

Mitigating the Disruptive Consequences of Knowledge Loss in Organizational Settings: Knowledge Loss Clusters and Potential Organizational Interventions

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Abstract: This paper reviews the management and organization studies literature underpinning the construct of knowledge loss. It proposes that five clusters of knowledge loss influence the capacity of organizations to retain their valuable organizational knowledge. Such clusters include hanging, fading, disengaging, dissolving, and vanishing. To overcome the disruptive consequences of knowledge loss, this paper proposes five potential organizational interventions including reminding, refreshing, re-acquiring, re-building, and re-inventing. This paper discusses the implications for theory and managerial practice in the context of the knowledge management literature and provides directions to future research.

Keywords: Organizational knowledge, Organizational forgetting, Knowledge loss, Knowledge management, Organizational interventions, Literature review

1. Introduction

Organizations are constantly working on the proper retention of organizational knowledge, either in the form of storage facilities, or as workforce retention programs. Losing valuable organizational knowledge is indeed costly in terms of wasted time, money, or key resources (Mariano et al., 2020).

Despite the disruptive consequences of losing valuable organizational knowledge, knowledge loss still needs to be fully understood. For instance, the magnitude of disruptions caused by knowledge loss is still unclear. In the scholarly literature, there has been a tendency to treat different instances of knowledge loss univocally, with some exceptions (Martin de Holan and Phillips, 2004). However, a more in-depth examination of the existing scholarly literature shows that this tendency may be detrimental. Addressing the consequences of the most experienced organizational member's departure may be more challenging than retrieving a codified procedure from an archive that has become temporarily unavailable. These two examples relate to dissimilar clusters of knowledge loss that require separate interventions to prevent unsolicited disruptions.

This paper builds on an in-depth examination of the scholarly literature and proposes that different clusters of knowledge loss may indeed exist in organizations, suggesting potential managerial interventions. In this paper, knowledge loss is defined "the accidental disappearance of existing organizational knowledge" (Mariano et al., 2020, p. 191). This paper answers the following research questions: What are the clusters of knowledge loss? Which managerial interventions can reduce the disruptive consequences of knowledge loss?

This paper classifies different instances of knowledge loss in five clusters—i.e., hanging, fading, disengaging, dissolving, and vanishing—and suggests five potential interventions—i.e., reminding, refreshing, re-acquiring, re-building, and re-inventing—to help overcome the disruptive consequences of knowledge loss in organizational settings.

By proposing these five clusters of knowledge loss and their related organizational interventions, this paper contributes to current theory and managerial practice in several ways. First, it provides a more granular description of knowledge loss. Second, it proposes specific organizational interventions that may assist managerial practice with positive consequences on improved productivity and quality (Darr et al., 1995); maintenance of stocks of organizational knowledge (Boone et al., 2008) and knowledge retention mechanisms (Levy, 2011; Schmitt et al., 2011). Finally, this paper helps direct future empirical studies investigating the different impacts of knowledge loss on organizational practices (Mariano et al., 2020).

2. What is Knowledge Loss?

Knowledge loss has become a topic of scholarly and managerial interest since the early 1990s when it was originally discussed in the context of learning curves and organizational forgetting conversations (e.g., Argote, 2013; Blackler et al., 1999). Compared to unlearning (e.g., Cegarra-Navarro and Wensley, 2019)—which is the intentional removal of organizational knowledge to make room for new ways of doing things—knowledge loss

has been conceptualized as an unsolicited phenomenon with disruptive consequences on organizational productivity, efficiency and performance.

Over the last decades, scholars have documented knowledge loss in studies of organizational members' behaviors (Martin de Holan and Phillips, 2004); investigations of storage facilities (Argote, 2013); or have consider it an unsought consequence of organizational restructurings, mergers, or acquisitions (Anand et al., 2012). Grounded in such an extensive scholarly literature, this paper provides a synthesis for theory and managerial practice, grouping the potential causes of knowledge loss into five clusters. This paper also proposes five potential interventions to ease the disruptive consequences of knowledge loss.

3. Clusters of Knowledge Loss

3.1 Hanging

When organizational members become repositories of key organizational knowledge, the likelihood of disruptions associated to their unwanted behavior may increase (Massingham, 2018; Cattani et al., 2012). Hanging describes these potential disruptions and represents a first cluster of knowledge loss. If proper retention mechanisms are omitted, this valuable individual knowledge may be lost. This may be the case of knowledge that has not been used daily, which tends to disappear more easily (Fernandez and Sune, 2009). Indeed, passage of time and infrequent use have been proposed to be potential causes of knowledge loss at the individual level (Argote, 2013). Similarly, the extent to which knowledge is perceived as valuable is likely to influence its usage. Research has found that knowledge not directly connected to the relevant day-to-day tasks tends to disappear more quickly than core knowledge used on a regular basis (Mariano and Casey, 2016). If passage of time, infrequent use, or low perceived value influence the extent to which knowledge is used, hanging may surface. Hanging may be particularly detrimental when multiple individuals contribute to organizational processes and, therefore, the loss of one contribution may have a critical impact on the overall performance at a more aggregated level. For instance, there may be periodic submissions happening at given points in time and there may be considerable work to be performed to meet deadlines. If deadlines are missed, there may be interruptions in the amount of work performed by other individuals at higher levels in the hierarchical structure. Therefore, if the individual knowledge is lost, this may result in potential issues at a more collective level. Proper preventive mechanisms may have to be staged and periodically used to prevent collective disruptions.

3.2 Fading

Fading describes a second cluster related to knowledge retained in storage facilities such as records, archives, collective electronic infrastructure, and databases. Scholars have praised the role of shared databases to preserve information quality and facilitate knowledge transfer across organizational members (Boone et al., 2008; Agrawal and Muthulingam, 2015). Some have proposed that knowledge embedded in technology and storage facilities is less prone to depreciation or loss than knowledge embedded in routines or organizational members, promoting more technologically sophisticated organizational forms (Argote, 2013).

However, the disbandment of storage facilities such as when they break-up or cease to function; or their deterioration—a symptom of reduced quality, strength, passage of time or fall in disuse—are likely to determine the loss of crucial organizational knowledge. For instance, the removal of a repository can affect organizational memory, especially when the repository is highly centralized (Fernandez and Sune, 2009). Similarly, improper “clear desk” policies may produce documentation inaccessible to organizational members (Blackler et al., 1999). At times, technical or physical constraints (Easterby-Smith and Lyles, 2011) may prevent a proper access to storage facilities, records, or databases, although it may be temporal. Similarly, codification processes that make knowledge explicit but more abstract and generalizable could generate the loss of situated and heuristic knowledge available previously (Treleaven and Sykes, 2005).

Since organizational knowledge may dissipate in the long term—in terms of content as well as the rationale behind it (Easterby-Smith and Lyles, 2011)—deliberate and properly planned maintenance strategies are crucial. Having storage facilities is a necessary but not sufficient condition for organizational knowledge to be available and up to date. Keeping a repository functioning and updated is challenging. Similarly, if knowledge is hard to be found in the storage facilities, the system is less likely to be used (Franco and Mariano, 2007). Proper maintenance mechanisms have to be implemented to prevent the accidental loss of explicit organizational knowledge.

3.3 Disengaging

When organizational members move to other roles, departments, subsidiaries, or geographical locations, potential detrimental consequences may occur to organizational knowledge. Such detrimental consequences may include poor data handover (Shankar et al., 2013); reduced knowledge accessibility and coordination (Shaw et al., 2005); disruptions to knowledge flows (Ward and Wooller, 2010); disappearances of important contacts (Ward and Wooller, 2010); and misplaced, lost nodes, or broken links in networks of relationships (Shaw et al., 2005).

Disengaging describes those instances and represents a third cluster of knowledge loss. In such instances, knowledge may be lost but there is still a chance to retrieve it from the network of relationships. Research has found that gatekeepers, brokers, central nodes and, at times, peripheral network nodes contribute to the preservation of organizational knowledge (Argote, 2013; David and Brachet, 2011). A key aspect would be to make individual expertise known at a more collective level and facilitate internal interactions. Acquaintance and socialization strategies, especially in labor intensive organizations, become crucial (Boone et al., 2008). Similarly, a proper assessment of the roles and positions of organizational members may help reduce accidental knowledge losses. Certain forms of social networks that favor an optimal mix between strong and weak ties may also reduce knowledge loss if organizational members move (Droege and Hoobler, 2003; Schmitt et al., 2011). Additional strategies such as intergenerational learning practices (Bratianu and Leon, 2015), architectural knowledge, coordination among units, and development of existing capabilities to be transformed in effective organizational routines (Daghfous et al., 2013) could potentially mitigate knowledge loss and increase organizational knowledge retention.

3.4 Dissolving

Dissolving describes a fourth cluster of knowledge loss. In this specific instance, knowledge is permanently lost. It may be the case of departing organizational members, including internal replacement, quitting, or retirement of employees (Parise et al., 2006)—such as aging workforce (Calo, 2008), or replaced management teams (Ciuk and Kostera, 2010). When organizational members leave without a proper knowledge management strategy in place, organizations are likely to experience decreased revenues (Schmitt et al., 2011) and productivity (Massingham, 2018); disruptions to firm's credibility (Joe et al., 2013); customers mistrust (Massingham, 2018); and increased needs to orient and train newcomers (Droege and Hoobler, 2003). Knowledge loss due to turnover (Eckardt et al., 2014) includes the parting of subject matter expertise (Martin de Holan and Phillips, 2004; Eugene Jennex, 2014; Schmitt et al., 2011; Sumbal et al., 2018) and governance knowledge (Joe et al., 2013; Mariano et al., 2018); knowledge about business relationships and social networks (Easterby-Smith and Lyles, 2011); knowledge of business systems, processes or value chains (Joe et al., 2013); and institutional memory (Scalzo, 2006; Massingham, 2008; Haunschild et al., 2015). Indeed, when key organizational members leave, the subsequent knowledge downsizing caused by their departures may challenge the capacity to rebuild the lost organizational memory. Depending on who leaves and what knowledge departs with them, knowledge loss may have a qualitatively different impact. Turnover-related disruptions have highlighted the crucial importance of knowledge transfer strategies such as centralized knowledge management systems, demographic inventories (Calo, 2008), knowledge risk profiles, increased collaboration levels and stronger network ties (Droege and Hoobler, 2003; Dagfous et al., 2013; Schmitt et al., 2011), knowledge overlapping procedures, and job and career redesign.

3.5 Vanishing

Vanishing describes a fifth cluster related to the complex combinations of collective and physical spaces where organizational activities take place. It may be the case when mergers, acquisitions, or restructuring impose radical changes that have a disruptive influence on the amount and quality of knowledge possessed at the organizational level, creating knowledge asymmetries (Anand et al., 2012), and loss of know-how. Mergers or outsourcing have been found to create knowledge asymmetries and produce hidden costs of outbound knowledge flows. At times, they may have contributed to the loss of technological know-how (Conti, 2014) or legal knowledge (Reitzig and Wagner, 2010). For instance, leakages of technological know-how have been proposed to be asymmetric with respect to a firm's research and development strategy, with higher losses of valuable organizational knowledge in the case of riskier projects (Conti, 2014). More trusted partners have been proposed to let organizations acquire more knowledge, lose less valuable knowledge, and increase the overall level of alliance satisfaction (Norman, 2004).

4. Mitigating the Disruptive Consequences of Knowledge Loss

This paper proposes the following five potential interventions to help mitigate knowledge loss i.e., reminding, refreshing, re-acquiring, re-building, re-inventing.

4.1 Reminding

Reminding is a first intervention that is proposed to relate to the first cluster of knowledge loss i.e., hanging. It relates to individual knowledge. Reminding is proposed to be performed before (ex-ante) the accidental loss of knowledge may create disruptions at a more collective level. Strategies include prompt mechanisms to avoid knowledge loss due to passage of time or infrequent use of knowledge such as the use of how-to lists to accomplish a routine task; self-training mechanisms to re-acquire knowledge loss due to infrequent use; or the introduction of automated or less automated reminders to be sent periodically to provide the necessary information to accomplish certain tasks. For instance, an automatic gentle reminder that urges to provide certain documented forms of knowledge at given points in time e.g., “please remember to provide your elaborations by (include a certain date)”, accompanied with instructions on how to get the task done or individuals to contact in case of specific questions or concerns. Useful managerial assessment questions could include: Can this knowledge be conveniently codified for future uses? Who is in charge of collecting this knowledge? At what point in time is this knowledge going to be requested? Can an automated mechanism prevent potential knowledge loss-related disruptions?

4.2 Refreshing

Refreshing is a second intervention that is proposed to relate to the second cluster of knowledge loss i.e., fading. It relates to organizational knowledge embedded in storage facilities. Refreshing is proposed to be performed concurrently to keep the storage facilities fully functional. Strategies include the facilitation of both access and maintenance of the storage facilities. For instance, facilitating the access to electronic repositories, archives, documents to find explicit knowledge; introducing a dedicated person or system (e.g., automated chatbot) to provide pointers/links; and introducing mechanisms to facilitate and incentivize the sharing or tacit knowledge at a more collective level, since the act of documenting has been proposed to be a valuable strategy to keep key organizational knowledge in place (Levy, 2011). Useful managerial assessment questions could include: How can this knowledge be maintained and retrieved? What retrieval mechanisms can facilitate the location of this knowledge? Will there be a person in charge of maintaining this knowledge? What incentives can ensure the correct and timely update of the storage facility?

4.3 Re-acquiring

Re-acquiring is a third intervention that is proposed to relate to the third cluster of knowledge loss i.e., disengaging. It relates to knowledge found in the individuals’ networks of relationships. Re-acquiring is proposed to be performed concurrently to keep or strengthen the networks of relationships to find valuable knowledge that otherwise would be lost. This may be particularly useful during restructuring (Kleiner et al., 2011). Thus, the major aim of re-acquiring would be to facilitate the access to key nodes and links in available networks of relationships, including gatekeepers, brokers, central nodes and, at times, peripheral nodes. Strategies include the facilitation of virtual or less virtual networking sites; datasets of expertise or demographic inventories (Calo, 2008); or the development of relationships that may help increase knowledge exchange to answer questions such as “could you please tell me how we used to do that?” especially at an intergenerational level (Bratianu and Leon, 2015) to facilitate coordination within and across units. Additionally, it may be worth sending periodical updates related to network nodes that clarify where useful knowledge can now be found e.g., “Please note that Person X is now available for clarifications” or “Please note that the position has been assigned to Person Y who will be in charge to answer your questions”. Useful managerial assessment questions could include: How can the extended network of relationships be used to retrieve organizational knowledge that has now become unavailable? What pointers or referrals can be implemented to facilitate knowledge retrieval? How can a dataset of expertise be implemented? How can virtual and less virtual networking sites aid the location and retrieval of knowledge?

4.4 Re-building

Re-building is a fourth intervention that is proposed to relate to the fourth cluster of knowledge loss i.e., dissolving. Re-building is proposed to be performed ex-post, through reflection attempts and performance of actions to restore the lost knowledge, with the overall aim to strengthen the capacity to re-build the knowledge that had dissipated. Common clues to this type of knowledge loss include comments such as “we

used to know how to do this but not anymore”. Another clue may regard the temporary shift of roles. This may be the case in small businesses when the owner often has to take charge of a position that has become temporarily vacant and for which a replacement has yet to be found. When the organization realizes that knowledge may have been dissolved, actions to rebuild this knowledge, and to prevent similar disruptions need to be taken. These actions include the re-building of tacit, explicit, or relational knowledge, depending on the knowledge type that has been dissolved, including the overlapping of knowledge to have it always available at multiple locations, for instance implementing a master pool strategy to ensure that multiple individuals possess the needed knowledge. Useful managerial assessment questions could include: Is there a chance to restore the lost knowledge? Who can help re-build the lost knowledge? What actions can be initiated to recover from the lost knowledge on a short as well as long term basis? How a distributed knowledge system can be developed to prevent the loss of knowledge?

4.5 Re-inventing

Finally, re-inventing is the fifth intervention that is proposed to relate to the last cluster of knowledge loss i.e., vanishing. Re-inventing is proposed to be performed when knowledge has been permanently lost, often unknowingly. The major aim is to facilitate the recreation or optimization of knowledge and related processes to favor knowledge reinstate. It may be particularly important to look for clues that signal this cluster of knowledge loss after restructuring, mergers, or acquisitions. In these instances, there may be a tendency to re-invent the wheel because of lost know-how (Conti, 2014), knowledge asymmetries (Anand et al., 2012), or loss of technological and legal knowledge (Reitzig and Wagner, 2010). If knowledge loss occurs, there may need to be a conscious intention to identify it to prevent future knowledge loss. Useful managerial assessment questions could include: Has the organization experienced a reduced level of productivity after the restructuring? Could this reduced level of productivity be associated with lost knowledge? What organizational areas have been disrupted the most and who was involved with them? Have knowledge asymmetries advantaged our partners and disadvantaged our organizations? How can this be prevented?

For a summary, see Table 1 and Figure 1.

Table 1: Five Clusters of Knowledge Loss and Potential Organizational Interventions

Cluster	Disruptions	Organizational Interventions and Timeline	Mitigation Mechanisms	Assessment Questions
Hanging	Chain of task interruptions Collective outcomes disruptions	Reminding (ex-ante)	Prompt mechanisms to avoid knowledge loss due to passage of time, infrequent use, or low perceived value e.g., how-to lists, self-training, reminders	Can this knowledge be conveniently codified for future uses? Who is in charge of collecting this knowledge? At what point in time is this knowledge going to be requested? Can an automated mechanism prevent potential knowledge loss-related disruptions?
Fading	Disbandment (i.e., break up or cease to function), deteriorations, fall in disuse Loss of a centralized repository Clear desk policies and inaccessible documents Technical or physical constraints Loss of situated and heuristic knowledge during codification processes	Refreshing (concurrent)	Properly maintained IT Documentation eliciting explicit knowledge storage, access, and retrieval	How can this knowledge be maintained and retrieved? What retrieval mechanisms can facilitate the location of this knowledge? Will there be a person in charge of maintaining this knowledge? What incentives can ensure the correct and timely update of the storage facility?
Disengaging	Knowledge accessibility, coordination, and flow	Re-acquiring	Shared close relationships and	How can the extended network of relationships be used to

Cluster	Disruptions	Organizational Interventions and Timeline	Mitigation Mechanisms	Assessment Questions
	Broken links, misplaced or lost nodes Disappearances of important contacts Poor data handover	(concurrent)	workspaces Increased level of socialization and acquaintance in labor intensive organizations Assessment of role and position: Gatekeepers, brokers, central nodes, and peripheral nodes Favored forms of network structure with optimal mix between strong and weak ties Intergenerational learning Architectural knowledge and coordination among units Development of existing capabilities to transform into routines	retrieve organizational knowledge that has now become unavailable? What pointers or referrals can be implemented to facilitate knowledge retrieval? How can a dataset of expertise be implemented? How can virtual and less virtual networking sites aid the location and retrieval of knowledge?
Dissolving	Newcomers training needs Interferences in knowledge transfer Loss of subject matter expertise, business relationships, network knowledge, institutional memory including know-how, business systems, processes, and value chains knowledge Loss of governance knowledge Decreased revenues, productivity, credibility Increased customers mistrust	Re-building (ex-post)	Centralized knowledge management systems Demographic inventories Knowledge risk profiles and assessment Job and career redesigns Increased collaboration and stronger network ties Knowledge overlapping	Is there a chance to restore the lost knowledge? Who can help re-build the lost knowledge? What actions can be initiated to recover from the lost knowledge on a short as well as long term basis? How a distributed knowledge system can be developed to prevent the loss of knowledge?
Vanishing	Accidental loss due to re-structuring, mergers, or outsourcing Knowledge asymmetries in inter-organizational alliances Hidden costs of outbound knowledge flows Loss of technological/legal knowledge Leakages of technological know-how with higher knowledge losses in riskier projects	Re-inventing (ex-post)	Trusted partnerships Recreation/optimization attempts to facilitate knowledge reinstatement	Has the organization experienced a reduced level of productivity after the restructuring? Could this reduced level of productivity be associated with lost knowledge? What organizational areas have been disrupted the most and who was involved with them? Have knowledge asymmetries advantaged our partners and disadvantaged our organizations? How can this be prevented?

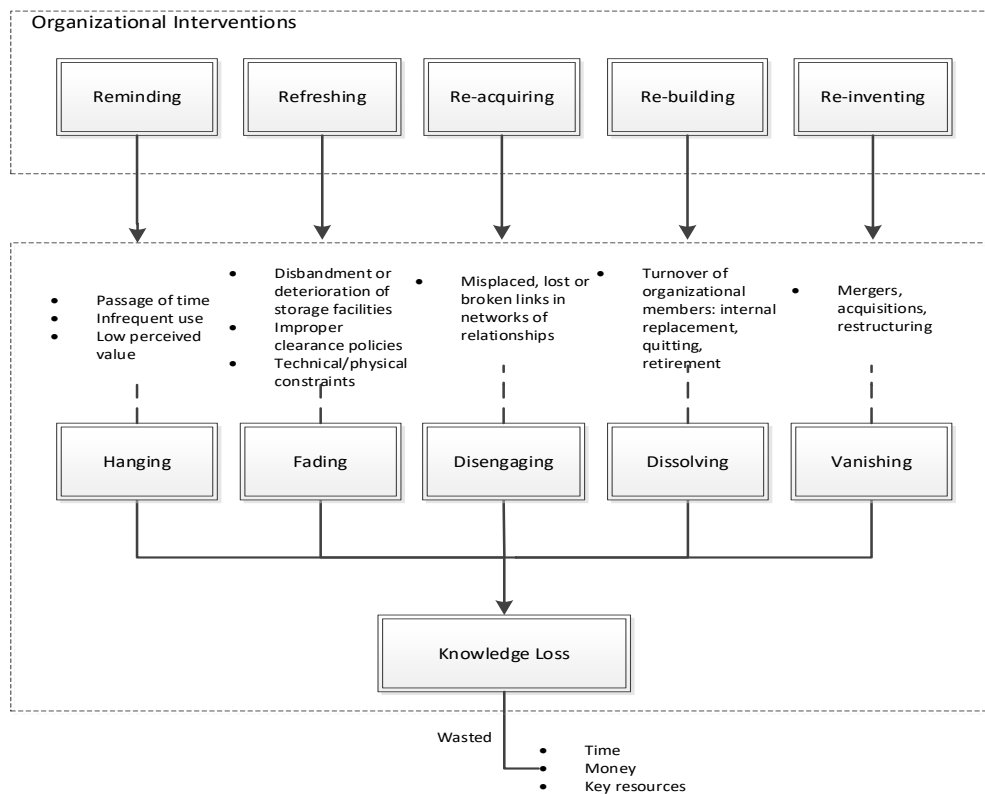


Figure 1: A Synthesis

5. Implications for Theory and Practice

This paper contributes to theory in several ways. First, it expands current understanding by proposing a classification of five different clusters of knowledge loss i.e., hanging, fading, disengaging, dissolving, and vanishing. These clusters of knowledge loss were grounded in the relevant literature on knowledge loss, and showed how changes to individuals and their relationships, storage facilities or the organizational structural dimensions could have an influence on the accidental departure of organizational knowledge. While a great deal of scholarly work has extensively investigated the key role of organizational learning and has linked it to organizational performance, only a few studies have provided more granular descriptions of the disruptive consequences of knowledge loss, proposing organizational dysfunctions such as avoidance, resistance, struggle, alteration, and conversion processes (Mariano and Casey, 2016). This paper adds to these studies and proposes that five clusters of knowledge loss may have different impact on an organization's possessed knowledge, depending on passage of time and infrequent use (Fernandez and Sune, 2009), low perceived value of knowledge (Mariano and Casey, 2016); failures in storage facilities (Franco and Mariano, 2007) or network of relationships (Shaw et al., 2005); or because of changes to an organization's structural dimension (Mariano and Casey, 2016).

Second, this paper proposes five potential organizational interventions to overcome the disruptive consequences of knowledge loss. These interventions include reminding, refreshing, re-acquiring, re-building, and re-inventing. These interventions are proposed to be applied ex-ante, concurrently, and ex-post, to anticipate potential knowledge loss disruptions, correct them along the way, or adjust collectively possessed knowledge after some organizational instances may have reduced it or completely lost it.

Third, this paper provides a new theoretical perspective and novel assumptions that may be tested by future empirical studies, especially those investigating organizations that are going through restructurings, significant changes to workforce, or introduction/disbandment of storage facilities (Levallet and Chan, 2019).

Managers who want to reduce the disruptive consequences of knowledge loss could consider specific points in time to positively enforce, assist, or support certain interventions that may help prevent or overcome knowledge loss. The proposed classification and potential organizational interventions provide managers with a roadmap to better understand knowledge loss as well as the possible ways to decrease its disruptive consequences.

6. Future Research Directions

Future research could empirically investigate the impact of each cluster of knowledge loss (or their combination) on organizational outcomes or organizational change processes.

Another area of investigation could examine the circumstances under which the rigidity of an organization's structure could affect the unintentional departure of organizational knowledge.

Furthermore, future research could investigate the temporal dimension of knowledge loss clusters. How does passage of time influence knowledge loss clusters? What are the conditions under which knowledge loss caused by passage of time produce organizational tensions and unsolicited organizational change?

Organizations that are experiencing high turnover rates or significant changes to workforce, and organizations that are going through restructurings or introduction/disbandment of storage facilities and information technology systems (Levallet and Chan, 2019) would represent ideal settings to conduct empirical examinations.

References

- Agrawal, A. and Muthulingam, S. (2015) "Does organizational forgetting affect vendor quality performance? An empirical investigation", *Manufacturing and Service Operations Management*, Vol 17, No. 3, pp 350-367.
- Anand, G., Gray, J. V and Siemsen, E. (2012) "Decay, shock, and renewal: Operational routines and process entropy in the pharmaceutical industry", *Organization Science*, Vol 23, No. 6, pp 1700-1716.
- Argote, L. (2013) "Organizational forgetting". In Argote, L. (Ed.), *Organizational Learning: Creating, Retaining and Transferring Knowledge* (pp 57-84), Springer.
- Blackler, F., Crump, N. and McDonald, S. (1999) "Organizational learning and organizational forgetting: Lessons from a high technology company". In Easterby-Smith, M., Araujo, L. and Burgoyne, J. (Eds.), *Organizational Learning and the Learning Organization: Developments in Theory and Practice* (pp 194-216), Sage.
- Boone, T., Ganeshan, R. and Hicks, R. L. (2008) "Learning and knowledge depreciation in professional services", *Management Science*, Vol 54, No. 7, pp 1231-1236.
- Bratianu, C. and Leon, R. D. (2015) "Strategies to enhance intergenerational learning and reducing knowledge loss", *VINE*, Vol 45, No. 4, pp 551-567.
- Calo, T. J. (2008) "Talent management in the era of the aging workforce: the critical role of knowledge transfer", *Public Personnel Management*, Vol 37, No. 4, pp 403-416.
- Cattani, G., Dunbar, R. L. M. and Shapira, Z. (2012) "Value creation and knowledge loss: The case of Cremonese stringed instruments", *Organization Science*, Vol 24, No. 3, pp 813-830.
- Cegarra-Navarro, J. G. and Wensley, A. (2019) "Promoting intentional unlearning through an unlearning cycle", *Journal of Organizational Change Management*, Vol 32, No. 1, pp 67-79.
- Ciuk, S. and Kostera, M. (2010) "Drinking from the waters of Lethe: A tale of organizational oblivion", *Management Learning*, Vol 41, No. 2, pp 187-204.
- Conti, R. (2014) "Do non-competition agreements lead firms to pursue risky R&D projects?" *Strategic Management Journal*, Vol 35, pp 1230-1248.
- Daghfous, A., Belkhdja, O. and C. Angell, L. (2013) "Understanding and managing knowledge loss", *Journal of Knowledge Management*, Vol 17, No. 5, pp 639-660.
- Darr, E. D., Argote, L. and Eppler, D. (1995) "The acquisition, transfer, and depreciation of knowledge in service organizations: Productivity in franchises", *Management Science*, Vol 41, No. 11, pp 1750-1762.
- David, G. and Foray, T. (2011) "On the determinants of organizational forgetting", *American Economic Journal: Microeconomics*, Vol 3, No. 3, pp 100-123.
- Droege, S. B. and Hoobler, J. M. (2003) "Employee turnover and tacit knowledge diffusion: A network perspective", *Journal of Managerial Issues*, Vol XV, No. 1, pp 50-64.
- Easterby-Smith, M. and Lyles, M.A. (2011) "In praise of organizational forgetting", *Journal of Management Inquiry*, Vol 20, No. 3, pp 311-316.
- Eckardt, R., Skaggs, B. C. and Youndt, M. (2014) "Turnover and knowledge loss: An examination of the differential impact of production manager and worker turnover in service and manufacturing firms", *Journal of Management Studies*, Vol 51, No. 7, pp 1025-1057.
- Eugene Jennex, M. (2014) "A proposed method for assessing knowledge loss risk with departing personnel", *VINE*, Vol 44, No. 2, pp 185-209.
- Fernandez, V. and Sune, A. (2009) "Organizational forgetting and its causes: An empirical research", *Journal of Organizational Change Management*, Vol 22, No. 6, pp 620-634.
- Franco, M. and Mariano, S. (2007) "Information technology repositories and knowledge management processes: A qualitative analysis", *VINE*, Vol 37, No. 4, pp 440-451.
- Haunschild, P. R., Polidoro, F. and Chandler, D. (2015) "Organizational oscillation between learning and forgetting: The dual role of serious errors", *Organization Science*, Vol 26, No. 6, pp 1682-1701.

- Joe, C., Yoong, P. and Patel, K. (2013) "Knowledge loss when older experts leave knowledge-intensive organisations", *Journal of Knowledge Management*, Vol 17, No. 6, pp 913-927.
- Kleiner, M.M., Nickelsburg, J. and Pilarski, A. (2012) "Organizational and individual learning and forgetting", *ILR Review*, Vol 65, No. 1, pp 68-80.
- Levallet, N. and Chan, Y.E. (2019) "Organizational knowledge retention and knowledge loss", *Journal of Knowledge Management*, Vol 23, No. 1, pp 176-199.
- Levy, M. (2011) "Knowledge retention: Minimizing organizational business loss", *Journal of Knowledge Management*, Vol 15, No. 4, pp 582-600.
- Mariano, S. and Casey, A. (2016) "The dynamics of organizational routines in a startup: The EREDA model", *European Management Review*, Vol 13, No. 4, pp 251-274.
- Mariano, S., Casey, A. and Olivera, F. (2018) "Managers and organizational forgetting: A synthesis", *The Learning Organization*, Vol 25, No. 3, pp 169-179.
- Mariano, S., Casey, A. and Olivera, F. (2020) "Organizational forgetting part I: A review of the literature and future research directions", *The Learning Organization*, Vol 27, No. 3, pp 185-209.
- Martin de Holan, P. and Phillips, N. (2004) "Remembrance of things past? The dynamics of organizational forgetting", *Management Science*, Vol 50, No. 11, pp 1603-1613.
- Massingham, P. (2008) "Measuring the impact of knowledge loss: More than ripples on a pond?" *Management Learning*, Vol 39, No. 5, pp 541-560.
- Massingham, P.R. (2018) "Measuring the impact of knowledge loss: a longitudinal study", *Journal of Knowledge Management*, Vol 22, No. 4, pp 721-758.
- Norman, P. M. (2004) "Knowledge acquisition, knowledge loss, and satisfaction in high technology alliances", *Journal of Business Research*, Vol 57, No. 6, pp 610-619.
- Parise, S., Cross, R. and Davenport, T. H. (2006) "Strategies for preventing a knowledge-loss crisis", *MIT Sloan Management Review*, Vol 47, No. 4.
- Reitzig, M. and Wagner, S. (2010) "The hidden costs of outsourcing: Evidence from patent data", *Strategic Management Journal*, Vol 31, No. 11, pp 1183-1201.
- Scalzo, N. J. (2006) "Memory loss? Corporate knowledge and radical change", *Journal of Business Strategy*, Vol 27, No. 4, pp 60-69.
- Schmitt, A., Borzillo, S. and Probst, G. (2011) "Don't let knowledge walk away: Knowledge retention during employee downsizing", *Management Learning*, Vol 43, No. 1, pp 53-74.
- Shankar, R., Mittal, N., Rabinowitz, S., Baveja, A. and Acharia, S. (2013) "A collaborative framework to minimise knowledge loss in new product development", *International Journal of Production Research*, Vol 51, No. 7, pp 1-11.
- Shaw, J.D., Duffy, M.K., Johnson, J.L. and Lockhart, D.E. (2005) "Turnover, social capital losses, and performance", *Academy of Management Journal*, Vol 48, No. 4, pp 594-606.
- Sumbal, M.S., Tsui, E., Cheong, R. and See-to, E.W.K. (2018) "Critical areas of knowledge loss when employees leave in the oil and gas industry", *Journal of Knowledge Management*, Vol 22, No. 7, pp 1573-1590.
- Treleaven, L. and Sykes, C. (2005) "Loss of organizational knowledge: From supporting clients to serving head office", *Journal of Organizational Change Management*, Vol 18, No. 4, pp 353-368.
- Ward, S. and Wooler, I. (2010) "Keeping knowledge flowing in a downturn: Actions for knowledge and information managers", *Business Information Review*, Vol 27, No. 4, pp 253-262.