

Knowledge Vulnerabilities: Definitions and Interpretations

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Abstract

Although many studies have been carried out in the knowledge domain, knowledge vulnerabilities is still a less explored field, difficult to analyze, full of challenges, with areas of high interest especially in the current times of unpredictable changes. The paper aims to study knowledge vulnerabilities, focusing on their definitions and interpretations. We propose an analysis on the existing publications dealing with knowledge vulnerabilities and knowledge risks. A critical analysis shows that the concept of knowledge vulnerabilities is used in some complex studies like those focusing on climate change, but not in the knowledge management systems. That is a significant knowledge gap for the knowledge management systems considering that already researchers focus on knowledge risks. The findings demonstrate the importance of introducing this concept in the analysis of knowledge risks and in elaborating strategies for reducing the probabilities of their emergence and of mitigating the associated possible consequences.

Key words: knowledge, knowledge vulnerabilities, knowledge management, knowledge risks

J.E.L. classification: D83, G32, D81

1. Introduction

Nowadays, we wonder how challenging can be for the knowledge management all the changes around the world, especially for the knowledge risks management. Constant changes are marked by unpredictability, including the global pandemic crisis, military tensions between the United States of America and China, Turkiye and Greece, the Israeli and Palestinian conflict, Russia and Ukraine, insurgencies in Africa and other parts of the world, as well as energy crisis, global food crisis, financial crisis, warming climate crisis, and cybersecurity war, “given the fact that organizations have less time to manage all the uncertainties and that they are constrained to continuously develop new strategies to assure healthy management of knowledge risks” (Ursache, 2022b).

Even if in the last 20 years the number of research topics in the knowledge domain has increased and become more and more diversified, the concepts of *knowledge vulnerabilities* and *knowledge risks* have not been analyzed in depth. In fact, there is a notable knowledge gap concerning the study of knowledge vulnerabilities, although they are at the root of any possible risk. The concept of knowledge vulnerabilities has already been introduced in other science domains like climate change and health systems, but not in the knowledge management systems yet. Understanding knowledge vulnerabilities help managers and leaders to identify much better the possible knowledge risks and design strategies to mitigate their consequences (Bratianu, 2002; Bratianu & Bejinaru, 2022; Durst & Henschel, 2020; Durst & Zieba, 2017; Durst & Wilhelm, 2013).

The first stage of our research is to identify the main significant definitions of the *knowledge vulnerabilities* and to understand their semantic domains. If we cannot find such definitions, we should look for the definitions given to *vulnerabilities* in other domains and to think how we can adopt them for the knowledge management systems. The current work seeks to conduct a systematic analysis of current academic research to find some relationships between knowledge management, knowledge risks and knowledge vulnerabilities. We can state our research question as follows:

RQ: What is the relationship between knowledge vulnerabilities and knowledge risks in the knowledge management systems?

The structure of the current paper is as follows. Following this brief introduction, we present a critical literature review, we explain the methodology, and present our findings. Finally, we present the main conclusions of our research and its limitations.

2. Literature review

2.1. Knowledge management

Knowledge is intangible and nonlinear, distinguishing this way clearly from tangible resources like physical objects, including monetary resources (Bratianu, 2007, 2023; Bratianu & Bejinaru 2023; Nonaka & Takeuchi, 1995). Knowledge management emerged as a necessity of dealing with organizational intangible resources for which the classical management based on tangibility and linearity does not work anymore. Knowledge management (KM) encompasses all activities and processes dealing with data, information and knowledge, including knowledge creation, acquisition, transfer, retention, and knowledge sharing. Databases, portals, and collaboration tools are just a few examples of the knowledge management systems (KMS) and technologies that are frequently used to support these operations.

An excellent example of how knowledge powers firms could be unicorns. They are start-up firms that, in a short time, reach the value of 1 billion dollars, surpassing traditional companies that already have experience in the market. For a unicorn, market experience, tradition, and classic business models do not even matter. All that matters is the knowledge they possess, how they use it and how they create value through knowledge in the new economy, where technological innovations and opportunities are everywhere, including associated risks (Bratianu et al., 2020; Massingham, 2020; Tiwana, 2002; Ursache, 2022a).

In the current corporate environment, KM has grown in significance as firms are under greater pressure to innovate and boost performance in order to keep up with rapid global change. Businesses that can manage their information efficiently can compete and adjust to shifting market conditions. In this way, organizations will gain a new competitive edge that will separate strong from weak organizations by managing knowledge vulnerabilities and assessing correctly knowledge risks.

A reference point in the knowledge research domain is the SECI model that describes the dynamics of organizational knowledge creation (Nonaka & Takeuchi, 1995, 2019). This model contains three main components: the SECI knowledge cycle, the dynamic context Ba, and the knowledge vision. The SECI (Socialization, Externalization, Combination, and Internalization) cycle shows how knowledge created at the individual level is integrated in an evolving spiral into organizational knowledge along the ontological dimension (Nonaka & Takeuchi, 1995, 2019). The model explains the dynamics between tacit knowledge and explicit knowledge. Tacit knowledge is that knowledge we obtain through direct experience and it can be expressed only by using body language (i.e. wordless knowledge). Explicit knowledge, often referred to as codified knowledge, is the opposite. It is knowledge that can be simply articulated, shared, and documented in a symbolic form, such as text, numbers, images, or sounds. Documents, databases, and other physical or digital material contain it. Research on explicit knowledge in management and organizational studies has centered on how businesses can efficiently manage and use their explicit knowledge assets, such as papers, databases, and other digital and physical media formats. Additionally, researchers have looked at how explicit might boost competitiveness, creativity, and organizational success.

Bratianu and Bejinaru (2019, 2023) extended the dyad of tacit-explicit knowledge into a triad rational-emotional-spiritual knowledge in their theory of knowledge fields. Adopting a thermodynamics perspective, Bratianu (2023), and Bratianu and Bejinaru (2019) elaborated a new knowledge dynamics model. The model shows that any form of knowledge can be transformed into another form of knowledge. For instance, emotional knowledge can be transformed into rational knowledge or spiritual knowledge, and vice-versa.

2.2. Knowledge vulnerabilities and knowledge risks

So far, vulnerabilities have been analyzed in areas like disaster management, geography, climate change, economics, information security, and, more recently in cybersecurity founding various academic research, but the identification and analysis of knowledge vulnerabilities, in a more comprehensive way, have not yet been the topic of research in the knowledge domain (Alexander, 2013; Chambers, 1989; Cutter, 1996; Dow, 1992; Gabor & Griffitch, 1980; Kaspersen, Kaspersen & Dow, 2001; Turner II et al., 2003).

The concept, which has its roots in the Latin word *vulnus* and then evolved into *vulnerabilis* and most recently into *vulnerability*, has been used for centuries and has been defined in different ways since it first came into use. Vulnerabilities indicate in general some weaknesses in the knowledge management systems. However, there are many practical situations in which managers are not aware of these weaknesses and thus they cannot reduce the potential for their knowledge risks (Bratianu & Bejinaru, 2022).

The topic is complicated since diverse definitions, methods for measuring, and evaluations of vulnerabilities are used by experts in a variety of fields, including public health, psychology, geography, and development studies, among others. It involves a variety of traits that make individuals and communities more susceptible to harm and less able to prevent, avert, and reduce the probability distribution of the knowledge risks.

3. Research methodology

The present research represents the result of a critical literature analysis in the domain of knowledge management and other domains where the concepts of vulnerabilities and risks are studied, like climate change, health systems and information systems with their cybersecurity. It is a semantic analysis aiming at explaining the meanings associated to the concept of knowledge vulnerability and its relation with knowledge risk. We extracted from literature some of the most important definitions and compare their semantic power.

4. Findings and discussion

Oxford Advanced Learner's Dictionary (OALD, 2000) defines the adjective *vulnerable* as being a "weak and easily hurt physically or emotionally". It results that *vulnerability* reflects a weakness of an individual or a system. That weakness constitutes a potential for the generation of one or several risks under certain internal and external conditions. The concept of risk is defined (OALD, 2000) as being "the possibility of something bad happening at some time in the future". Applying these general definitions to knowledge management systems we obtain the meaning for *knowledge vulnerability*, and for *knowledge risk*, respectively.

Because we could not find in the knowledge management literature the concept of *knowledge vulnerability*, we identified some of the most cited definitions of *vulnerability* in the larger domain of complex systems research. The results are presented in Table 1.

Table no. 1 Vulnerabilities definitions available in the literature

Definition	Year	Author
“ <i>Vulnerability</i> represents the potential harm incurred by a person, asset, activity or assemblage of items that is at risk. The risk is motivated by natural, technological, social, intentional, or complex hazards and the potential outcome is a disaster. As it is mainly the result of social, economic, political, and cultural factors in decision making, <i>vulnerability</i> is constructed socially”.	2013	Alexander, D., p. 980
Generalized “ <i>vulnerability</i> is a characteristic of the poorest of the poor in every society, especially those who not only suffer income poverty [but] are also politically marginal (no voice in decisions that affect them), spatially marginal (resident in urban squatter settlements or in remote rural locations), ecologically marginal (livelihoods based on access to meager natural resources or living in degraded environments), and economically marginal (poor access to markets)”.	2013	Wisner, 2013a, p. 258
“ <i>Vulnerability</i> defines the extent to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It depends not only on a system’s sensitivity but also on its adaptive capacity”.	2007	IPCC, 2007, p. 869
By “ <i>vulnerability</i> we mean the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or in society”.	2004	Wisner et al., 2004, p. 11
“ <i>Vulnerability</i> is the degree to which a person, system or unit is likely to experience harm due to exposure to perturbations or stress”.	2001	Kasperson, R. Kasperson, J. & Dow, K., p. 253
“ <i>Vulnerability</i> is conceived as both a biophysical risk as well as a social response, but within a specific areal or geographic domain. This can be geographic space, where vulnerable people and places are located, or social space who in those is most vulnerable”.	1996	Cutter, S., p. 529
“ <i>Vulnerability</i> is defined as the extent to which a natural or social system is susceptible to sustaining damage from climate change. Vulnerability is a function of the sensitivity of a system to changes in climate and the ability to adapt to systems to changes in climate. Under this framework, a highly vulnerable system would be one that is highly sensitive to modest changes in climate”.	1996	Intergovernmental Panel on Climate Change (PCC). World Meteorological Organisation.
“ <i>Vulnerability</i> is defined in terms of exposure, capacity and potentiality. Accordingly, the prescriptive and normative response to vulnerability is to reduce exposure, enhance coping capacity, strengthen recovery potential and bolster damage control (i.e., minimize destructive consequences) via private and public means”.	1993	Watts, M.J., & Bohle, H., p. 43

“ <i>Vulnerability</i> is the differential capacity of groups and individuals to deal with hazards based on their positions within physical and social worlds”.	1992	Dow, K., p. 417
“ <i>Vulnerability</i> is operationally defined as the inability to take effective measures to insure against losses. When applied to individual’s vulnerability is a consequence of the impossibility or improbability of effective mitigation and is a function of our ability to detect the hazards”.	1989	Bogard, W., p. 147
“ <i>Vulnerability</i> is the potential for loss”.	1989	Chambers, R., p. 3
“ <i>Vulnerability</i> is the degree of loss to a given element or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude”.	1982	United Nations Disaster Relief Organization (UNDRO).
“ <i>Vulnerability</i> is the degree to which a system acts adversely to the occurrence of a hazardous event. The degree and quality of the adverse reaction are conditioned by a system’s resilience (a measure of the system’s capacity to absorb and recover from the event)”.	1981	Timmerman, P., p. 1
“ <i>Vulnerability</i> is the threat (to hazardous materials) to which people are exposed (including chemical agents and the ecological situations of the communities and their level of emergency preparedness). Vulnerability is the risk context”.	1980	Gabor, T., & Griffitch, T., p. 323

Source: Authors' own research.

As can be noted, vulnerabilities have been identified in several domains, and a form has been developed that can aid in our best understanding of the notion. The common semantic feature of those definitions given in Table 1 is that *vulnerability* represents a potential for generating risks under some specific conditions from inside and from the external environment.

For example, in the area of information security, cybersecurity and privacy protection, according to ISO 27005, vulnerability notion has been defined as: “a weakness of an asset or group of assets that can be exploited by one or more threats, where an asset is anything that has value to the organization, its business operations, and their continuity, including information resources that support the organization’s mission”; and on ISO/IEC 29147:2018(en) Information technology, security techniques, vulnerability disclosure, define that a “vulnerability can be thought of as a weakness or exposure that allows a security impact or consequence”.

Considering the analyzed definitions, we may state that *knowledge vulnerability* represents a weakness in securing the human value, knowledge, individual or by group that can be exploited through one or more threats if the weakness is known and exposed. The vulnerability has an impact on the individual, the group, or the knowledge management system with consequences which can result in the generation of a knowledge risk.

In Table 2 we present the main vulnerabilities we could identify in the knowledge management systems which may lead to generation of knowledge risks. In general, a knowledge vulnerability may represent a potential for more possible knowledge risks.

Table no. 2 Knowledge vulnerabilities

Knowledge vulnerabilities as potentials for generating knowledge risks		
<ul style="list-style-type: none"> • Lack of effective knowledge base maintenance vulnerabilities • Knowledge stealing vulnerabilities • Declining organizational creativity and innovation vulnerabilities • Ineffective management vulnerabilities 		
<ul style="list-style-type: none"> • Knowledge transfer vulnerabilities 		
<ul style="list-style-type: none"> • Knowledge gap vulnerabilities 		
<ul style="list-style-type: none"> • Knowledge articulation vulnerabilities • Knowledge outsourcing vulnerabilities • Knowledge acquisition vulnerabilities • Knowledge continuity vulnerabilities 		
<ul style="list-style-type: none"> • Unlearning knowledge vulnerabilities • Forgetting knowledge vulnerabilities 		
<ul style="list-style-type: none"> • Knowledge waste vulnerabilities • Knowledge hoarding vulnerabilities • Knowledge hiding vulnerabilities • Knowledge attrition vulnerabilities • Knowledge obsolescence vulnerabilities 		
Knowledge Risks Treated in the literature	Authors	Year
<ul style="list-style-type: none"> ➤ Knowledge waste risk ➤ Knowledge hoarding risk ➤ Knowledge hiding risk ➤ Knowledge attrition risk ➤ Knowledge obsolescence risk 	Bratianu, C. et al.	2020
<ul style="list-style-type: none"> ➤ Knowledge risks due to unlearning ➤ Knowledge risks due to forgetting 	Durst, S. & Zieba, M.	2017
<ul style="list-style-type: none"> ➤ Knowledge articulation risks ➤ Knowledge outsourcing risks ➤ Knowledge acquisition risks ➤ Knowledge continuity risks 	Lambe, P.	2013
<ul style="list-style-type: none"> ➤ Knowledge gap risk, <i>which may hinder the company in fulfilling its objectives.</i> 	Perrot, B. E.	2007
<ul style="list-style-type: none"> ➤ Knowledge transfer risks <i>are concentrated at the level of operational business practices.</i> 	Bayer, F., & Maier, R.	2006
<ul style="list-style-type: none"> ➤ Lack of effective knowledge base maintenance ➤ Knowledge stealing ➤ Risk of declining organizational creativity and innovation ➤ Ineffective management 	Jamieson, R., & Loeng, D.	2003

Source: Authors' own research.

5. Conclusions

The aim of the present paper is to critically assess the role of knowledge vulnerabilities in the literature dedicated to knowledge management systems. Unfortunately, we could not find significant papers on this subject, although there are some interesting studies focusing on knowledge risks. That stimulated us to search for the vulnerabilities in other research domains and we could find some those papers related to climate change, health systems, and information systems, especially cybernetics.

Today, when knowledge becomes essential to every organization and frequent disruptions leave organizations with less time to manage change, most of them are almost forced to evolve. New strategies to deal with the challenges of the ever-changing business environment, and the identification of knowledge gaps requires opening new directions of research to increase resilience and the sustainability of organizations. Knowledge vulnerabilities and knowledge risks represents such a new research perspective.

Following our research, we can say that knowledge vulnerabilities will play a larger role in the current knowledge domain given the unrestricted access to information and improvements in academic research, and new techniques will be accessible to evaluate and prioritize the knowledge vulnerabilities.

The main limitation of the present research is that it focused only on the semantic dimensions of the concept of knowledge vulnerabilities within the knowledge management systems. This research should be extended in the near future to include also the knowledge risks and the knowledge strategies managers can develop to mitigate the possible negative consequences of these knowledge risks.

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