

KNOWLEDGE RISKS TAXONOMY BASED ON THE ORGANIZATIONAL KNOWLEDGE DYNAMICS

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Abstract:

Research background: Business organizations are open to information and knowledge fluxes crossing their borders from inside out and from outside inside. Also, organizational knowledge may have an internal generation of knowledge, and knowledge sinks. Understanding this organizational knowledge dynamics provides a new perspective on knowledge vulnerabilities and risks. Taking advantage of this perspective, the paper presents a new ontology of knowledge risks contributing this way to the extant literature dedicated to knowledge risks.

Purpose of the article: The purpose of the paper is to present a new ontology of knowledge risks based on organizational knowledge dynamics.

Methods: The method is based on a conceptual framework of organizational knowledge dynamics (OKD) and on a semantic literature review. The knowledge gap addressed by this research is between the spectrum of knowledge risks and organizational knowledge dynamics. Some of the main types of knowledge risks in the literature are knowledge loss, knowledge leakage, knowledge waste, and knowledge spillover. The research design is based on a literature review, followed by a theoretical proposal of a new classification for knowledge risks, which is also our answer to bridging the knowledge gap. Our methodological approach for analyzing the knowledge risks used key expressions and focused on some key authors.

Findings & Value added: The main findings are intended to complete the gaps in the previous knowledge risk categories by using a criteria-based approach for defining a comprehensive classification.

Keywords: knowledge risks; knowledge taxonomy; organizational knowledge dynamics; knowledge processes.

JEL Classification: D80, D81, D83

1. Introduction

If an organization succeeds in attaining a superior knowledge base as a result of a process of organizational learning, this is associated in the literature with the superior performance of that firm (Bratianu, Prelipcean & Bejinaru, 2020; Curado, 2006; Mahler & Casamayou, 2009; Pedler, Burgoyne, & Boydell, 199; Senge, 1990).

Although learning at the organizational level may be one of the few competitive advantages that are sustainable for organizations, an organization's knowledge base may be negatively impacted by internal and external factors, especially during crises like the COVID-19 pandemic (Bratianu, 2020; Bratianu & Bejinaru, 2021). Part of these influencing factors is related to knowledge risks. Unfortunately, the literature that analyzes the concept of "knowledge risks" is vast and treats diverse types of knowledge risks from different perspectives without a clear relationship with the organizational knowledge dynamics. Thus, there is a knowledge gap between the taxonomies published so far and the complexity of the organizational knowledge dynamics as a result of the specificity of each organizational knowledge process.

The main purpose of the present paper is to propose a new taxonomy or ontology for the knowledge risks by taking into account organizational knowledge dynamics generated by different knowledge processes. Thus, the generic research question can be formulated as follows:

RQ: How can be created a taxonomy of knowledge risks based on the organizational knowledge paradigm?

The concept of *knowledge risk* is an application of the generic concept of *risk* to knowledge processes, and it reflects the potential situation in which there could be some negative consequences of some decisions concerning knowledge processes under the influence of internal and external factors (Cameron & Raman, 2005; Massingham, 2010; Massingham, 2020; Society for Risk Analysis, 2018). To understand *knowledge risks*, we have first to understand the concept of *knowledge vulnerabilities* within a given organization. They are the weak points of the knowledge system and knowledge management routines. These weak points may be the roots of knowledge risks because they initiate the knowledge risks under the pressure of some external forces (Bratianu & Bejinaru, 2022; Fuchs, Birkmann & Glade, 2012; Sarawitz, Pielke & Keyhah, 2003).

Knowledge risks are associated with activities performed under the pressure of uncertainty (Hastie & Dawes, 2001; Lindley, 2006). It is a fact of life that uncertainty cannot be avoided and that business and economics cannot be developed in a determinist mode. However, we care about knowledge risks only when their negative consequences imply significant losses for organizations. In other words, we start looking for knowledge risks only their impact on the competitive advantage becomes unacceptable. For smart organizations, managers should analyze their knowledge vulnerabilities and knowledge risks in a continuous way because the changes in the external environment create a high level of uncertainty.

2. Literature review

In life sciences, engineering, and management, the concept of risk is associated with those events whose consequences are negative. For instance, natural catastrophes like earthquakes and floods produce huge material and human damage. Car accidents and technological breakdowns produce significant material and human damage. Bad decisions or economic crises lead to financial losses. All of these events have in common a probabilistic nature and the conceptual difficulty of anticipating them (Les Coleman & Casselman, 2016;

Massingham, 2010). However, in the banking and insurance domains, the concept of risk includes both negative and positive consequences as possible results in some uncertain conditions (Anastasei, 2004; Pritchett *et al.*, 1996; Williamson, 2008). In our research, the interest is focusing only on those possible events with negative consequences. People refer to these risks as pure or real risks, while the others used in finance are called speculative risks. When considering risks in the field of knowledge management, pure risks are those that would make sense. Thus, when we refer to the dynamics of knowledge, we take into consideration the possibility that knowledge may reduce its value when knowledge risks manifest. In this paper, this topic is analyzed within the context of knowledge processes: knowledge creation, knowledge acquiring/ import, knowledge capturing, knowledge storage (access, retrieval, and protection), knowledge use – internal, and knowledge use – external. This means that the study takes the approach that knowledge risks can manifest themselves along knowledge processes.

Although we focus in this paper on knowledge risks, we should emphasize the importance of identifying first the knowledge vulnerabilities of the knowledge management system because they are the roots of all possible knowledge risks. “Vulnerabilities reflect some system’s weaknesses with respect to some external forces that may produce physical, financial, operational, or human damages. Vulnerabilities show why different systems have different reactions to the changes produced in the external environment” (Bratianu & Bejinaru, 2022). Within this framework, knowledge risk “describes a likelihood of any loss resulting from the identification, storage or protection of knowledge that may decrease the operational or strategic benefit of a company” (Durst, 2019, p. 21).

The literature on knowledge risks is dominated by the papers published by Durst and Zieba (Bratianu, *et al.*, 2020; Durst, 2019; Durst & Henschel, 2020; Durst & Wilhelm, 2013; Durst & Zieba, 2017; Durst & Zieba, 2018; Durst, Hintereger & Zieba, 2019; Durst & Zieba, 2019; Zieba, 2017; Zieba & Durst, 2018). Their works focus mostly on knowledge taxonomies. Analyzing the above papers, we find that taxonomies state the following types of knowledge risks: knowledge attrition, knowledge hiding, knowledge hoarding, knowledge leakage, knowledge loss, knowledge spillover, and knowledge waste.

Knowledge loss may be considered, in our opinion, the most significant way to diminish the value of knowledge that an organization has along its knowledge processes. For example, Durst & Zieba (2017) appreciate that knowledge loss is a type of knowledge risk that can not be avoided because of retirements or employee turnover that is increasing. For instance, DeLong (2004) remarks on what happened at Boeing after an early retirement bad strategy: "After Boeing offered early retirement to 9,000 senior employees during a business downturn, an unexpected rush of new commercial airplane orders left the company critically short of skilled production workers. The knowledge lost from veteran employees combined with the inexperience of their replacements threw the firm's 737 and 747 assembly lines into chaos" (pp. 18-19). Also, some of the lost knowledge may never be regained. This puts a strategic issue for organizations. According to the literature, there are also other types of situations when knowledge can be lost: employee poaching (by other organizations), accidents, health issues, or even the death of an employee (Durst & Zieba, 2017, after Durst & Wilhelm, 2011).

According to Bratianu (2018), a process through which an organization may reduce the loss of knowledge when employees leave or retire is knowledge retention. This strategy is also mentioned by Zieba (2017). The process of knowledge retention is related to maintaining knowledge that exists in the minds of the employees and is important for the organization. In order for strategies for knowledge retention to be supported, an organization needs to develop an organizational culture that stimulates knowledge retention through intergenerational

learning (Bratianu & Leon, 2015; Bratianu *et al.*, 2011). Closed to knowledge loss is knowledge waste (Durst & Zieba, 2017, 2019). Knowledge waste refers to the knowledge that is available in an organization, but managers ignore its presence and its potential use. In most cases, knowledge waste is tacit.

Somehow related, in our opinion, to knowledge loss is *knowledge attrition*. This type of knowledge risk refers to corrupted (for example, waiting too much time to use some knowledge or inappropriate use of certain knowledge) or obsolete knowledge (Durst & Zieba, 2019). Knowledge attrition is considered to be a gradual process that may be stopped, and thus it can or not lead to an actual loss of knowledge (Durst & Zieba, 2017).

Knowledge hiding is considered a risk in the relationship with the process of knowledge sharing (Serenko & Bontis, 2016). “Knowledge hiding behavior refers to the intentional behavior in the workplace where employees deliberately pretend to be stupid, conceal or refuse to provide knowledge requested by colleagues” (Bai, 2020, p. 407-410). *Knowledge hoarding* means accumulating knowledge that, later in time, may be shared or not, and this appeared in the case when that knowledge was not asked for by other employees in the organization (Durst & Zieba, 2019).

When an organization loses knowledge, either in an accidental or a deliberate way, to personnel that is not authorized or even outside of the organization, it means that *knowledge leakage* has manifested (Durst & Zieba, 2017). When talking about knowledge leakage, we can consider sensitive knowledge about an organization's customers or knowledge related to the organization's products or even strategies (Durst & Zieba, 2019). There are multiple areas in which knowledge leakage may appear: human resources, suppliers, competitors, clients, and non-competitive organizations.

Knowledge spillover has commonalities with knowledge leakage, in our opinion. This type of knowledge risk happens when the knowledge of value to an organization spills out to organizations that are competitors and will use that knowledge to obtain competitive advantages (Durst & Zieba, 2017). This knowledge risk is usually related to situations when organizations are part of networks or alliances. However, there are ways to reduce that risk by obtaining intellectual property on different theories, ideas, or projects.

Another interesting concept is that of *knowledge forgetting*. According to de Holan & Phillips (2004), there are two modes of organizational forgetting: purposeful and accidental. Knowledge forgetting is related to the process of unlearning (Cegarra-Navarro & Moya, 2005).

There are many other types of knowledge risks mentioned in the literature. In Durst & Zieba (2019) we can also find the following: missing or inadequate competencies of organizational members, risks related to old technologies, risks related to cybercrime, risks related to social media, digitalization risks, risks related to knowledge gaps, relational risks, risks of improper knowledge application, risks of using obsolete or unreliable knowledge, knowledge outsourcing risks, espionage, communication risks, continuity risks, knowledge acquisition risks, knowledge transfer risks, mergers and acquisition risks. However, the number of knowledge risks is not important because, from a practical point of view, we may have infinite types of risks. Risks can be defined whenever we address uncertainty and probabilistic thinking. The main issue is to understand the set of risk types and the criteria based on which a taxonomy or ontology is constructed. Otherwise, there are no clues on how to act in order to decrease their consequences.

Bratianu (2018) shows that all the papers published so far in this area of knowledge risks consider knowledge to be rational. However, the theory of knowledge fields demonstrates that knowledge has three basic dimensions (i.e., rational, emotional, and spiritual), and each

dimension should be considered in developing a comprehensive knowledge risk analysis. Thus, we discuss about *emotional risks* and *spiritual risks*, which can have dramatic consequences on the evolution of an organization. Emotional risks may happen when there are organizational changes, especially among managers. For instance, changing the management style from a democratic and people-oriented to an autocratic and job-oriented style will induce many frustrations among employees and negative consequences in their contribution to the innovation processes. Spiritual risks may happen when there are changes at the top level of the organization because these changes will affect the vision, mission, and fundamental values of that organization.

Knowledge risks are clearly related to the specific knowledge processes in any organization (Cameron & Raman, 2005; Massingham, 2020; Waring & Glendon, 1998). The knowledge management literature is very rich in examples of knowledge processes proposed by different authors. This diverse array of names attributed to knowledge processes comes from the fact that we are talking about abstract concepts with areas of imprecision in their meanings. Nevertheless, some common ground can be found by analyzing the proposals of several authors.

After analyzing the work of several authors, Staab *et al.* (2001) propose a list of five knowledge processes: knowledge creation, knowledge import, knowledge capture, knowledge retrieval, access, and knowledge use. Andrews & Delahaye (2000) propose a list of two knowledge processes that they call knowledge distribution or knowledge contributing (sharing one's own knowledge) and acquisition or knowledge adopting (importing knowledge from another source). Andreeva & Kianto (2011) synthesize a list of six processes: knowledge creation, intra-firm knowledge sharing, external knowledge acquisition, knowledge dissemination, knowledge storage, and documentation. Kraaijenbrink (2012) presents a list of four knowledge processes: knowledge creation, knowledge application, knowledge integration, and knowledge retention. The number of processes is not the same for the diversity of organizations and knowledge management systems. That is why it is important to consider those processes that are generic for most organizations and to discuss the knowledge risks in association with them.

3. Methodology

The present paper is conceptual and proposes a new classification for knowledge risks by taking into consideration the dynamics of knowledge value for the firm. More specifically, we are taking into consideration how the value of an organization's knowledge may be affected by the presence of these knowledge risks. The present research is based on a semantic literature review, looking for books and papers discussing knowledge vulnerabilities and risks. We used keywords like "knowledge vulnerabilities," "knowledge risks," "risk management," "knowledge risk management," and "knowledge risk analysis". We searched on the well-known databases Emerald, de Gruyter, Elsevier, Proquest, Sage, Springer, Scopus, and Web of Science, and the journals dedicated to knowledge management.

After searching and analyzing the literature, we could conclude that in the literature there have been proposed diverse typologies and classifications of knowledge risks, but we also observed that there is a gap in the literature. This gap concerns the dynamics of knowledge value, depending on risks related to knowledge. The present paper proposes a new classification for risks related to knowledge, with the intention of covering the gap. For this, we are also taking into consideration knowledge processes within organizations since the presence of risks is related to uncertainty about different outcomes or outputs of actions

undertaken. Thus, there is an implicit relation between knowledge processes and knowledge risks, and the nature of the processes related to knowledge will determine the nature of knowledge risks.

4. Results and discussion

Organizational knowledge dynamics

Organizational knowledge is a concept based on the process of knowledge dynamics creation at the individual level and integration at the team and organizational levels (Nonaka & Takeuchi, 1995; Nonaka & Takeuchi, 2019). Organizational knowledge is composed of three fundamental fields of knowledge (i.e., rational, emotional, and spiritual) in concordance with the theory of knowledge fields and knowledge dynamics (Bratianu, 2018). Rational knowledge plays a dominant role in the decision-making process, emotional knowledge contributes significantly to creating the organizational culture, and spiritual knowledge is fundamental in creating the vision and the mission of the organization. Organizational knowledge is a nonlinear entity (Bratianu & Vasilache, 2009) and has a certain distribution that yields organizational knowledge entropy. The more uniform the distribution is, the higher the knowledge entropy is (Ben-Naim, 2012; Bratianu, 2007; Bratianu, 2019; Chalidze, 2000).

Figure 1 illustrates the main organizational knowledge dynamics (OKD) components: KA – knowledge acquisition, KC – knowledge creation, KS – knowledge sharing, KU – knowledge use, and KL – knowledge loss. Nonaka and Takeuchi (1995, 2019) explain in their SECI (Socialization, Externalization, Combination, and Internalization) model how individual knowledge is created and then expanded to the team and organizational levels. It represents the main component of any organization and its intellectual capital. Knowledge creation (KC) contributes directly to the increasing level of organizational knowledge and intellectual capital. When there is a need for more knowledge or the organization is small to produce its own knowledge, managers go for knowledge acquisition (KA). There are different ways of doing that. The simplest one is to purchase knowledge embedded in books, journals, reports, databases, or even software. The more sophisticated way is to hire knowledgeable people or to ask some consulting companies to offer a part from their expertise on specific problems. Also, knowledge can be purchased in the form of training programs.

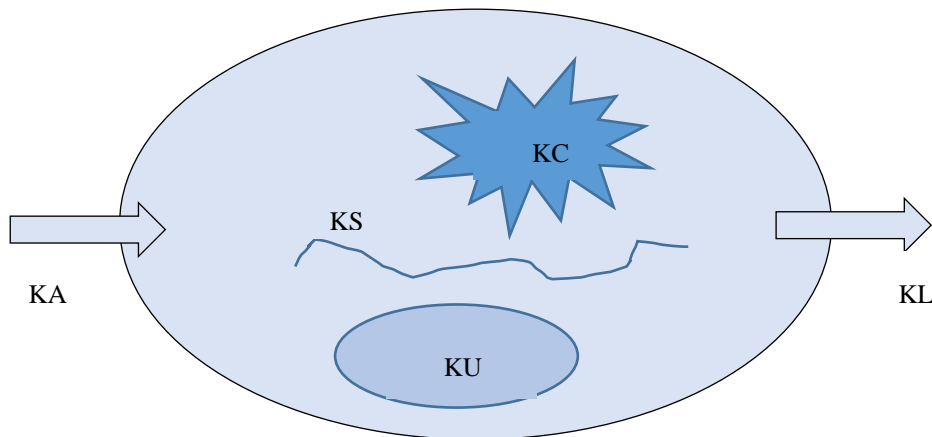
Knowledge acquisition contributes to the increasing level of organizational knowledge. Knowledge sharing (KS) has a major role in changing the organizational knowledge distribution in order to increase knowledge entropy (Ben-Naim, 2012; Chalidze, 2000) and stimulate innovation. Knowledge sharing does not contribute to the increase in organizational knowledge content. Knowledge use (KU) refers to embedded knowledge in products and services. Knowledge use does not decrease the level of knowledge because knowledge can be re-used any time it is needed. Knowledge loss (KL) is knowledge that leaves the organizational boundary when people retire or managers just fire them out during economic crises (DeLong, 2004; Mahler & Casamayou, 2009). Knowledge loss contributes to the decrease of the organizational knowledge level. Considering the integrated effect of all these components, we get the organizational knowledge dynamics (OKD) for the knowledge variation within a given time interval ΔK :

$$\Delta K = \Delta KC + \Delta KA - \Delta KL \quad (1)$$

This equation is the framework for the new knowledge risks taxonomy we want to develop because it reveals the knowledge process that contributes to the organizational knowledge dynamics. The identification of risks in any risk management system is based on discovering

the hazards or threats related to the risks. The questions are: “What could cause harm?”; “What is the probability of a certain event that may bring damages?”; “How severe would likely adverse effects be?” (Waring & Glendon, 1998). Knowledge risks are linked to incidents affecting organizational knowledge, where knowledge is disclosed, leaked, forgotten, or lost.

Figure 1. Organizational knowledge



Source: Authors' own research

The standard deviation, or variance, is a well-known measure of risk, as it includes both the probability of occurrence and the estimated magnitude of change of the potential results (Williamson, 2008; Pritchett et al., 1996). The knowledge risk (KR) is the result of the product between the probability of occurrence of a certain knowledge event (KE) that will produce a certain magnitude of knowledge damage (KD):

$$KR = KE \cdot KD \quad (2)$$

Starting with equations (1) and (2), we can develop a model for having a better understanding of the knowledge risk categories. The first logical step is to separate the types of knowledge variations into the following groups or clusters:

- *Knowledge value variations can occur due to the contributions of knowledge creation, knowledge acquisition, and knowledge loss variables within the organization's boundary.* This perspective is easy to understand if we consider the organization as a knowledge entity well-defined by its interface with the external environment. The interface is permeable to knowledge fluxes because the knowledge management system is an open system.
- *Knowledge value variations can occur without gaining or losing knowledge, based on the changes of different contextual factors leading to a change in the distribution of organizational knowledge.* It is the contribution of knowledge sharing, knowledge hiding, knowledge hoarding, and knowledge transformation from one field to another one.
- *Knowledge value varies when there are transformations between the three basic knowledge fields: rational, emotional, and spiritual.*

For our taxonomy, based on the above arguments, we will consider the following main knowledge processes: knowledge creation (KC), knowledge acquisition (KA), knowledge sharing (KS), knowledge use (KU), and knowledge loss (KL). We shall add emotional knowledge (EK) processes and spiritual knowledge (SK) processes based on the theory of knowledge fields.

Proposal of a new classification of knowledge risks based on the dynamics of knowledge value in the knowledge processes of an organization

The new taxonomy is presented in Table 1. We would like to remark on the fact that our focus was the organizational knowledge dynamics structure and balance, such that we did not consider for this taxonomy risks generated by using the information technology. We consider that it is a quite different domain of analysis with a specific logic and complexity that should be approached by experts in cybersecurity.

Table 1: Proposed taxonomy of knowledge risks

Clusters	Risks typologies
(KC) Knowledge creation	KRNC – Knowledge risk of non-creation. It is a major risk as a result of lacking the capability of knowledge creation or the necessary motivation to do it.
	KRWT – Knowledge risk of wrong timing. It is quite frequent to come up with ideas too early to be accepted or too late to be useful.
(KA) Knowledge acquisition	KRNA – Knowledge risk of not acquiring the necessary knowledge at the required time.
	KRWA – Knowledge risk of wrong acquisition. It happens due to the ignorance of those who decide.
(KL) Knowledge loss	RKLR – Risk of knowledge loss with the retirement of people. Retired people may take with them critical knowledge for the production of goods and services.
	RKSO – Risk of knowledge spillover. Here, we consider the loss of exclusivity or even ownership of knowledge.
	RKFO – Risk of knowledge forgetting. That can be a random or intentional process.
(KS) Knowledge sharing	RKHI – Risk of knowledge hiding. People may manifest fear or lack of trust in sharing their experience and expertise with other people.
	RKHO – Risk of knowledge hoarding. Many people are interested in hoarding knowledge for themselves without any willingness to share that knowledge.
(KU) Knowledge use	RKAT – Risk of knowledge attrition when embedding it into products and services. It is a risk for generating low quality products and services.
	RKWA – Risk of knowledge waste. That happens when managers do not use the available organizational knowledge.
(EKD) Emotional knowledge dynamics	EROC – Emotional risk of organizational change. Any change generates emotions due to the unknown future. The risk is high when there is a critical lack of information about the purpose of the organizational change.
	ERCM – Emotional risk of changing the managers. That is a significant risk when managers with different management styles are changed. New managers may generate tensions and frustrations among employees. The risk can be dramatic when new transformational leaders come to power.
(SKD) Spiritual knowledge dynamics	SKRV – Spiritual knowledge risk of changing the organizational values system. That happens when top managers or business owners are changed. That happens especially after mergers and acquisitions.
	SKRC – Spiritual knowledge risks when people work in different cultures within multinational companies. The lack of necessary cultural intelligence may lead to such risks.

Source: Authors' own research

We emphasize the fact that each risk type presented in Table 1 can be decomposed into several other risks with specific probabilities of occurrence. Thus, Table 1 is a comprehensive but not exclusive taxonomy of knowledge risks.

5. Conclusions

Knowledge risks constitute an emergent topic due to their importance in designing robust knowledge management systems. The literature dedicated to this topic contains papers focusing mostly on different taxonomies, which represent the first attempts to build up a coherent theory of knowledge vulnerabilities and knowledge risks. Many of the published taxonomies lack a systematic approach and a clear criterion used in performing the ontology. In most cases, the authors use their imagination and experience in dealing with knowledge risks.

The purpose of this paper is to present the organizational knowledge dynamics equilibrium balance and to build up a new taxonomy based on the main processes evidenced in that dynamics. The equation refers to the dynamics of the level of organizational knowledge dynamics as a result of the positive contribution of knowledge creation and knowledge acquisition and the negative contribution of knowledge loss. Also, the paper reveals the dynamics of knowledge distribution as a result of knowledge sharing and knowledge use. These two latter processes do not contribute quantitatively to the knowledge level dynamics but only to the distribution of organizational knowledge dynamics and knowledge entropy.

Our analysis results are presented in Table 1, considering the main risks associated with the following processes: (KC) – knowledge creation, (KA) – knowledge acquisition, (KL) – knowledge loss, (KS) – knowledge sharing, (KU) – knowledge use, (EKD) – emotional knowledge dynamics, and (SKD) – spiritual knowledge dynamics. The EKD and SKD processes are critical for organizational knowledge risks, yet they lack almost entirely from the literature. Thus, the contribution of the present paper is reflected not only in the logical model used to build up the taxonomy but also in introducing in our findings new knowledge processes based on the theory of knowledge field developed by one of the authors in some other papers.

The limitations of the paper could be interpreted as being related to the degree of detailing the knowledge risks categories, but that is possible in future research.

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