from (software) tools (e.g., Müller-Wienbergen, Müller, Seidel and Becker, 2011; Szopinski et al., 2020), unlearning could also benefit from adequate tools. However, to the best of our knowledge, there is no overview of previous research on practical (how-to) guidance for unlearning processes. Therefore, we ask:

RQ: *Which practical approaches exist to support unlearning?*

In this research-in-progress paper, we conducted a systematic literature review (SLR) following Bandara et al. (2015) as part of a larger Design Science Research (DSR) study that seeks to build an unlearning support system. This paper constitutes a central part of an initial rigor cycle (Hevner, March, Park and Ram, 2004) to accumulate and build upon the existing knowledge base. With the SLR, we provide a state-of-the-art review on practical support for unlearning and lay the ground for further research.

In our literature screening process, we obtained 903 papers and identified 41 relevant ones that investigate different types of guiding unlearning. We analyzed these papers based on theoretical concepts of unlearning (see Section 2). As our findings suggest, existing research on unlearning tends to favor the reuse of existing approaches over the design of artifacts explicitly intended for unlearning. Our sample further shows that frameworks and methods seem to outnumber applicable tools for specific sub-processes of unlearning. Also, we disclosed a lack of research in design-oriented disciplines which in the future could add applicable guidance in the form of design knowledge and design artifacts. Thereby, claims for more empirical research (e.g., Grisold, Kaiser and Hafner, 2017) in the field of unlearning could be addressed. Our work contributes to the body of knowledge on unlearning by providing an integrated overview of guidance for unlearning support on different levels in organizations tied to established concepts of unlearning in the literature. We hope to complement the existing literature and inspire further research on operationalizing unlearning and 'bringing it to life'.

This paper is structured as follows: After the motivation (Section 1), we specify this paper's main concepts and outline related work (Section 2). Following our research method (Section 3), we present our corpus of identified relevant papers and propose a synthesis of the findings (Section 4). Finally, we discuss implications, limitations, and future directions (Section 5).

2 Conceptual Background

Organizations need to wisely manage their knowledge (De Holan and Phillips, 2004) to compete in today's increasingly knowledge-intensive economies. Knowledge can be differentiated into *cognitive* and *behavioral* (Easterby-Smith and Lyles, 2011). Cognitive knowledge typically refers to values, beliefs, assumptions, mental models, and frames of reference (Akgün et al., 2007; Lee and Sukoco, 2011), as well as to behavioral knowledge, such as practices and routines (Tsang and Zahra, 2008; Fiol and O'Connor, 2017). Organizational unlearning is closely related to 'organizational forgetting' and to "the loss, voluntary or otherwise, of organizational knowledge" (De Holan and Phillips, 2004, p. 1606). In contrast to unintentional loss of knowledge (e.g., Smunt, 1987; Schmitt, Borzillo and Probst, 2012),

unlearning represents an intentional form of forgetting. It refers to the conscious questioning of existing cognitive and behavioral knowledge (e.g., Starbuck, 1996), the exploration of novel paths, as well as the creation of new values, frames of reference, practices, and routines (Grisold et al., 2017). Ultimately, it seeks to reduce the influence of superfluous knowledge and undesirable behaviors (Pralhad and Bettis, 1986). Unlearning creates the foundation for building new knowledge and behavior in a planned manner. In line with this, unlearning can be understood as "[the] process by which individuals and organizations acknowledge and release prior learning (including assumptions and mental frameworks) in order to accommodate new information and behaviors" (Becker, 2005, p. 661).

Unlearning can be viewed as a process (Becker, 2005; Akhshik, 2014) consisting of interrelated sub-processes (Lewin, 1951). Reese (2017) compared different conceptualizations (Fiol and O'Connor, 2017; Starbuck, 2017; Visser, 2017) and identified three major common phases: (1) *destabilization*, (2) *experimenting*, and (3) *discarding*. Based on prior research in a variety of fields, Fiol & O'Connor (2017) refined the understanding of the interplay of these three sub-processes related to organizational routines. During (1) *destabilization*, individuals should ostensibly question old routines. Triggers or stimuli might be internal, namely from inside the organization, or external from the environment. This results in "relevant cognitive and emotional dissonance" (Fiol and O'Connor, 2017, p. 84) because of the resistance brought up by existing, personal knowledge. Then, (2) *experimenting* provides space for the performative exploration of avenues and for the motivation to abandon old routines. This process differs from (1) as it implies social interaction, for example, with peers during reflection. Afterwards, (3) *discarding* needs to be facilitated. To release old knowledge, individuals and groups must recognize the benefits of a new routine compared to the old one. In the end, this process "requires multiple instances of discarding-from-use of aspects of the old, accompanied by multiple instances of trial-and-error new learning [and] the old [routine] is never fully extinct" (Fiol and O'Connor, 2017, p. 89) which is in line with adjacent concepts (Hislop, Bosley, Coombs and Holland, 2014; Grisold et al., 2017).

The unlearning process occurs on various levels (Cegarra-Navarro and Wensley, 2019): *Individuals* (e.g., De Holan and Phillips, 2004; Hislop et al., 2014), *groups* and *teams* (e.g., Becker, 2005), *organizations* (Akgün et al., 2007; Akhshik, 2014). Thereby, Tsang & Zahra (2008) emphasized that unlearning at the organizational level depends on unlearning at the individual level. Therefore, individual learning is expected to be the foundation for larger unlearning processes.

3 Method: A Qualitative Systematic Literature Review

As part of a larger design-oriented research project aimed at building an artifact in the form of an unlearning support system, this paper reviews existing literature to disclose the current understanding and derive initial design objectives (Sonnenberg and vom Brocke, 2012). To achieve this, we conducted a qualitative, systematic literature review (Templier and Paré, 2018) with two major knowledge-building activities: *synthesizing* prior research on unlearning and *identifying research gaps* (Schryen, Wagner, Benlian and Paré, 2020). In doing so, we adapted guidelines for qualitatively analyzing literature from Bandara et al. (2015), which involve four phases: (1) extraction of literature, (2) screening and selection, (3) coding and analysis, and (4) presentation of results.

In the first phase (extraction), we specified a search strategy. Initially, we studied seminal works and review papers on unlearning (i.a., Akhshik, 2014; Hislop et al., 2014; Grisold et al., 2017) to establish an understanding of the concept and to formulate a working definition. We excluded adjacent (but different) terms, such as 'forgetting' (e.g., "forget*") and 'relearning' as they do not focus on unlearning in particular. For example, we refrained from using "relearn*" because it mostly refers to the acquisition of new knowledge, procedures, and routines (Sharma and Lenka, 2019), and thus does not refer to discarding old knowledge. Following our conceptualized understanding of unlearning support (see Section 2), we iteratively developed a search phrase. Finally, we ended up with the following search phrase: "(unlearn*) AND (method* OR tool* OR approach* OR technique* OR application* OR instrument* OR intervention*). We did not apply any constraints on the period of publication to capture as many relevant papers on practical support as possible. Here, the term 'practical support' refers to applicable artifacts that assist unlearning, such as in the form of frameworks, guidelines, methods,

(software-based) tools, and other guidance. In terms of search sources, we sought at incorporating a wide range of literature beyond disciplinary boundaries because knowledge on unlearning support is scattered across various communities (Mariano, Casey and Olivera, 2020). Thus, we selected several databases both from within and outside the IS discipline: *ACM Digital Library*, *AISEL*, *IEEE Xplore* (Information Systems); *PsycNet* (Psychology); *ERIC* (Education); *Business Source Complete*, *EconLit*, *ProQuest* (Management); *Academic Search Ultimate*, *Web Of Science* (multidisciplinary).

In the second phase (screening and selection), we performed the search in 11/2022, which resulted in a total sample of 41 papers. To arrive at a manageable sample, we applied several inclusion criteria. We limited our search to peer-reviewed papers published in English. Following Bandara et al. (2015), two researchers screened titles, abstracts, and keywords to examine if the papers meet our inclusion criteria, namely dealing with practical support for unlearning (i.e., papers provide or elaborate on applicable artifacts, as noted earlier). In case of disagreement or uncertainty, the researchers discussed if the paper should be included or not based on their shared understanding of what constitutes practical support for unlearning. In contrast, the following types of papers were excluded: exclusively report on abstract definitions of unlearning; focus on machine learning; focus on neurology/pathology/psychology without a clear connection to organizational contexts; no practical guidance. As a result, we compiled a final sample of 41 papers relevant to answer this paper’s research question (see Figure 1).

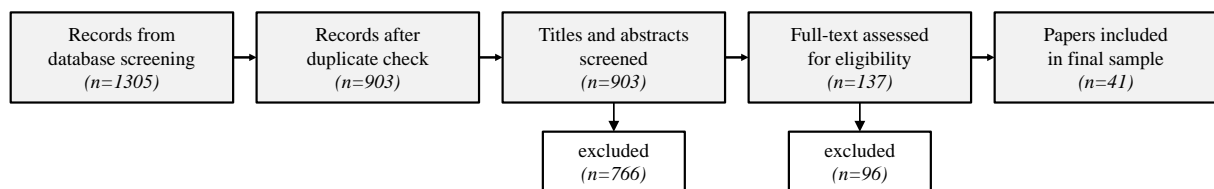


Figure 1. Literature screening and selection process.

In the third phase (coding and analysis), we created a coding scheme to analyze the final sample and classify the papers according to relevant unlearning concepts for our research. For creating the coding schema, we combined deductive and inductive reasoning. We began with deductively making use of established understandings from two different areas. First, from the area of unlearning, three concepts were adopted: *processes of unlearning* (based on Reese, 2017; and Fiol and O’Connor, 2017), *unlearning goal* (based on Easterby-Smith and Lyles, 2011), and the *level of analysis* (based on Cegarra-Navarro and Wensley, 2019) (see details in Section 2). Second, as our objective is to identify practical support, we draw on the field of DSR which is explicitly devoted to the creation of artifacts extending the boundaries of both individual and organizational capabilities (Hevner, vom Brocke and Maedche, 2019). Four different artifact types (Offermann, Blom, Schönherr and Bub, 2010; March and Smith, 1995) were transferred to unlearning: A *framework* delimits a certain aspect of reality, abstracts from details, makes visible the interrelation between related concepts and supports the process of unlearning its parts. A *guideline* provides a general recommendation for the achievement of an unlearning goal without a fixed structure. A *method* offers a step-wise description of activities that need to be performed to achieve a certain goal. A *tool* is a situational instantiation in a specific context for a precise purpose that further operationalizes methods. All types are applicable in the unlearning process on at least one level (i.e., individual, group, or organizational). In our analysis, we only identified papers as relevant which clearly contributed to the four types of support. This allowed us to build upon proven concepts in the fields of unlearning and DSR. Besides deduction, we also used induction during the coding process. Based on our insights, we refined our scheme. Specifically, we followed Easterby-Smith and Lyles’ (2011) categorization of knowledge types into cognitive and behavioral, resulting in a streamlined matrix where all dimensions are on the same level. This ensured a concise and sound analysis.

In the last phase (presentation), we developed a comprehensive concept matrix (Webster and Watson, 2002). Applying and building upon this integrated overview of practical support for unlearning, we explored the state of the art of research that is concerned with guiding the process of unlearning for individuals, groups, and organizations. Moreover, the synthesis of the literature disclosed several foci of available research as well as gaps that provide indications for future avenues.

4 Results: Unlearning Support

In the following, we present the results of our review and the analysis of the 41 papers (see Table 1).

Looking at the context of the papers, **application areas** were widely scattered. Among the identified research areas, management (n=14), education (n=4), and health care (n=3) stood out as prevailing contexts. Important **roles** in the context of unlearning included i.a. employees, top managers, middle managers, operations managers, as well as students. In some publications, no context (n=6) or roles (n=10) could be identified because they presented generic approaches applicable to any contexts/roles.

The majority of studies (n=26) addressed all three **sub-processes** (destabilizing, experimenting, discarding) of unlearning. Regarding the **support**, the majority of papers presented methods (n=25) and frameworks (n=21) that incorporate unlearning concepts. Only a few studies proposed guidelines (n=6) and tools (n=4). Strict separation of cognitive and behavioral **goals** appears to be difficult, as most approaches in our corpus employed a combined view. Looking at the **level**, unlearning on the organizational level prevailed in our sample (n=29).

Reference	Process			Support				Goal		Level		
	Destabilize	Experiment	Discard	Framework	Guidelines	Method	Tool	Cognitive	Behavioral	Individual	Group	Organization
(Almqvist, Catasús and Skoog, 2011)	●	--	--	--	--	●	--	--	●	--	--	●
(Ashworth, 2016)	●	●	--	●	--	--	--	●	--	●	--	--
(Atkinson, 1998)	●	●	●	●	--	--	--	●	●	●	--	--
(Baxter, Lyndon, Dole and Battistutta, 2004)	--	●	●	--	--	●	--	--	●	●	--	--
(Becker et al., 2006)	--	--	●	--	--	●	--	●	●	●	--	--
(Buchen, 1999)	●	●	--	--	--	●	--	--	●	--	●	●
(Burt and Nair, 2020)	●	●	--	--	--	●	--	●	--	--	●	●
(Cegarra-Navarro and Cepeda Carrión, 2013)	●	●	●	●	--	--	--	●	●	●	●	●
(Cegarra-Navarro et al., 2010)	●	●	●	●	--	--	--	●	●	●	●	●
(Cegarra-Navarro et al., 2013)	●	●	●	●	--	--	--	●	●	●	●	●
(Cegarra-Navarro et al., 2011)	●	●	●	●	--	--	--	●	●	●	●	●
(Cepeda-Carrión et al., 2011)	●	●	●	●	--	--	--	●	●	●	●	●
(Clarke, 1998)	●	●	●	●	--	●	●	●	--	●	--	--
(Delshab et al., 2021)	●	●	●	●	--	--	--	●	●	●	●	●
(Dixon, 1990)	●	●	●	●	--	●	●	●	●	●	●	--
(Fiol and Connor, 2017)	●	●	--	--	--	●	--	●	●	●	●	●
(Gold and Yeo, 2012)	●	●	●	●	--	●	--	●	--	●	●	●
(Goldsmith, 2006)	--	●	--	--	--	●	--	●	--	●	●	--
(Grisold, Klammer and Kragulj, 2020)	●	●	●	--	--	●	--	●	●	●	●	●
(Hutchins and Muller, 2012)	--	●	--	--	●	--	--	●	●	--	--	●
(Kyle et al., 2017)	--	●	--	--	--	●	--	●	●	●	--	--
(Labib et al., 2019)	--	●	--	--	--	●	●	●	--	●	--	--
(Mariano et al., 2020)	●	●	●	●	--	●	--	●	●	●	●	●
(Matsuo, 2018)	●	●	--	--	●	●	--	●	●	●	●	--
(McKeown, 2012)	●	●	●	--	--	●	--	●	●	--	●	●
(Middlehurst, Cross and Jeannin, 2018)	●	●	●	●	--	●	--	●	●	●	●	--

(Morais-Storz and Nguyen, 2017)	●	●	●	●	--	●	--	●	●	--	--	●
(Mull, Duffy and Silberman, 2022)	●	●	--	--	--	●	--	●	●	--	●	●
(Ngana, 2015)	●	●	●	●	--	--	--	●	●	--	--	●
(Nygren, Jokinen and Nikula, 2017)	●	●	●	●	--	●	--	●	●	--	●	●
(Peschl, 2019)	●	●	●	--	●	●	--	●	●	--	--	●
(Prabowo and Suhernita, 2018)	●	●	●	●	--	●	--	●	●	●	●	●
(Rebernik and Širec, 2007)	●	●	●	●	--	--	--	●	●	--	--	●
(Sasaki, Nummela and Ravasi, 2021)	●	●	●	--	--	●	--	●	●	--	--	●
(Sharma and Lenka, 2019)	●	--	●	--	--	--	●	●	●	--	--	●
(Sherwood, 2000)	●	●	●	--	--	●	--	●	●	--	●	--
(Snihur, 2018)	●	●	●	--	●	--	--	●	●	--	--	●
(Sotirakou and Zeppou, 2004)	●	●	●	●	--	--	--	●	●	--	--	●
(Srithika and Bhattacharyya, 2009)	●	●	●	●	●	●	--	●	●	●	●	●
(Starbuck, 1996)	●	●	--	--	●	--	--	●	●	--	--	●
(Usman et al., 2018)	●	●	●	●	--	--	--	●	●	--	--	●
SUM	35	38	29	21	6	25	4	38	35	23	22	29

Table 1. Classification of literature on unlearning support.

As our integrated overview shows, the majority of practical support approaches for unlearning were intangible artifacts in the form of frameworks and methods. In the following, we outline some examples from the literature sample and discuss our main observations in relation to unlearning support.

Frameworks are mostly meant to be used at the organizational level, to cover all three sub-process of unlearning as conceptualized by Fiol & O'Connor (2017) and Reese (2017), and to simultaneously address cognitive and behavioral knowledge structures. Concerning knowledge management and innovation, Rebernik & Sirec (2007) provide a five-step framework for making tacit knowledge explicit. It supports particularly the processes of destabilizing and experimenting. The *MATE model* by Sotirakou & Zeppou (2004) assists in transformational efforts in the public sector seeking to modernize governmental structures. In their case study on ethical leadership and organizational unlearning, Usman, Hameed & Manzoor (2018) developed a framework to support the unlearning of destructive behaviors. Prabowo & Suhernita (2018) focused on corruption as destructive behavior and developed the framework for *Shame-oriented Anti-Corruption Discernment Stimulation* aiming at public officials. Their processual understanding of unlearning is based on the five phases for transformative learning from Nohl (2015) whose process steps show strong similarities to works of Mezirow (1997) and Visser (2017). Making use of appreciative inquiry (AI), Srithika & Bhattacharya (2009) provide a strength-oriented framework called the *4-D-Cycle* of AI that highlights the need for continuous management of unlearning as an ongoing activity. It aims at supporting individuals, groups and organizations along the entire process of unlearning through *Discovery, Dream, Design* and *Destiny* and outlines supporting guidelines and methods. To ensure the sustained success of unlearning initiatives, studies in hospitality (Juan Gabriel Cegarra-Navarro et al., 2013), telemedicine (Juan Gabriel Cegarra-Navarro and Cepeda Carrión, 2013) and ambidexterity in SME (Juan Gabriel Cegarra-Navarro et al., 2011) employed the framework for the measurement of unlearning contexts. The framework consists of three sub-frameworks: lens fitting, changing individual's habits, and consolidating emergent understandings. Cegarra-Navarro & Sánchez-Polo (2008) applied it in a study on the Spanish optometry industry to assess unlearning efforts.

In terms of supporting **methods**, our sample disclosed guidance for reflection and coaching through mostly spatial approaches and external actors. Almost all authors mentioned **reflection**. Individual or joint reflection helps in the sub-process of experimentation but is also useful in others. For instance, Gold & Yeo (2012) suggest using reflection together with sensemaking. Prabowo & Suhernita (2018) propose reflection with discernment whereby individuals go through the stages of receptivity,

recognition, and grieving during self-reflection. Ashworth (2016) used threshold concepts to stimulate reflection in students. Besides reflection, **coaching** can support unlearning throughout the entire unlearning process. Clarke (1998), for instance, proposes paradoxical thinking as a useful method to break existing frames of reference which should be facilitated by external coaches. Grisold, Klammer & Kragulj (2020) report that external change consultants can act as coaches supporting the discarding of old habits and routines. Videotaping employee behavior with subsequent demonstration of old behavior to employees can supplement unlearning as reflection aid.

Besides reflection and coaching, **external actors** appear in different shades in our analyzed sample. For instance, Sasaki, Nummela & Ravasi (2021) show how external designers supported Japanese traditional firms by culturally adapting their processes and products. They “helped craft producers reach foreign consumers by envisioning alternative ways to use their traditional skills and materials“ (Sasaki, Nummela & Ravasi, 2021, p. 262), which shows their potential to act both as triggers for destabilization and as a means of support to develop new modes of thinking and altering old belief structures and behaviors. In a study on innovation in SMEs, McKeown (2012) suggests disruptive discourse as a method to challenge current beliefs and practices whereby mentors from the outside can assist managers. In a similar vein, Mull, Duffy & Silberman (2022) indicate how internal actors (e.g., team leaders) can act as coaches for employees and teams in the context of Human Resources Development interventions. Thus, they can have an impact by taking the role of positive disruptors, change agents, or unlearning cells (Grisold et al., 2020) facilitating sustainable unlearning.

Furthermore, **psychological safety** plays a central role since support approaches often aim at creating a safe environment (Edmondson, 1999). Individuals need to overcome emotional barriers and must not be feared to challenge existing ways of doing business. We found several accounts for providing unlearning-friendly environments as means of supporting unlearning: Reflective space or strategic spaces (McKeown, 2012); non-threatening environments, islands of temporal and spatial freedom (Mariano et al., 2020); space for experimentation, safe zones (Grisold et al., 2020). This resembles the concept ‘enabling spaces’ as put forward by Grisold, Kaiser & Hafner (2017).

We also found that **arts-based methods**, such as roleplay (Fiol & O’Connor, 2017), storytelling, and visual aids (Srithika and Bhattacharyya, 2009), can support individuals and groups in destabilizing and exploring new avenues for thinking and acting to prepare the grounds for discarding old knowledge.

Apart from that, **incentivization** can support the prevention of relapse into old routines (Srithika and Bhattacharyya, 2009). In its positive form, incentivization through rewards can help prevent employees from relapsing into old behaviors, thus supporting sustainable unlearning. However, if employees fall back to old routines, organizations may resort to sanctions as a negative form of incentivization.

In the end, we found a small number of **methods specifically designed for unlearning** in a given context. For instance, Baxter et al. (2004) have developed Old Way New Way, a method to support apprentices in discarding old routines during vocational education. In the context of humanitarian operations management, Labib et al. (2019) have developed a method that combines fault tree analysis and reliability block diagrams to support operations managers in reflecting on previous disasters to develop a better understanding and unlearn ineffective approaches during disasters.

5 Discussion and Future Research

We presented the results of our systematic review to answer our research question: “*Which practical approaches exist to support unlearning?*” We identified 41 papers relevant to this question and coded them based on our conceptualization of unlearning. The results show that frameworks prevail on the organizational level and methods on the individual and organizational levels. Cognitive and behavioral knowledge are mostly equally targeted goals for unlearning across the sample. We found support approaches for all three sub-processes of unlearning, but interestingly no software-based instantiations.

Overall, with our study, we **contribute** to ongoing research on unlearning support in two ways. To organize the field, we first synthesized various streams of research, including Information Systems, Psychology, Education, Management, into an integrated overview of practical support for unlearning.

This may serve as a common frame of reference for researchers of different disciplines. Second, we spotted research gaps that may inform future avenues for research, such as for the design of specific unlearning support tools. Thereby, we hope to promote the interdisciplinary accumulation of knowledge (vom Brocke, Winter, Hevner and Maedche, 2020) on the nascent field of unlearning support systems and lay the foundation for additional guidance and artifacts currently underrepresented in our sample.

Our results and findings have several broader **implications** for both academia and practice. *For researchers*, promising avenues for further research are outlined. The integrated overview of the literature may serve as a foundation for advanced research beyond the boundaries of this work. For instance, the process of unlearning may differ regarding various types of knowledge to be unlearned. This raises interesting questions, including: What are the differences in requirements between types of knowledge (i.e., cognitive, behavioural)? How do contexts (e.g., education, business) affect the unlearning process? To which extent are support approaches required to adapt to specific contexts? Apart from that, scholars might further investigate our dimensional concept, such as extending the sub-dimension ‘level’ to inter-organizational to consider the increasing interest in ecosystems. Then, what are the characteristics of the process of inter-organizational unlearning? How can multiple networked processes of unlearning be supported? Do new roles and/or requirements emerge? *For practitioners*, our study provides insights for the design and use of unlearning support systems. First, designers of new tools should extract design-relevant knowledge from existing artifacts (e.g., Chandra Kruse, Seidel and vom Brocke, 2019), such as process-oriented frameworks. Second, tools should provide features for managing and executing the sub-processes, and include features to ensure psychological safety. Third, new or refined tools should enable collaborative unlearning in digital environments, particularly for sub-processes that involve experimenting with new knowledge and discarding the old. Fourth, unlearning support should be guided by specific unlearning goals aiming at different levels (i.e., individual, group/team, organizational). Fifth, support approaches should facilitate repetition and continuous measurement to reduce the likelihood of relapse to old knowledge structures.

Aside from this, our research has **limitations**. For instance, other scholars might have used other search phrases or other data sources. However, as we focused on papers from conferences and journals beyond disciplinary boundaries, we are confident in having an appropriate sample. Further, other scholars might have conceptualized unlearning support differently yielding another coding of the papers. However, two researchers coded the sample based on established concepts in the literature on unlearning and – based on a shared understanding – discussed conflicts to ensure a stringent level of rigor in the process.

In **future research**, we plan to conceptualize design principles (Schoormann, Möller and Kruse, 2022) to build a prototype of an unlearning support system. To refine the design principles, we seek to use justificatory knowledge, such as from Change Management (Grisold et al., 2020), Agile Methods (Matook and Blasiak, 2020), and Behavior Change Support Systems (Oinas-Kukkonen, 2013). Based on the design principles, we plan to build and evaluate a novel prototype to obtain empirical insights into both the practical support for unlearning and the nature of the unlearning process per se. This will enable us to respond to recent calls for knowledge on unlearning beyond the conceptual level (e.g., Grisold, Kaiser and Hafner, 2017).

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