# Let's Learn Unlearning: How Top Managers Conceive and Implement Knowledge Active Forgetting

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Abstract: Regarding the influential role of top managers in the process of unlearning, the main question in this paper is "how top managers understand and approach unlearning" in their managerial activities. Toward this aim, based on several case studies with top managers who have recently been involved in the process of knowledge based changes, we realized that top managers are more apt to focus on technical and concrete types of knowledge such as knowledge which resides in systems and procedures. Moreover, among all different possible approaches toward unlearning, they mainly make sense of this it as a process of "pushing by new knowledge", and "abandoning old knowledge" that both of them are radical approaches toward unlearning. The main lesson drawn in this study is that researchers who interact with managers in their inquiry about unlearning must be aware about the natural orientations of top managers and how this might affect the validity of their field inquiry. Above all, the insights gained in this study shows that field study about unlearning based on the opinions of managers is easy to start with, as managers can make sense about this process easily, but is difficult to focus on, because managers easily shift from unlearning old knowledge to learning new knowledge in their thoughts.

Keywords: Knowledge Management (KM), Knowledge Active Forgetting (KAF), creative destruction, unlearning

#### 1. Introduction

Looking at knowledge management literature from a process view shows that compared with "assessment", "creation", "absorption", "storage and organization", "sharing", and "utilization", there is a gap in terms of considering the role of "**knowledge active forgetting**" (Rezazade mehrizi and Bontis, 2009; De Holan and Phillips, 2004). So the notion of knowledge active forgetting and other closely related concepts like "**unlearning**" haven't been well developed in the literature (DeHolan and Filiphs, 2005).

One of the inevitable consequences of rapid changes in technical and non-technical knowledge in today's business life is the obsoleteness of current knowledge. In fact, the other side of the creation and development of new knowledge is the accumulation of old knowledge and technologies that not only remain in the labyrinth of organization, but also, might negatively influence the process of creation and learning new knowledge (Schumpeter, 1934; Schumpeter, 1943; Winter, 1984). For this reason, firms need to consider their strategies toward such old and obsolete knowledge in an explicit way.

On the other hand, the influential role of top managers in formulating and implementing strategic actions can lead us to this conjecture that the way in which they conceive and implement the process of unlearning might have a direct bearing on the success of this KM process. Also, it stands to reason that top managers make and take their strategic (as well as non-strategic) decisions and actions based on their understanding from their business. So, the way in which they understand and make sense about the concept of old and obsolete knowledge, and the process of KAF, not only has a significant bearing on whether they consider this course of action as a strategic agenda, but also can fundamentally influence the specific approach that they might adopt in dealing with such old and obsolete knowledge.

In this research, we focus on top managers to examine "how they understand the concept of unlearning" (and its closely related concepts, such as "unfreezing" and "creative destruction"), and "how they try to put this concept into practice". This investigation will provide us with insights about how managers can support or prohibit the process of unlearning in their organizations. Also, it can help us examine the process of unlearning in our empirical inquiry in a more valid way.

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Through a review of the related literature on KAF, we will come up with a classification of five approaches through which the old and obsolete knowledge could be managed (Starbuck, 1996; Becker, 2008; Howells and Mitev, 2008; Lee and Lim, 2001). Also, we try to spot main issues why KAF is a strategic issue. Then we will consider the influential role of top managers in the process of KAF and how their perceptions could affect their courses of action in this domain of practice. In the third section, we will elaborate our research method and then, in the fourth part of the paper we simultaneously report and analyze the collected data, as is the case in the reality of qualitative research. Then, major conclusions about the understanding of top managers about knowledge forgetting, and its possible practical and theoretical implications will be discussed.

# 2. Theoretical background

It is almost the dominant view that in today's economic competitiveness, knowledge, is one of the, and possibly the, most important competitive advantage of firms (Davenport and Prusak, 1998; Mayo and Lank, 1994). The increasing role of knowledge based sectors on one hand, and the ever increasing depth and breadth of global competition has heightened this trend. So, today, the KM discourse is one of the top priorities of research and also practice.

The other side of this story is the rapid pace of change in both technological and managerial knowledge. The increasing rate of patents, new products, new firms, new managerial tools and techniques are just a few evidences that point to the rapid rate of **obsoleteness** and **depreciation** of old knowledge and technology. But seems this side of story has attracted relatively less scholars' attention.

The wealth of research in the realm of KM and learning has provided us with numerous definitions, specifications and classifications of knowledge (Drucker, 1999; Davenport and Prusak, 1998; Nonaka, 1994; Descartes, 1911; Locke, 1987). Instead of digging into the controversial debate about what is knowledge (Jasimuddin, 2006, Nonaka and Takeuchi, 2004, Tsoukas, 2003, Lubit, 2001, Tsoukas and Vladimirou, 2001, Stenmark, 2000/2001, Meso and Smith, 2000, Spender, 1996, Lyles and Schwenk, 1992, Penrose E., 1959), and regarding the aim of this paper which is understanding different ways that top managers make sense about the old knowledge and KAF, we prefer to adopt a broad definition of knowledge that includes both its tacit and explicit attributes of knowledge (Nonaka, 1994; Nonaka and Takeuchi, 1995; Polanyi, 1966; Cowan et al., 2000; Wagner and Sternberg, 1986). Also, we would like to emphasize that knowledge here could be at different levels of aggregation form individual to inter-organizational (Hedlund, 1994), and also we need to consider different characteristics of knowledge types based on their stickiness (Szulanski, 1996), process of creation, context-dependency (Asheim and Gertler, 2004), the scope of influence (Schank and Abelson, 1977), and their different types (for example being descriptive, managerial, procedural, or causal (Anderson, 1985, Nonaka and Takeuchi, 1995; Schank and Abelson, 1997)).

One of the peculiarities of knowledge as a unique asset is its stickiness to its context and owners (Kakabadse et al., 2003). This makes knowledge different form data and information as the old knowledge has a natural tendency to **reside** in organization in different ways. In fact, detaching the old knowledge from organization seems to be much more difficult than just abandoning physical assets, and even firing part of human resources.

Linking the two above points, first, the rapid pace of obsoleteness of knowledge on one hand, and the difficulty involved in detaching the obsolete knowledge from the organizational memory (Spender, 1996, Stein, 1995) on the other reveals that dealing with the old and obsolete knowledge is neither easy nor a matter of rapid actions overnight. As mentioned by many authors, the natural tendency of organizations is a kind of inertia and resistance that seems to be even more serious in the case of knowledge intensive changes (Malerba and Orsenigo, 1997; Poel, 2003; Breschi and Orsenigo, 2000; Nolan and Croson, 1995). So, briefly, organizations need to think seriously about their old knowledge and how to manage them toward their organizational goals, in an active way.

Defining knowledge active forgetting as "the process in which organization tries to deal with its old and obsolete knowledge in order to reduce its possibly negative impacts and to ensure the achievement of organizational goals in a conscious way", we devote the resting part of the paper to this concept. However, the literature of knowledge management is highly dominated by the idea of knowledge sharing(Rezazade Mehrizi and Bontis, 2009), and the literature of organizational learning

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is mainly concerned about the creation and adoption and accumulation of **new** knowledge (DeHolan and Filiphs, 2005, de Holan et al., 2004, de Holan and Phillips, 2004).

KAF is important at least for different reasons. Firstly, the existence of old and obsolete knowledge, especially when the new knowledge is radically different from the old one, can negatively affect the process of understanding, absorbing and assimilating the new knowledge (Schumpeter, 1934; Cohen and Levinthal, 1990; Miles et al., 1998; Nystrom and Starbuck, 1984; Carlile, 1997). On the other hand, while the old knowledge is still resides in the organizational routines and processes, it makes difficult to apply new ways of action that are based on the new knowledge.

The dominance of the existing knowledge, with its own assumptions and underlying paradigms, metal models and schemas (Walsh, 1995, Walsh and Ungson, 1991, Walsh, 1988) can prohibit firms to detect the sights of new knowledge and also impair their potential for creativity, the fact that is mentioned in part of literature as core rigidity (Leonard-Barton D., 1992), and success competence trap (Liebowitz and Margolis, 1995, Witt, 1997, Cowan, 1990, Arthur, 1989).

For more clarification, the process of KAF although conceptually differs from learning in the sense that its focus is on the **old** rather than the new knowledge, but practically, it is inextricably intertwined with the learning and development of new knowledge (Howells and Mitev, 2008). As an analogy, when a car moves from point A to point B, it could be **described** in two ways:

- 1. The car detached from A.
- 2.The car reached B.

Both of these two descriptions are true, and basically reporting the same behavior but in different ways.

In this example, looking at the underlying mechanism of movement, we might find the someone pushed the car farther from A and/or pulled toward B. Although here, these two mechanism are not mutually exclusive (because both can be happen at the same time), the resulting outcome would be the same, the movement of car between A and B.

Conceptually, if we consider learning as acquiring or creating new knowledge<sup>1</sup>, and unlearning<sup>2</sup> and forgetting as the way in which we deal with the old knowledge, a similar confusion might happen when we focus at the **behavior or outcome** of these two processes. In both learning and unlearning process, the result, in case of success, would be a new state. But when we focus on the underlying mechanism and trace what has happened to the old and new knowledge and which one has been the focus and leveraging point, it would be clearer to distinguish between these two different mechanisms.

Apart from this conceptual discussion, the process of KAF composes of two parts (not necessarily successive stages): 1) identification 2) action.

In the Identification part, the firm consciously realizes the existence of the old and obsolete knowledge and reflects (Scarbrough et al., 2004) on the possible negative or limiting impacts of it. This part is necessary to makes KAF as a kind of active (rather than just a kind of passive improvising). For example, learning from failures, could be one of the methods through which this identification phase takes place.

<sup>&</sup>lt;sup>1</sup> Although there are some authors that argued against this concept about learning and claimed that learning covers also the concept of unlearning, but for two reasons, we adopt this view here: 1) because the overall tone of literature of organizational learning is mainly considers learning as the way in which we acquire and create new knowledge, and 2) because this helps us to proceed though our discussion will less confusion.

<sup>&</sup>lt;sup>2</sup> Although many authors like (DeHolan and Filiphs, 2005, de Holan et al., 2004, de Holan and Phillips, 2004) implicitly or explicitly used unlearning and forgetting interchangeably, we think that these two concepts are different as the KAF has more clear emphasis on the knowledge as the subject of forgetting, while in unlearning, we might unlearn not only the old knowledge, but also old behaviors, situations, structures, and even artifacts.

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The second part of the KAF is related to the action that firms perform to deal with this identified old and obsolete knowledge. Based on a literature review, the described and prescribed ways of KAF can be summarized as these five categories:

Awareness: just knowing and declaring which knowledge is obsolete or harmful is enough

There different ways in which this approach can be implemented. For example, some scholars have emphasized on a kind of "continuous skepticism" or "doubts about current beliefs and methods" (Starbuck, 1996: 725) as a necessary condition in dealing with old knowledge.

**Stop using:** unlearning means just not using the old and obsolete knowledge, but still the knowledge resides in the organizational memory

Sometimes the normal processes of forgetting and transition may not be sufficient (Becker, 2008), so we need to go through more aggressive and formal methods of unlearning. Maybe the most popular approach in dealing with the old knowledge could be just not using that specific knowledge (Howells and Mitev, 2008). For example, stopping the production based on a specific technology, or not using the old methodologies of software development could be evident examples of this approach.

**Stop knowledge development:** here KAF means not only stopping using old and obsolete knowledge, but also changing the process of knowledge creation and absorption to stop the process of development obsolete knowledge.

In this way, stop development could be implemented through stopping R&D projects, and even intentionally stopping knowledge transfer and knowledge collaborations. The most evident example of this strategy is when Korean companies stopped developing their knowledge on the production Static-RAM once the Dynamic-RAM technology came to the market (Lee and Lim, 2001).

**Push out by new knowledge**: KAF here means just trying to learning new alternative knowledge is enough for the aim of actively forgetting the old knowledge.

This approach is conceptually different from absorbing new knowledge in the way that is more specific. A company might adopt a specific knowledge and **adds** it to its knowledge repository. In this case, there is not replacement, instead we are dealing with the knowledge accumulation. But this approach toward KAF means the firm intentionally replaces the old knowledge by the new one.

**Wipe out old knowledge**: here KAF means explicitly and formally removing the old parts of organizational memory in a radical way. for example firing old experts.

The most aggressive approach toward KAF seems to be abandoning. As an analogy, this is like a kind of surgery for removing the malfunctioned part.

Taking the old hardware and software out of the organization, throwing out dated documents and records and even firing experts who have been addicted to the old knowledge are some examples of this approach.

Vividly, these five approaches are not necessarily mutually exclusive (because sometimes more than one approach is used in a specific case), nor exhaustive. There might be other approaches (a new combination of these approaches or a completely different one) for the action part of KAF process. But for the aim of our paper this list seems prepare a satisfactory basis for thinking about the variety of possible approaches toward KAF. Finally, under each approach, there might be a pretty large number of ways in which it can be materialized. Examining the effectiveness of these approaches deepening on different contingencies (such as the type of knowledge, organizational factors, and the history of organization) is an interesting research agenda which out of the purview of this paper.

Regardless of the approach(es) used for KAF, there almost of a great consensus that the role of top managers in the process of KAF is crucial, both in positive (Hamel and Prahalad, 1994: 56; Normann, 1971; Starbuck, 1983) and in negative way. For example, as clearly mentioned by Nystrom and Starbuck (1984):

"Top managers' ideas dominate organizational learning, but they also prevent unlearning. Encased learning produces blindness and rigidity that may breed full-blown crises." (Nystrom and Starbuck, 1984: 52).

## They add:

"top managers, bolstered by recollections of past successes, live in worlds circumscribed by their cognitive structures. Top managers misperceive events and rationalize their organizations' failures." (Nystrom and Starbuck, 1984: 57-58).

Also, top managers have a heavy agenda of possibly positive actions that can facilitate the process of KAF, such as supporting new ideas and formally criticizing and sometimes abandoning the resources and structures shaped around the old knowledge (Nystrom and Starbuck, 1984, Lyles and Schwenk, 1992).

The wealth of literature on the decision making and organizational behavior has revealed that managers like all human being behave based on their mental models (Walsh, 1995) and, and generally, their understanding and perception about the subject. However, because of the limited cognitive capabilities of managers (Simon et al., 1963), and also other institutional boundaries there is no guarantee that their conception of issues correspond to the reality. Although reaching the ideal state of manager's understanding is not feasible, it stands to reason that we have to try to foster the level of correctness and relevance of their understanding about the important issues.

Following this line, the understanding of top managers from the concept of old and obsolete knowledge and possible approaches for managing it seems to be of a great potential impact on the success of the process of KAF. Although measuring the strength of this relation between the managers' understanding of the concept of KAF and the proper action that they take accordingly seems a relevant and interesting line of research, it is again out of the focus of this paper. But, as in imperative for such kind of inquiry, we need first to depart from the **academic and theoretical** discourse, and immerse in the reality of the business digging down into the cognition of managers in this regard. Knowing how managers, and especially top managers, think and make sense about the concepts related to KAF has these possible advantages.

Firstly, in a descriptive sense, it can provide us with new insights to have a better understanding of old and obsolete knowledge, and how it can be managed. Finding concrete examples of old knowledge, how managers understand the old-ness and obsoleteness of knowledge can deepen our conceptual framework and also avoiding us from falling the trap of a tautological debate. Secondly, it can help us to better communicate with managers in this area and create a more reliable and valid measurement methods (not necessarily in a quantitative way) for further researches. And thirdly, it might reveal how managers are aware or ignorant about this important issue.

So, based on the above discussion, our main research question here is how managers understand and make sense about the concept of old and obsolete knowledge and also the process of KAF.

## 3. Methodology

Regarding the aim of research which understanding the way in which top mangers conceive the concepts related to KAF, and due to the fact that our subject of study is the managers' understanding which is a subjective issue the most relevant research strategy would be a kind of interpretative research (Schutz, 2005).

For this reason, we used a qualitative approach based on interviews with top managers. The necessity of richness of the experience of managers about the knowledge based changes determined to a great deal the targeted audiences. So, we mainly selected three top managers (in this case the first two levels of organizational chart) that have been involved in knowledge based organizations. The first case was related to a management consultancy unit in one of the Iranian Ministries. The second one was the head of a dedicated training and education institute that was associated to one of the ministries. And the third case was the CEO of one of the largest automotive companies. All managers have had an experience of more than 10 years managing in different positions and almost all of them have been involved in several knowledge based changes. The diversity of the organizations helped us to cover a range of both technical and managerial knowledge.

For sure, because of the need to getting rich data and the difficulty of getting in touch with top manager due to their busy schedule, our options was limited in terms of the number of managers.

#### Data collection method:

A critical incident interview protocol (Boyatzis, 1998) has been developed before each interview. We found some examples of knowledge based changes for each case. We started the interview session with a short introduction about the overall research. Then we focused on the concrete examples of knowledge based changes, asking the managers to describe us their story about the process of change. We tried to ask them indirectly to more focus on the old knowledge and how they identified it, what were the sights of the obsoleteness, and how they dealt with it. Admittedly, they were more eager to talk about the new changes and the new knowledge, so it in some cases it took us more than one session to get sufficient insights related to the KAF.

Using the overall approach of critical incident techniques helped us to get more reliable and concrete clues about the understanding of top managers about the old knowledge and the process of KAF.

### Data analysis method

We transcribed the recorded interviews and using a paper and pencil method of inductive thematic analysis (Boyatzis, 1998) we analyzed the data. For the aim of more reliability and validity of results, implemented the triangulation of researchers (Eisenhardt, 1989) as two researchers coded the data independently and the results were compared and analyzed.

# 4. Findings and analysis

To frame our findings, we focus on three key topics: 1) How managers understand the concept of knowledge and how identify it, 2) How they make sense about the concept of old and obsolete knowledge and how identify it, and 3) how they understand and enact the process of KAF.

## The Concept of Knowledge and its Identification

By and large, top managers referred in their answers to knowledge mainly through issues such as policies, routines, procedures, systems and processes that exist in the organization, as well as individuals' behavioral patterns and habits. For example one of them mentioned, "the procedure in our organization, employee behavior, methods which are institutionalized in our organization ..."

#### The Concept of old and obsolete knowledge and its identification

After getting some clues about how top managers understand the concept of knowledge, we try to analysis top managers' views about the concept of *old* knowledge in the organization. Basically they sensed the oldness and obsoleteness of knowledge through two things: first when they compared it with a new alternative knowledge and second when they faced a serious problem that happened because of an old and obsolete knowledge.

## Facing a new knowledge

It was very difficult for the top managers to label something as old knowledge without comparing it with some new knowledge and in fact they could hardly perceive old and obsolete knowledge without having been exposed to new knowledge. For instance one of the top managers mentioned that: "considering the situation and new developments in our work area, we decided that we needed to bring about changes and inject new knowledge into the system".

Facing a critical and serious problem in the organization

Another situation that helped managers to make sense about their old knowledge was when they faced a serious problem because of the obsoleteness of their knowledge. In other words, top managers' understanding about old knowledge reflects a sort of failure in using their old knowledge. For example when asked about old knowledge and ways to identify them, one of them expressed: "one of the most important problems that I noticed in my organization was that: people tried to give a solution before having the problem well defined and measured", "our problem was to use a third party regarding the issue of organizational excellence and after a while a saw that

the organizations under our supervision do not reflect the realities throughout their respective organizations", and in fact they tried to identify old knowledge when they encountered a problem.

#### The process of KAF

We tried to figure out how managers make sense about the process of KAF. The result of our thematic analysis can be summarized as follows.

Great tendency to use new knowledge and replace old knowledge by the new one

As top managers are often inclined to use and push new knowledge and new methods, compared to other processes for knowledge active forgetting, they usually prefered to KAF as a kind of replacement procedure. Based on our five approaches, they well understood KAF in terms of "pushing by new knowledge".. For example we saw statements like: "we saw that some of the procedures which were quite prevalent throughout the organization were actually wrong and so we promoted new procedure to replace the old ones", "what we did was to define an educational mechanism and to create a higher goal, so that people could compare themselves with it and update themselves, and in this way they automatically discarded much knowledge that needed to be put away".

Abandoning of old knowledge

In addition to "pushing by new knowledge" which was the most convenient way of making sense about KAF process, managers understood this process as an "abandoning" process of old and obsolete knowledge.

However, as the process of abandoning and letting go of old knowledge can have many negative effects on the organization and incite serious resistance, most top managers are not very much inclined to use this process for KAF. Besides the top managers that participated in our study, worked in the public sector, therefore because of some considerations such as implementation risks, organizational tensions, resistance among members they had more hesitation to consider abandoning as a feasible approach toward KAF. This statement by one of the executives is illuminating, " In fact it is not operationally possible for us to through them away".

Stop using old knowledge

Top managers usually use this method in order to forget less importance old knowledge. In fact the managers pointed out that "considering some knowledge that is not very important and is worn out, it should not be used and should be left alone". Therefore, this method may be useful in dealing with some knowledge which is of less importance.

# 5. Conclusion

In this paper we tried to focus on the understanding of top manages about KAF. Therefore we analyzed the views and opinions of managers regarding the tree important issues: the concept of knowledge, the concept of old and obsolete knowledge, and the process of KAF.

Moreover, interviews with managers indicated that facing the concept of knowledge their attention quickly moves toward more concrete instance of knowledge and in fact they tend to have a better understanding of this type of knowledge. In talking about knowledge, whenever we mentioned this type of explicit knowledge, afterward it was very difficult for them to redirect their attention to implicit and subjective knowledge in their organization. This shows that dealing with top managers in our filed inquiry, we have to bear in mind that their attention to knowledge is not comprehensive to include all types of knowledge. So, researches must think about other complementary ways that help them to elicit the views of top managers about other more intangible and subjective types of knowledge.

It was very difficult for the top managers to focus on the concept of forgetting and thus they tended to pay attention to new knowledge and the ways to acquire that knowledge. Therefore, it can be concluded that when speaking to managers about KAF, it is better to start from learning new knowledge in order to get them into the subject, but then, we need to shift their attention from new knowledge to the old knowledge. Through this process, the can start thinking about old knowledge and how they managed it in a better way.

Furthermore, managers did not show a comprehensive view about KAF and did not pay attention to all the methods through which we might implement unlearning. Thus it is necessary for us to offer a complete and thorough introduction to the subject so that the top managers can have a complete, systemic and systematic understanding of forgetting in the organization. This has some implications for not only academic research in this field, but also training programs for top managers to draw their attention toward the whole spectrum of approaches toward managing old and obsolete knowledge.

Though, it is important to mention that this paper is a first step toward investigation of top managers' understanding about KAF. In the future, more comprehensive researches need to be conducted based on the findings of this paper to investigate the understanding of managers about forgetting of different types of knowledge - implicit, explicit, individual, organizational, technical, managerial, descriptive, procedural, causal- in organizations through more deep case studies in different sectors.

#### References

- Anderson, J. R. (1985) Cognitive Psychology and Its Implications, New York, NY, Freeman.
- Arthur, W. (1989) Competing technologies, increasing returns, and lock-in by historical events. Economic Journal, Vol. 99, pp. 116-131.
- Asheim, B. T. & Gertler, M. S. (2004) The Geography of Innovation, Regional Innovation Systems. IN FAGERBERG, J., MOWERY, D. C. & NELSON, R. R. (Eds.) The Oxford Handbook of Innovation. New York, Oxford University Press.
- Becker, K. (2008) Unlearning as a Driver of Sustainable Change and Innovation: Three Australian Case Studies. International Journal of Technology Management, Vol. 42, pp. 89-106.
- Boyatzis, R. E. (1998) *Transforming Qualitative Information: Thematic Analysis and Code Development,* Thousand Oaks, CA, Sage Publications.
- Breschi, F.M. and Luigi Orsenigo, (2000) Technological regimes and Schumpeterian patterns of innovation The economic Journal, VOL.110(463), pp. 388-410.
- Carlile, P. (1997) Transforming knowledge in product development: Making knowledge manifest through boundary objects. Unpublished dissertation, University of Michigan,.
- Cohen W. M. and Levinthal D. A. (1990) *Absorptive capacity: a new perspective on learning and innovation.*Administrative science quarterly, Vol.**35**, pp. 128-152.
- Cowan, R. (1990) Nuclear Power Reactors: A Study in Technological Lock-in. Journal of Economic History, Vol. 50, pp. 541-567.
- Cowan, R., David, P.A. and Foray, D. (2000) *The explicit economics of knowledge codification and tacitness*. Industrial and Corporate Change, **Vol. 9**(No. 2), pp. 211-253.
- Davenport, T. and Prusak, L. (1998) Working Knowledge: How Organizations Manage What They Know. Harvard Business School Press.
- DeHolan, P.M.d. and Phillips, N. (2004) Remembrance of Things Past? The Dynamics of Organizational Forgetting. Management Science.
- Deholan, P. M., Phillips, N. & Lawrence, T. B. (2004) Managing Organizational Forgetting. MIT Sloan Management Review, Vol. 45, pp. 45-51.
- Deholan, P. M. & FILIPHS, N. (2005) Organizational forgetting. IN EASTERBY-SMITH, M. & LYLES, M. A. (Eds.) The Blackwell Handbook of Organizational Learning and Knowledge Management. Oxford, Blackwell Publishing, pp. 393-409.
- Descartes, R. (1911) Discourses on the methods. The Philosophical Works of Descartes, Vol. 1, trans. by Haled, E.I. and Ross, G.R.T.(Cambridge University Press, Cambridge, MA, pp. 217-24).
- Drucker, P. (1999) Knowledge-Worker Productivity: The Biggest Challenge. California Management Review. Eisenhardt, K. (1989) Building theory from case study research. *Academy of Management Review*, Vol. 14, pp. 532-550.
- Hamel, G. and Prahalad, C.K. (1994) Competing for the Future: breakthrough strategies for seizing control of your industry and creating the markets of tomorrow. Harvard business school press.
- Hedlund, G. (1994) A model of knowledge management and the N-form corporation. *Strategic Management Journal*, Vol. 15, pp. 73-90.
- Howells, J. and Mitev, N. (2008) Working paper: A Sceptical Approach to the Concept of 'Unlearning': Empirical Evidence on Learning and 'Unlearning' in Two Major Process Studies of ICT Systems Implementation. Centre for Organizational Renewal and Evolution.
- Jasimuddin, S. M. (2006) Disciplinary roots of knowledge management: a theoretical review. International Journal of Organizational Analysis, Vol. 14, pp. 171-177.
- Kakabadse, N.K., Kakabadse, A. and Kouzmin, A. (2003) Reviewing the knowledge management literature: Towards a taxonomy. Journal of Knowledge Management, Vol. 7(No. 4), pp. 75-91.
- Lee, K. & Lim, C. (2001) Technological regimes, catching-up and leapfrogging: findings from the Korean industries. Research policy, *Vol.* 30, pp.459-483.
- Leonard-Barton D. (1992) core capabilities and core rigidities: a paradox in managing new product development. strategic management journal, 13, 111-125.
- Liebowitz, S.J. and Margolis, S.E. (1995) Path Dependence, Lock-In, and History. Journal of Law, Economics, and Organization, Vol. 11(No. 1), pp. 205-226.

- Locke, J. (1987) An Essay Concerning Human Understanding: Book II. Oxford University Press, Oxford.
- Lubit, R. (2001) Tacit Knowledge and Knowledge Management-The Key to Sustainable Competitive Advantage. *Organizational Dynamics*, Vol. 29, pp. 164-178.
- Lyles, M. A. & Schwenk, C. R. (1992) Top management, strategy and organizational knowledge structures. *Journal of Management Studies*, Vol. 29, pp.155-174.
- Malerba, F. and Orsenigo L. (1997) technological regimes and sectoral patterns of innovative activities. industrial and corporate change, VOL. 6, pp. 83-117.
- Mayo, A. & Lank, E. (1994) The Power of Learning: A Guide to Gaining Competitive Advantage, St. Mut, London. Meso, P. & Smith, R. (2000) A resource-based view of organizational knowledge management systems. Journal of Knowledge Management, Vol. 4, pp. 224-234.
- Miles, G., et al., (1998) Some conceptual and research barriers to the utilization of knowledge. California Management Review, Berkeley, Vol. 40(No. 3): p. 281-288.
- Nolan, R.L. and Croson, D.C. (1995) Creative Destruction: A Six-stage Process for Transforming the Organization. Harvard Business Press.
- Nonaka, I. (1994) A Dynamic Theory of Organizational Knowledge Creation. Organization Science, VOL.5, pp. 14-37.
- Nonaka, I. and Takeuchi, H. (1995) The Knowledge Creating Company. New York: Oxford University Press.
- Nonaka, I. and Takeuchi, H. (2004) Theory of Organizational Knowledge Creation, in Hitotsubashi on Knowledge Management. John Wiley & Sons. p. Chap. 3.
- Normann, R. (1971) Organizational Innovativeness: Product Variation and Reorientation. *Administrative Science Quarterly*, Vol. 16, pp. 203-215.
- Nystrom, P.C. and Starbuck, W.H. (1984) To Avoid Organizational Crises, Unlearn. Organizational Dynamics, Vol. 12(No. 4), pp. 53-65.
- Penrose e. (1959) The Theory of the Growth of the Firm, Oxford, Blackwell.
- Polanyl, M. (1996) The Tacit Dimension. London: Routledge and Kegan Paul Ltd.
- Rezazade Mehrizi, M.H. and Bontis, N. (2009) A cluster analysis of the KM field. Management Decision, Vol. 47(No. 9).
- Scarbrough, H., Swan, J., Laurent, S., Bresnen, M., Edelman, L. & Newell, S. (2004) Project-Based Learning and the Role of Learning Boundaries. *Organization Studies*, Vol. 25, pp. 1579–1600.
- Schank, R. C. & Abelson, R. (1977) Scripts, Goals, Plans, and Understanding, NJ: Erlbaum, Hillsdale.
- Schumpeter, J.A. (1934) The theory of economic development. Cambridge: Harvard Economic Studies.
- Schumpeter, J. A. (1943) capitalism, socialism and democracy. London: George Allen and Unwin.
- Schutz, A. (2005) Common-Sense and Scientific interpretation of Human Action. IN STEHR, N. & GRUNDMANN, R. (Eds.) *Knowledge Critical Concepts.* Taylor & Francis.
- Simon, H., NEWELL, A. & SHAW, J. (1963) The processes of creative thinking. *Contemporary approaches to creative thinking* New York, Atherton press.
- Spender, J. C. (1996) Organizational knowledge, learning and memory: three concepts in search of a theory. *Journal of Organizational Change Management,* Vol. 9, pp. 63-78.
- Starbuck, W. H. (1983) Organizations as action generators. *American Sociological Review*, Vol. 48, pp. 91-102. Starbuck, W.H. (1996) Unlearning Ineffective or Obsolete Technologies. International Journal of Technology
- Starbuck, W.H. (1996) Unlearning Ineffective or Obsolete Technologies. International Journal of Technology Management, Vol. 11, pp. 725-737.
- Stein, E. W. (1995) Organizational memory: review of concepts and recommendations for management. *International Journal of Management*, Vol. 15, pp. 17-32.
- Stenmark, D. (2000/2001) Leveraging Tacit Organizational Knowledge. *Journal of Management Information Systems*, Vol. 17, pp. 9-24.
- Szulanski, G. (1996) Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm *Strategic Management Journal*, Vol. 17, pp. 27-43.
- Tsoukas, H. (2003) Do we really understand tacit knowledge? IN SMITH, M. E. & LYLES, M. A. (Eds.) The Blackwell handbook of organizational learning and knowledge management. Oxford, Blackwell.
- Tsoukas, H. & Vladimirou, E. (2001) What Is Organizational Knowledge? *Journal of Management Studies*, Vol. 38, pp. 973-993.
- Wagner, R.K. and Sternberg, R.J. (1986) *Tacit Knowledge and intelligence in the everyday world*, in *Practical intelligence*, R.J. Sternberg and R.K. Wagner, Editors. Cambridge University Press: New York.
- Walsh, J. P. (1988) Selectivity and selective perception: an investigation of managers' belief structures and information processing. *Academy of Management Journal*, Vol. 31, pp. 873-96.
- Walsh, J. P. (1995) Managerial and organizational cognition: Notes from a trip down memory lane. *Organization Science*, Vol. 6, pp. 280-321.
- Walsh, J. P. & Ungson, G. R. (1991) Organizational Memory. *The Academy of Management Review,* Vol. 16, pp. 57-91
- Winter, S.G. (1984) Schumpeterian competition in alternative technological regimes. Journal of economic behavior and organization, Vol. 5, pp. 287-320.
- Witt, U. (1997) "Lock-in" vs. "critical masses" Industrial change under network externalities. International Journal of Industrial Organization, Vol. 15(No. 6), pp. 753-773.

