

On the Nature of Knowledge *Rethinking Popular Assumptions*

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Abstract

Knowledge management (KM) has been an increasing focus for both researchers and practitioners for more than a decade. The discussions generally have viewed the goal of KM as the application of technical and organizational capabilities to improve the processes of creating, storing, retrieving, transferring, and applying knowledge. This paper examines two important philosophical relationships that are at the foundation knowledge management: the relationship between tacit and explicit aspects of knowledge and the relationship between information and knowledge. The paper demonstrates that most papers that discuss knowledge management systems discuss these relationships as though there are two types of knowledge and that it is important to distinguish between knowledge and information. This paper challenges these two popular assumptions and suggests alternative viewpoints that may improve our philosophical foundation for the study of knowledge management systems.

1. Introduction

The focus of knowledge management has been to support creating, storing, retrieving, transferring, and applying of knowledge in organizations [2]. Knowledge is commonly thought to exist in two types: explicit and tacit [55]. According to the knowledge based view (KBV) of the firm, knowledge can be exploited to provide a competitive advantage [2, 7, 28, 41]. The KBV is the underlying justification for the interest in developing and implementing knowledge management systems [2], and systems that manage two types of knowledge, explicit and tacit, have been viewed as the basis for creativity and innovation [55]. Some proponents of the KBV recognize that both tacit and explicit knowledge may be used to gain competitive advantage, but they focus their attention on tacit knowledge because it is more complex to transfer both within and between organizations [27].

Some of the early works on the KBV don't specifically address types of knowledge but are based on the assumption that tacit (or implicit) knowledge is one discrete form which knowledge can take [43]. Additionally, Mata, Fuerst & Barney [50] compare

codifiable knowledge with knowledge that is learned by doing. The problem with this line of thinking is not in the conclusion that tacit knowledge can be managed and subsequently provide competitive advantage, but in the assumption that tacit and explicit knowledge are two types of knowledge. Such an assumption influences how knowledge management systems (KMS) are conceived, designed, and implemented.

Another assumption at the core of knowledge management is related to the differences between data, information, and knowledge. Although some researchers have used the terms information and knowledge synonymously, this is not the generally accepted norm. Most knowledge management researchers believe that knowledge is a higher order construct than information, even those who question the validity of the concept of knowledge management share this belief [73, 74, 78]. The result of this assumption is that it is not appropriate for knowledge management systems to manage information, namely that knowledge management systems should focus on explicating and storing tacit knowledge. This focus on the distinction between knowledge and information has an unfortunate impact on the practice of knowledge management.

The premise of this paper is that the core assumptions of knowledge management, as evidenced by current research, need to be revisited. First, the knowledge management field needs to reexamine Polanyi's concept of the tacit dimension of knowledge [59-61]. All knowledge is composed of both tacit and explicit *dimensions* (not *types*). The second assumption that needs to be reconsidered is that the domain of interest for knowledge management systems should only embrace knowledge and not information.

These misconceptions affect the concept of knowledge management at its core. If knowledge is not correctly understood, how can it be properly managed? The approaches to KMS design and implementation reflect the designer's understanding of knowledge, and misconceptions can lead to limitations or even failures of knowledge management efforts.

The paper is structured as follows. We begin by explaining the tacit dimension of knowledge as originally articulated by Michael Polanyi. Second, we review the way the term tacit knowledge is commonly used in the

knowledge management literature. Next, we discuss the definitions of data, information, and knowledge which are in vogue. Then we discuss how the basic assumptions of the knowledge management research community need to be challenged. Finally, we discuss the research implications associated with challenging these assumptions.

2. Tacit knowledge as a dimension

The concept of knowledge as originally conceived by Polanyi has not been well represented in the knowledge management literature. Polanyi began by stating that personal knowledge is discovered, not made [59]. Learning is the process by which personal knowledge is discovered. There are three types of learning: invention, observation, and understanding (also called latent learning). Latent learning is a concept that is most closely associated with inarticulate learning. Polanyi describes a continuum of variation of speech and thought that from one extreme to the other is: the area where tacit knowing renders articulation of knowledge virtually impossible, the area where the tacit knowing is easily converted into speech (the tacit knowing is part of the text which contains it), and the area in which the tacit and explicit fall apart because the speaker doesn't know, or quite know, what he is talking about. This concept of tacit knowing is the basis for the tacit dimension of knowledge [59].

The refinement of the term tacit knowledge continued with the development of the tacit dimension of knowledge [60]. The focus of Polanyi's book, The Tacit Dimension, is that we know more than we can say we know. Here he uses an example of electroshock to explain the two terms comprising the tacit dimension, namely the proximal and distal terms [60]. He explains that recognizing a nonsense term as a precursor to receiving an electric shock is the proximal term of the tacit dimension and receiving the shock is the distal term. He explains that "we know the first term only by relying on our awareness of it for attending to the second" and that this is the term of which we have tacit knowing [60 p: 10]. He also said that explicating all knowledge to the exclusion of any tacit knowledge is self-defeating:

" Therefore: a mathematical theory can be constructed only by relying on prior tacit knowing and can function as a theory only within an act of tacit knowing, which consists in our attending from it to the previously established experience on which it bears. Thus the ideal of a comprehensive mathematical theory of experience which would eliminate all tacit knowing is proved to be self-contradictory and logically unsound" [60 p. 21]

This supports Polanyi's contention that knowledge always has an inarticulate component, a tacit dimension.

There are several additional statements regarding tacit that are important. First, personal, tacit assessments and evaluations are necessary at each step of knowledge acquisition [61]. Tacit information, it is argued, cannot be replaced by any mechanical procedure [61]. Polanyi and Prosch [61] go on to say that:

"We share the purpose of a mind by dwelling in its actions. And so, generally, we also share the purposes or functions of any living matter by dwelling in its motions in our efforts to understand their meaning" [13 p. 45].

3. Tacit knowledge as a type

The knowledge management literature uses the concept of tacit knowledge quite differently from the way in which it was introduced by Polanyi. Much of the extant literature in the knowledge management field relies on the definition of tacit knowledge that was popularized by Nonaka [55], who cited Polanyi's work extensively [7, 15, 41, 51, 77]. The core premise of this popular concept of knowledge is that there are two types, not dimensions, of knowledge. It is subsequently argued that the articulation of tacit knowledge should be one of the primary aims of knowledge management systems.

Nonaka's take on knowledge management stems from his discussion of how Japanese firms create knowledge. "The explanation of how Japanese companies create new knowledge boils down to the conversion of tacit knowledge to explicit knowledge" [55 p. 11]. Nonaka proceeds to summarize his interpretation of Polanyi's concept of tacit knowledge, as shown in Table 1 [55]. This, unfortunately, is based on the misconception that tacit and explicit knowledge are two types of knowledge instead of two dimensions of knowledge.

Table 1. Two types of knowledge

Tacit Knowledge (Subjective)	Explicit Knowledge (Objective)
Knowledge of experience (body)	Knowledge of rationality (mind)
Simultaneous knowledge (here and now)	Sequential knowledge (there and then)
Analog Knowledge (practice)	Digital Knowledge (theory)

The misconception is furthered in Nonaka's later work on tacit knowledge. "For the purpose of sharing what one knows, however, tacit knowledge has to be made explicit through a common language that is acceptable to the other community members and the company at large" [74 p. 22]. Based on this concept of tacit knowledge, three pitfalls of

knowledge management are proposed[74]. First, knowledge management relies on information easily detectable and quantifiable, such as documents, policies, and procedures. Second, knowledge management is focused on the creation of tools, which may inadvertently lead to constraining the process of knowledge creation instead of merely focusing it. Finally, it is suggested that knowledge management relies on a knowledge officer that may be too far up the hierarchy to keep pace with knowledge creation occurring at the market level.

Nonaka and Takeuchi go on to propose three premises of knowledge management. First, knowledge is defined as justified true belief [55]. Two important characteristics of such knowledge are that both individuals and groups hold knowledge and that knowledge is not simply information, especially when it is tacit knowledge [74]. Second, knowledge depends on perspective, changing the perspective changes the phenomenon itself [74]. The third premise of knowledge management suggested by von Krogh et al. [74] is that knowledge creation is not a science, it is an art.

4. Tacit knowledge in the literature

The authors examined the use of the term “tacit knowledge” in the knowledge management literature. In order to be as inclusive as possible, we conducted a search on the ISI Web of Science website. To focus our effort, we performed search for articles in English that contained the keywords “tacit knowledge” and “Knowledge Management”. The result set included 69 journal articles and conference proceedings. We were only able to obtain copies of 59 of the articles, so the current analysis was performed on 59 out of the original 69. Four of the articles that could not be located were conference proceedings, and one journal article could not be identified from the citation provided by ISI Web of Science.

The articles were read by one of the authors and placed in one of three categories based on how the article treated the concept of “tacit:” 1) defined tacit knowledge as a dimension of knowledge, 2) defined tacit knowledge as a type of knowledge, or 3) performed a literature review and did not define tacit knowledge. Two articles stated that knowledge included both tacit and explicit dimensions then proceeded to describe tacit knowledge as a type of knowledge [12, 70]. Three articles performed literature reviews and did not take a stand on the nature of tacit knowledge [18, 62, 66].

The results of the literature review indicate that tacit knowledge is predominantly being treated as a type of knowledge, as opposed to a dimension of knowledge. The results of the study are summarized in Table 2. The Appendix presents a complete listing of the articles and their categorization. Fifty-three out of 59 articles (89.8%)

referred to tacit knowledge as a type of knowledge. Not all of the articles are based on Nonaka’s work, but they take a similar position in terms of tacit knowledge. Only 3 of the 59 articles (5.1%) referred to tacit knowledge as one dimension of knowledge. The remaining 3 (5.1%) articles were literature reviews that simply acknowledged various uses of the phrase tacit knowledge but did not narrow their use to either a type or a dimension of knowledge.

Table 2. Tacit knowledge in the literature

Categorization	Dimensions	Types	No Position
Number	3	53	3
Percent	5.1%	89.8%	5.1%

To confirm the judgment of the first reviewer, the second author reviewed a subset of forty-six of the papers (ones that were available electronically) and classified them according to how the term “tacit” was used. Of these forty-six papers, the second author judged that one paper was critiquing the use of the term “types of knowledge,” two were using the term tacit in two different ways, and agreed with the first author’s classification on all but two of the remaining forty-three papers, providing an untrained inter-rater reliability of 95%.

5. Information versus knowledge

There exists an important differentiation between data, information, and knowledge in the knowledge management research community. In fact, the conventional view of data, information, and knowledge is often represented in terms of a hierarchy [17]. In this view, data are seen as the lowest level and consist of simple facts. The term often applied is “raw” data. Data are collected, sorted, and structured to become information. Information becomes knowledge when it is interpreted, put into context, or when meaning is added to it [73]. In this conceptual framework, data are required for information, and information is a prerequisite for knowledge.

An alternative view to the traditional hierarchy has been proposed. It maintains the distinction between knowledge, information, and data, but it changes the relationship among the three concepts. Tuomi [73] proposed a reversed knowledge hierarchy. He suggests that data emerges last, only after someone has used their knowledge to represent information. The implication of such a reversed hierarchy is that prior knowledge is a critical element of the knowledge management process. This prior knowledge may be brought to bear on information, thus creating knowledge from information. In order to exploit this relationship, KMS should be concerned with managing both information *and*

knowledge. This is further discussed in the following section.

6. Challenging the status quo

This paper suggests that we reconsider these two popular underlying assumptions about knowledge management. First, tacit should be understood to be a dimension of knowledge. Second, the importance of the difference between information and knowledge should be relaxed. Once these two foundational assumptions of knowledge are rethought, researchers will better be able to understand the foundations of knowledge and to design better knowledge management systems.

Our first suggestion is to go back to basics where tacit knowledge is concerned. Polanyi [59-61] clearly states that tacit knowledge is a dimension of knowledge. He also clearly states that not only can tacit knowledge not be articulated fully, but that even if it could be fully explicated, it wouldn't be wise to do so. Polanyi [61] even goes so far as to say that there is always a tacit dimension to knowledge. Consequently, we suggest embracing Polanyi's definition and explanation of tacit knowledge.

The second suggestion is not to worry about the distinction between knowledge and information. We are not suggesting that the terms be used synonymously, because we agree that they are indeed two different concepts. We are, however, suggesting that there is no good reason to focus on one to the elimination of consideration of the other. Making such a distinction hinders the effort to manage knowledge.

In understanding the importance of the second suggestion, we go back to Tuomi's arguments about the nature of the relationship among knowledge, data, and information. Tuomi [73] suggests that in order to make sense of a document stored in a knowledge management system one must take contextual knowledge into account. He further states that "system designers implicitly rely on culturally shared and accumulated stocks of knowledge" [73 p. 110]. In this example, the document of interest is said to be information and the culturally shared knowledge is likely tacit. This can be inferred from the fact that Tuomi [73] suggests adding more contextual clues to interact with the tacit knowledge of the user.

The fact that knowledge management systems rely on shared knowledge, either tacit or explicit, makes the case for ignoring the difference between information and knowledge. The goal of the KMS should be to store as much explicit knowledge and information as is relevant, to the extent that is feasible. This stored information and knowledge will, in turn, interact with the knowledge possessed by the users of the KMS to allow the successful retrieval of knowledge. A KMS should, in fact be designed to accommodate both the aspects of knowledge

and information stored in the KMS and the processes by which a user discovers new knowledge from the combination of his/her own previous knowledge and the stored information/knowledge in the KMS.

By rethinking these two assumptions it becomes possible to say two things. First, the explicit dimension of knowledge may be represented by information. That is, information may be viewed as the explicit representation of knowledge, which is composed of both tacit and explicit dimensions. Second, the tacit dimension is information in action (i.e., interaction with the user)—knowledge is "in formed" within the user's mind as the information is interpreted and applied by the user. This is congruous with the idea that knowledge is created when information is applied in a particular context [9]. It is important to note that when defining knowledge in this manner, the information must be relevant and potentially useful in order to be applied, as noted by Jenkins [38].

7. Implications for research and practice

There are two implications for research and practice. First, many designers of KMS have been focusing their efforts on the wrong tasks. The core premise of previous KMS research has been to capture tacit knowledge and make it explicit. By Polanyi's definition, tacit is a dimension of knowledge, not a type. He also states that knowledge which is highly tacit may be impossible to explicate. Furthermore, he advises that it would not be beneficial to explicate highly tacit knowledge, even if it were possible. Consequently, KMS designs that attempt this approach are unlikely to be successful.

Instead of approaching knowledge management as a task of converting the tacit dimension of knowledge to the explicit dimension, KMS designers should focus on capturing information, the explicit representation of knowledge, and as much of the context of that information as possible. The tacit dimension of knowledge comes into existence as the user interprets, interacts with, and applies this information in context. An effective KMS will be designed to support the interpretation process and to capitalize on this interaction, complementarity, and potential synergy among the user (including the user's prior knowledge), the information itself, and the situational context. KMS is more than simply the information and communication technologies (ICT), which are mostly information systems. KMS must store not only the information, but also the context. Finally, the user is a critical component of the KMS. Without the prior knowledge of the user, the system is merely an information system.

The second implication for knowledge management research is to seek to better understand how users interact with information and knowledge to create, discover, or

retrieve knowledge using a KMS. Possible research directions include a) investigations into how to display information (the explicit dimension of knowledge) so that users discover and can effectively apply their knowledge to their own contexts, b) investigations into the types of informational cues required for various user communities to exploit their shared cultural knowledge and experiences, and c) the appropriate level of explicit knowledge/information necessary to lead users to create, discover, retrieve, and exploit their underlying knowledge.

8. Conclusion and discussion

This paper has challenged the two popular assumptions that appear to underlie KMS research. The paper has argued that these assumptions—that there are two types of knowledge and that KMS should focus on converting one type to another—are incongruous with the aims of knowledge management. The concept of tacit as a type of knowledge has been used contrary to its meaning and inappropriately applied in knowledge management research. Further, research has focused on an inconsequential difference between knowledge and information which has impeded the success of KMS.

If we are to continue to make progress in knowledge management, we need a philosophical foundation that acknowledges the recursive relationship among information and the human processes of interpreting and interacting with this information in the act of knowing. We may develop this foundation (as one anonymous reviewer has suggested) in a synthesis of the works of Churchman, Habermas, and others. This paper has not done this synthesis. However, it has reassessed the prevailing assumptions embedded in the popular and research literature on knowledge management and has clarified the role of knowledge management systems. By removing these conceptual constraints—which have harnessed so much of the energy devoted to knowledge management—and by suggesting a clarification of the relationship between knowledge and information, this paper enables us to think more creatively about the philosophy underlying KM research. This small step brings us closer to establishing a unified philosophy of knowledge management from which we can develop effective system designs.

Appendix

Papers using tacit as a type

First Author	Title (Brief Title)
Ahn, JH[1]	Assessing the Contribution of Knowledge
Al-Hawamdeh, S[3]	KM: Rethinking Information management
Al-Jayyousi, O[4]	Greywater Reuse: KM for Sustainability
Almeida, P[5]	Are Firms Superior to Alliances
Alvesson, M[6]	Odd Couple: Making Sense of Knowledge
Armbrecht, FMR[8]	KM in R&D
Blair, DC[10]	KM: Hype, Hope, or Help?
Bloodgood, JM[11]	Influence of Change Strategies on KM Strategies
Boiral, O[12]	Tacit Knowledge and Environmental MGMT
Bolisani, E[13]	Electronic Communication and Knowledge Transfer
Bond, P[14]	Creativity Enhancement Software
Connell, NAD[16]	It's Tacit Knowledge
Dayassindhu, N[19]	Embeddedness, Knowledge Transfer
den Butler, FAG[20]	What Makes models-policy interaction successful
Desouza, KC[21]	Strategic Contributions
Dyck, B[22]	Learning to Build a Car
Gabbay, J[24]	Evidence Based Guidelines
Gertler, MS[26]	Learning from America?
Gertler, MS[25]	Tacit Knowledge and Economic Geography
Hall, R[29]	Managing knowledge Associated w/ Innovation
Hannabuss, S[30]	Narrative Knowledge
Hedlund, G[31]	Model of KM and the N-Form Corporation
Helokunnas, T[32]	Knowledge Searching and Sharing
Hendriks, PHJ[33]	Many Rivers to Cross
Huang, CC[35]	Rough Set Approach
Inkpen, AC[36]	KM Processes
Isaai, MT[37]	Predictive and Reactive Approaches
Johannessen, JA[39]	KM and Sustainable Competitive Advantage
Johnson, B[40]	Why all this Fuss
Klint, P[42]	Enabling the Creation of Knowledge
Lee, SH[44]	Human and Social Capital
Liao, SH[45]	Problem Solving and Knowledge Inertia
Lubit, R[46]	Tacit Knowledge and KM

First Author	Title (Brief Title)
Madhavan, R[47]	From Embedded Knowledge to Embodied Knowledge
Marwick, AD[48]	KM Technology
Mascitelli, R[49]	A Framework for Sustainable Advantage
McInerney[52]	KM and Organizational Climate
Mitri, M[53]	Applying tacit KM Techniques
Noh, JB[54]	A Case-based Reasoning Approach
Nutley, SM[56]	Developing Organizational Learning
Orapimpan, O[57]	Computer Aids for KM
Petrovic-Lazarevic, S[58]	Neuro-Fuzzy Modeling
Salisbury, M[63]	An Example of Managing Knowledge
Sanderson, SM[64]	Adding Value to Selling Activity through KM
Schamp, EW[65]	Dimensions of Proximity
Sharma, S[67]	Total KM
Snyder, CA[68]	Corporate Memory Management
Squier, MN[69]	KM in 3 Financial Organisations
Stenmark, D[70]	Leveraging Tacit Organizational Knowledge
Tserng, HP[71]	Developing an Activity-Based KMS
Wang, CL[75]	Leveraging Knowledge
Werr, A[76]	Exploring Management Consulting Firms
Woo, JH[79]	Dynamic Knowledge Map

Papers using tacit as a dimension

First Author	Title (Brief Title)
Edmondson, AC[23]	Learning how and Learning What
Hislop, D[34]	Mission Impossible
Tsoukas, H[72]	What is Organizational Knowledge?

Papers which don't take a position

First Author	Title (Brief Title)
Day, RE[18]	KM History in Europe
Ponzi, LJ[62]	The Intellectual Structure of Knowledge
Schultze, U[66]	Knowing What You Don't Know

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