

ORGANIZATIONAL KNOWLEDGE: DEFINITIONS, TAXONOMIES, AND METAPHORS IN A DIGITAL TRANSFORMATION ENVIRONMENT

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Purpose: In the era of digital transformation, organizational knowledge becomes even more important than before in building the competitive advantage of enterprises (Malerba et al., 2020; Santorno et al., 2018; Chen et al., 2023). Digital transformation forces companies to rethink knowledge resources to meet current requirements.

Design/methodology/approach: The research methods consist of a comprehensive and systematic domestic and foreign literature review of organizational knowledge definitions, taxonomies, and metaphors in a digital transformation environment.

Findings: The development of companies in a dynamic, competitive business environment with digital transformation is altering the way knowledge is perceived within organizations and requires a new approach to understanding knowledge assets and their formation.

Research limitations/implications: The research should continue on the relationship between digital transformation and knowledge processes in the organization (acquisition, generation, storage, sharing, and transfer).

Practical implications: The research results prove that an adequate understanding of organizational knowledge, its taxonomy, and the right choice of metaphors guide efforts on knowledge creation in organizations in a digital transformation environment.

Originality/value: The research contributes to organizational knowledge management and sheds light on how knowledge metaphor analysis contributes to diagnosing situations and finding solutions that contribute to an organization's potential.

Keywords: Systematic literature review, organizational knowledge, knowledge definitions, knowledge taxonomies, metaphorical analysis.

Category of the paper: Literature review, general review.

1. Introduction

According to the knowledge-based theory of the company, knowledge is strategically the company's most important resource, and the essential role of the company is to integrate the

expertise of employees into products and services (Grant, 1996; Hughes et al., 2022; Pereira et al., 2021; Chen et al., 2023). Thus, a company can be seen as a knowledge-integrating organization (Michna, 2017, p. 10). The fundamental assumption of this theory is that knowledge is the critical input enabling the production process and that it is the primary source of value for the enterprise. Among the mechanisms that integrate specialized knowledge are: rules and directives, procedures, sequentiality, group problem solving, and digital technology.

2. Knowledge Definitions and Knowledge Taxonomies

When discussing the concept of knowledge, it is important to distinguish between such related concepts as data, information, knowledge, and wisdom (Liew, 2013; Chaffey et al., 2005, p. 223; Hussain, 2021; Jakubik, 2022). Data are discrete, objective facts, e.g. numbers, symbols, and images, without context or interpretation. They are source-based, not processed, and it is impossible to draw conclusions and take action from them. Yet they are the material from which information is created. Information is data that has been given meaning, interpreted and placed in a certain context (Jemielniak, 2012, p. 39). Knowledge, on the other hand, is a combination of data and information to which expert opinions, skills, and experience are added. The result is a valuable resource that can be used in decision-making (Chaffey, 2005; Khan, 2023; Jakubik, 2023).

Davenport and Prusak (2000, p. 5) define knowledge as a fluid mixture of experience, values, contextual information, and expert conclusions that provides a framework for evaluating and absorbing new experiences and information. Argote (2013) observes that knowledge is the result of learning, while it manifests itself as a cognitive change or as a change in behavior. It can also be understood as the totality of knowledge and skills possessed by an individual. Knowledge and ignorance co-exist (Shankar, 2014, p. 65).

Table 1.

Distinctions between data, information, knowledge and wisdom

Level	Definition	Learning process	Outcome
Data	Raw facts	Accumulating truths	Memorization (data bank)
Information	Meaningful, useful data	Giving form and functionality	Comprehension (information bank)
Knowledge	Clear understanding of information	Analysis and synthesis	Understanding (knowledge bank)
Wisdom	Using knowledge to establish and achieve goals	Discerning judgments and taking appropriate action	Better living/success (wisdom bank)

Source: Bierly, Kessler, Christensen, 2000, 595-618.

Knowledge can be seen by differentiating it with data and with information or as state of mind, object, process, and access to information or ability. Different perceptions of knowledge have various implications for knowledge management (Table 2).

Table 2.
Knowledge Definitions and Their Implications

Definition of Knowledge		Implications for Knowledge Management (KM)	Implications for Knowledge Management Systems (KMS)
Knowledge vis a vis Data and Information	Data is facts, raw numbers Information is processed/interpreted data Knowledge is personalized information	KM focuses on exposing individuals to potentially useful information and facilitating assimilation of information	KMS will not appear radically different from existing IS, but will be extended toward helping in user assimilation of information
State of Mind	Knowledge is the state of knowing and understanding	KM focuses on exposing individuals to potentially useful information and facilitating assimilation of information	Impossible to mechanize state of knowing. Role of IT to provide sources of knowledge rather than knowledge itself.
Object	Knowledge are objects to be stored and manipulated	Key KM issue is building and managing knowledge stocks	Role of IT involves gathering, codifying, and storing knowledge
Process	Knowledge is a process of applying expertise	KM focus is on knowledge flows and the process of creation, sharing, and distributing knowledge	Role of IT to provide link among sources of knowledge to create wider breadth and depth of knowledge flows
Access to Information	Knowledge is a condition of access to information	KM focus is organized access to and retrieval of knowledge content	Role of IT to provide effective search and retrieval mechanisms for locating relevant information
Capability	Knowledge is the potential to influence action	KM is about building core competencies and understanding strategic know-how	Role of IT is to enhance intellectual capital by supporting development of individual and organizational competencies

Source: Alavi, Leidner, 2001, pp. 107-136.

Nonaka and Takeuchi (Nonaka, 1997, pp. 14-37; Nonaka et al., 2000, p. 275) presented the concept of knowledge conversion, which deals with the interaction between tacit knowledge into explicit knowledge. This dynamic and interactive model of knowledge creation is anchored in the assumption that organizational knowledge is created through interactions between tacit and explicit knowledge in both ontological and epistemological dimensions (Vidic, 2022). In the ontological dimension, knowledge is created by members of the organization, as it cannot produce knowledge without creative individuals, which it supports by providing the best possible conditions conducive to knowledge creation (Michna, 2017, pp. 26-28).

On the epistemological dimension, the division identified by Polanyi (1966, p. 4), who distinguished tacit and explicit knowledge in the philosophical sciences, was taken as a starting point. Tacit knowledge is objective, related to theory and concerns past experiences “there and then” (extra-contextuality). In practice, the concept of tacit knowledge is the basis of the theory of knowledge creation in organizations. Tacit knowledge is inarticulate,

subjective, contextual, linked to senses, dexterity, physical experiences and intuition, and is created “here and now”, in a given context (Insch et al., 2008; Nonaka et al., 2000, pp. 5-34). Tacit knowledge includes both cognitive and technical elements. Cognitive tacit knowledge refers to ingrained schemas, beliefs, and mental models that are taken for granted. Technical tacit knowledge is related to personal abilities or specific know-how.

The creation of organizational knowledge is a spiraling, iterative process, crossing departmental as well as organizational boundaries (Nonaka et al., 2000, pp. 84-95; Nonaka, 1998, pp. 40-54; Nishihara, 2021). The process starts at the individual level and is carried higher and higher by broadening the scope of interaction, and includes the following modes of knowledge conversion: Socialization - Externalization - Combination - Internalization. Socialization is the conversion of tacit knowledge into tacit knowledge through shared experience (master and pupil) set in a specific context. Through observation, imitation, exercise and co-learning, there is a sharing of experience and an adaptation of thinking to that of others, which would be impossible to achieve through conversation alone. Open meetings can be helpful, building mutual trust within the team. Externalization is the transposition of tacit knowledge into explicit knowledge through a creative cognitive process using metaphors, analogies, patterns, hypotheses, and mental models. The great usefulness of metaphors in the externalization of knowledge stems from the possibility of better understanding new phenomena and developing novel concepts by referring to phenomena whose structures and features are already familiar. Combination is the conversion of explicit knowledge into explicit knowledge. This process occurs within structured knowledge by categorizing, selecting or unifying information. It primarily involves combining different components of explicit knowledge (for example, knowledge just formulated by a team of employees is combined with pre-existing knowledge contained in an existing database), which can lead to the creation of new knowledge within an organization. Internalization is the transformation of explicit knowledge into tacit knowledge through verbalization and various types of documentation. The purpose of this process is to provide knowledge to employees by sharing and disseminating the experiences of others.

In the concept discussed above, it is clearly indicated that tacit and explicit knowledge do not exist in a “pure” form. All knowledge is rooted in tacit knowledge, and even the “most” explicit knowledge contains some tacit elements. Tacit knowledge and explicit knowledge are not opposites, but constitute a continuum and interact with each other in a continuous spiral. Transfer of tacit knowledge plays an important role to achieve the knowledge recontextualization (Tran, 2022).

Nonaka et al. (2014) also presented the concept of knowledge triad relationships comprising tacit knowledge, explicit knowledge and *fronesis* – practical knowledge. Aristotle explains *fronesis* (*phronesis*, Gr.) as practical wisdom or prudence (Steyl, 2020; Darnell et al., 2022; Massingham, 2019). This practical knowledge includes valuation (optimal evaluation of the “here and now”), through which the context is interpreted, the essence of the issue is grasped,

and meaning-making beyond the context takes place. Fronesis is linked to leadership capacity and innovations (Hylving, 2020), as well as should be spread across all organizational levels.

Knowledge is a very broad concept and different types of knowledge (Michna, 2017, p. 9) are distinguished by various criteria (Table 3).

Table 3.
Knowledge Taxonomies and Examples

Knowledge Types	Definitions	Examples
Tacit Cognitive Tacit: Technical Tacit:	Knowledge is rooted in actions, experience, and involvement in specific context Mental Models Know-how applicable to specific work	Best means of dealing with specific customer
Explicit	Articulated, generalized knowledge	Knowledge of major customers in a region
Individual	Created by and inherent in the individual	Insights gained from completed project
Social	Created by and inherent in collective actions of a group	Norms for inter-group communication
Conscious	Explicit knowledge of an individual	Syntax of a programming language
Automatic	Individual's tacit, subconscious knowledge	Riding a bike
Objectified	Codified knowledge of a social system	An operating manual
Collective	Tacit knowledge of a social system	Organization culture
Declarative	Know-about	What drug is appropriate for an illness
Procedural	Know-how	How to administer a particular drug
Causal	Know-why	Understanding how the drug works
Conditional	Know-when	Understanding when to prescribe the drug
Relational	Know-with	Understanding how the drug interacts with other drugs
Pragmatic	Useful knowledge for an organization	Best practices, business frameworks, project experiences, engineering drawings, market reports

Source: Alavi, Leidner, 2001, pp. 107-136.

One can also separate out the knowledge that exists in routines – systemic, socio-political, and strategic. Each of these types of knowledge has its own dimensions (Table 4).

Table 4.
Organizational Knowledge Types and Dimensions

Knowledge Types	Definitions	Examples
Systemic	Know-how Documented systems, processes, practices and policies	Unspoken rules and meanings associated with the policies, processes etc.
Socio-Political	Organization charts, roles and responsibilities Who does what where Formal decision process i.e. governance structure	How to get things done i.e. influence networks, coalitions etc. Who's powerful and who isn't Values, norms and behaviors
Strategic	Documented context including annual reports, industry prospectus etc.	Interpretations of the 'official word' Competitive and industry position and perceptions of stakeholders Core competencies Status and role in industry, society and community

Source: Evans, Easterby-Smith, 2001, 135-154.

Different types of knowledge require different sources of knowledge acquisition (Kmieciak et al., 2016; Czerwińska-Lubszczyk, 2014; Kmieciak et al., 2018). Fletcher and Harris (2012) distinguish four sources of new knowledge acquisition by companies, divided into external and internal: direct experience, indirect experience, internal information, and external information seeking.

3. Knowledge Metaphors and Knowledge Characteristics

The most important part of the knowledge creation process occurs when tacit knowledge is transformed into explicit knowledge. Tacit knowledge cannot be expressed explicitly, so in order to establish a dialogue, organizational members often use metaphors, analogies, and different types of narratives as means of expression (Venkitachalam et al., 2012).

In the literature, one can find metaphors that represent the very concept of knowledge as water, love (Andriessen, 2008) or energy (Brătianu et al., 2008). The latter metaphor is based on both quantum and classical physics. Namely, if, in the context of Newton's principles of dynamics, knowledge is metaphorically understood as mechanical energy, it can come in two forms. Tacit knowledge is described as potential energy, while explicit knowledge is described as kinetic energy. In this context, the externalization of knowledge can be presented as the conversion of potential energy into kinetic energy. A broader metaphor of viewing all knowledge conversion processes as thermodynamic principles is also presented (Brătianu, 2011). Appropriate metaphors enable a better understanding of the concept of knowledge and guide efforts regarding knowledge creation in an organization (Table 5). Although it is worth noting that metaphors have some limitations, for example in converting tacit knowledge into explicit knowledge, there is no strict and unambiguous quantitative relationship between knowledge forms, unlike the laws of physics.

Table 5.

Different metaphors and models for knowledge, how it spreads and its relationship with practice

Discipline/tradition (with examples of key scholars)	Metaphor or shorthand description for knowledge	Metaphor or description for spread and distribution of knowledge	Implied link between knowledge and practice
<i>Perspectives consistent with 'knowledge translation'</i>			
Clinical science	Research discoveries (laboratory science)	T1 knowledge transmission	<i>In vitro</i> discoveries are tested <i>in vivo</i> to generate clinical applications
Clinical epidemiology/ evidence-based medicine	Research evidence (e.g. clinical practice guidelines)	T2 knowledge dissemination/translation	'Evidence-based practice/policy' = implementation of clinical research evidence

Cont. table 5.

<i>Perspectives inconsistent with 'knowledge translation'</i>			
Philosophy (Polanyi)	Personal knowledge, embodied knowledge, tacit knowledge	Acquiring a way of engaging with the world	Knowledge is embodied, inseparable from the knower and contiguous with practice
Nichomachean ethics (Aristotle) and narrative medicine (Montgomery)	Practical reason	Accumulation of experience under the supervision of wise and good teachers, reflection on practice, often transmitted as 'stories'	<i>Praxis</i> is the ability to make wise, practical, ethical judgments ('what best to do in this case')
Philosophy (Wittgenstein) and ethnomethodology (Garfinkel)	'Language games': the unwritten rules that members of a social group follow as they go about their everyday practices	Learning a set of rules (not by codification but by recognizing 'family resemblances' between different situations and contexts of action and acting them out)	Knowledge is a set of dispositions that people acquire and promulgate within a community, and which confer the ability to speak and act appropriately in a social situation
Cultural sociology (Bourdieu)	Cultural capital, 'knowing how' rather than 'knowing that'	Cultural and social [re]production through people's interactions	Knowledge is the socially acquired capacity or tendency of a person to act appropriately in given circumstances
Organizational sociology (Brown and Duguid; Weick, Brown and Duguid)	Individual: 'sticky' knowledge (cannot easily be passed on), 'knowing the ropes'. Collective: shared representations, institutional logics, routines	Accumulation of experience, reflection on practice, informal storytelling ('office gossip'), following routines	Knowledge is the ability to exercise judgment within a particular field of practice. It involves (a) the ability to draw distinctions and (b) connection with a collectively generated and shared domain of practice
Communities of practice (Lave and Wenger)	Knowledge as socially shared practices, linked to membership and identity	Apprenticeship, social learning, legitimate peripheral participation (learning by 'lurking' in the community of practice)	Knowledge is contiguous with practice
Management studies/resource-based view of the firm (Nonaka)	Knowledge (especially tacit knowledge) is a commodity or resource to be managed and thus a key contributor to profitability	The 'knowledge creation cycle' (socialization, externalization e.g. through storytelling, combination with other knowledge and internalization)	Knowledge in an organization takes many forms, one of which is embodied in practice
Interdisciplinary perspective on healthcare (Davies)	Diverse: research evidence plus tacit knowledge plus local knowledge, linked in a messy way	Knowledge interaction ('messy engagement of multiple players with diverse sources of knowledge') and knowledge intermediation ('managed processes by which knowledge interaction can be promoted')	Dynamically linked in a somewhat messy (but ultimately productive) way
Engaged scholarship (Van de Ven)	What emerges when researchers and practitioners collaborate to address a practical problem	Co-production	Knowledge emerges from collaborative practice

Cont. table 5.

Eclectic synthesis of all the above (Gabbay and le May)	Mindlines (individually embodied, collectively reinforced, largely tacit guidelines)	The knowledge of research evidence is transformed and internalized through interaction with patients, reflection on practice, and exchange of stories with trusted colleagues (communities of practice)	Knowledge, practice and context are inseparable. An individual's mindline is one person's mental embodiment of their 'knowledge-in-practice-in-context', mediated through collective mindlines, so that they become 'contextually adroit'
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Source: Greenhalgh, Wieringa, 2011, 501-509.

The selection of a certain metaphor in an organization guides the process of finding solutions to improve knowledge management (Table 6).

Table 6.

Results of the knowledge as water metaphor

Diagnosis	Solutions
Knowledge does not flow	Build canals
Separate source of knowledge	Flush out and freshen knowledge
Knowledge is not channeled	Tap knowledge from people leaving
No dispersion of knowledge	Create knowledge map
Hydrocephalus: people keeping knowledge to themselves	Managers as knowledge channels Knowledge management

Source: Andriessen, 2008, 5-12.

Distinctive characteristics of knowledge that have key implications for management and use for value creation are pointed out. Namely, it points to (Grant, 1996; Kang et al., 2010; Michna et al., 2020, p. 71; Jasimuddin, 2019; Bayona et al., 2020):

- it is embedded in the minds of employees,
- inexhaustible, knowledge is not diminished in the process of exploitation and transfer,
- transferability, with explicit knowledge being transferable through communication and tacit knowledge through application,
- viscosity, which makes it difficult to transfer,
- aggregability, which is the ability of the recipient to add new knowledge to existing knowledge,
- utility, which refers to the ability of the owner of the resource to obtain a return equal to the value created by the resource,
- domain specificity,
- indispensability,
- self-supply, knowledge that is shared by employees does not lose its value,
- spontaneity,
- simultaneity,
- non-linearity.

4. Conclusion

Foreign as well as domestic literature on knowledge, its taxonomy and metaphors is remarkably extensive. The creation and use of knowledge in the era of digital transformation requires a redefinition of organizational knowledge resources and a better understanding of its characteristics through the use of appropriate metaphors. It is also a challenge for companies to constantly seek information on technological developments, even if they are not currently relevant to the market in which the company operates, but may be in the future. Implementing digital transformation requires identifying those technologies (Saariko et al., 2020) that can be incorporated into internal processes as well as business offerings. The dynamic fractal organization (Nonaka et al., 2013) or the hypertext structure (Tariq, 2022; Michna, 2017, pp. 30-31), which is an open system whose knowledge interacts with customers, suppliers, and the rest of the environment, can help with this. Process learning, otherwise known as deutero learning, is also becoming increasingly important and takes place when organizations learn how to understand learning through single (adaptive) as well as double loop (reconstructive) learning (Dörner et al., 2021, p. 69). This type of learning is also referred to as meta-learning and is discontinuous, cognitive, and conscious (Visser, 2007). Its main goal is to increase the ability to learn and the object of learning is the learning itself.

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