Discussing "Tacit Knowledge" Again

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Abstract. The definition of tacit knowledge is a widely discussed topic, and scholars from different fields and disciplines have provided varying interpretations and definitions. Generally speaking, tacit knowledge refers to knowledge that is difficult to articulate, teach, and express within an individual. However, there is no consensus on the specific definition of tacit knowledge. As research on tacit knowledge deepens, the concept of tacit knowledge becomes more extensive and profound, requiring further refinement and development of its definition. This article integrates existing definitions of tacit knowledge and constructs a tacit knowledge continuum based on the degree of explicitness and socialization. With the introduction of explicitness, various knowledge systems are classified. Finally, the difference between hidden knowledge and tacit knowledge is clarified.

Keywords: Tacit knowledge; Knowledge continuum; Hidden knowledge.

1. Conceptual Definition of Tacit Knowledge

The concept of tacit knowledge was first proposed by Michael Polanyi in 1958 [1]. Polanyi argued that "human knowledge has two aspects. One is explicit knowledge, which can be expressed in formalized language, including mathematical formulas, specifications, and procedures. The other is tacit or implicit knowledge, which is acquired through personal experience and is difficult to formalize and communicate." According to Polanyi, explicit knowledge can be coded in certain symbolic systems such as language, mathematical formulas, graphs, gestures, and flags, while tacit knowledge is difficult to express and similar to the Chinese proverb "it can be understood but not expressed." Here are some definitions of tacit knowledge provided by other scholars:

Table 1. Some scholars' definitions of tacit knowledge

scholar	Polanyi M	Nonaka I [2], Kaiji Liao [3], Minglu Jin [4], Fanghua Wang [5]	Drucker P F [6]
metrics	Unexpressed knowledge	Knowledge that is not easy to record, code and express	Knowledge that cannot be expressed in words

There are certain disagreements among scholars regarding the criteria for defining tacit knowledge. In the field of knowledge management, it is not appropriate to define tacit knowledge as "knowledge that cannot be expressed in words", as this would render significant issues such as the explicit utilization of tacit knowledge meaningless. If tacit knowledge is defined as "knowledge that is not easily articulated", then the knowledge possessed by a librarian who knows the shortest way to find Harry Potter in the library or a supermarket employee who knows the location of every item may be considered tacit knowledge, even though it is easily articulated, but not encoded and highly personalized. If "whether it has been articulated" is used as the criterion for judging explicit knowledge corresponding to tacit knowledge, then the knowledge of finding books or goods mentioned above is neither tacit nor explicit knowledge (assuming that the librarian and employee did not record this knowledge). If "whether it is easy to articulate" is used as the criterion for judging explicit knowledge corresponding to tacit knowledge, then the "invisible" knowledge stored in the brain that has not been articulated becomes an "explicit knowledge", which is quite strange. Therefore, the criterion for defining tacit knowledge should be "knowledge that has not been articulated". These unexpressed knowledge are highly personalized, subjective, and some are not easy to record, encode, or articulate.

2. Categories of tacit knowledge

2.1 Different scholars' classifications of tacit knowledge types

Ribiero and Collins classified tacit knowledge into three types: stronger tacit knowledge, medium tacit knowledge, and weak tacit knowledge [7]. Professor Wu Yishan further elaborated the connotations of the three types of tacit knowledge in his academic blog [8]: weak tacit knowledge is tacit knowledge that is relatively easy to make explicit, such as the knowledge of a warehouse keeper on where to place which parts on which shelf; medium or somatic tacit knowledge, such as the tacit knowledge involved in riding a bike. This type of knowledge is embodied and hidden in the body, and is generally unspeakable. The subject can express a certain degree of cycling knowledge, but there is a part of muscle memory and other content that cannot be expressed; collective tacit knowledge with a higher degree of intensity is related to long-term social norms and is usually implicit.

Leping Song classified tacit knowledge into three categories [9]. Skill-based tacit knowledge mainly refers to the accumulated work experience, technical know-how, organizational operating habits, management systems and concepts, etc. of individuals or organizations in long-term work practice. This type of tacit knowledge can be clearly expressed in words and is easy to spread and communicate. This type of tacit knowledge is basically equivalent to the weak tacit knowledge mentioned above. Cognitive tacit knowledge mainly refers to the innate talents of individuals or organizations, as well as business insights, thinking patterns, mental models, organizational culture, work atmosphere, team cooperation, etc. accumulated in long-term work practice. This type of tacit knowledge is internalized in people's minds or permeates through various aspects of the organization, and is difficult to describe in words, mainly reflected through individuals' speech and behavior or the specific work processes of the organization. This type of tacit knowledge is basically equivalent to somatic tacit knowledge and collective tacit knowledge. Environmental tacit knowledge mainly refers to various peripheral tacit knowledge that affects regional innovation, including innovation opportunities implied by national and regional innovation policies, the guiding and coordinating role of government actions in innovation activities, and innovation discovery brought about by the aggregation of big data in the industry, etc. This type of tacit knowledge needs to be fully scanned and deeply analyzed for the surrounding innovation environment. This type of tacit knowledge will be discussed in detail later in this article.

2.2 Division of tacit knowledge degree of tacitness

Scholars such as Lijun Liu [10] believe that the visibility of knowledge should not be binary, and emphasize that the degree of tacitness of tacit knowledge can be divided into three levels: results invisibility, process invisibility, and context invisibility. Results invisibility best fits the classic definition of tacit knowledge, and process invisibility refers to knowledge of "knowing the what but not the why." In addition, tacit knowledge is always related to a certain context. Context invisibility is defined as "the shared context among team members who possess and apply tacit knowledge that has invisible and unobtainable characteristics to individuals outside the team." For example, the research and development process, terminology, data, experimental conditions, and common experiences of the members of the same research and development team constitute a shared context among team members, and even if this knowledge is recorded by the research and development team, it may still be "tacit" to individuals outside the team who do not have access to this shared context.

2.3 Knowledge Continuum

Some scholars have proposed the concept of a "knowledge continuum" [11] based on the degree of difficulty in making implicit knowledge explicit. The knowledge continuum emphasizes that all knowledge forms a continuous structure, where knowledge encoding and the degree of difficulty in making it explicit gradually decreases from left to right, and the extent to which knowledge can be made explicit increases as technology advances.

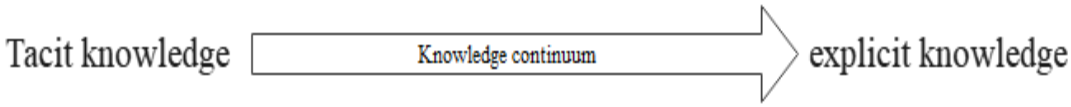


Figure 1. Knowledge continuum

Furthermore, using the concept of knowledge continuum as the x-axis and knowledge communities (a behavior entity composed of interrelated actors in a certain knowledge field [12]) as the y-axis, a coordinate system of implicit knowledge can be constructed. The x-axis can be divided into three stages based on the level of difficulty in explicitation, while the y-axis can be divided into four stages based on the size of the knowledge community.

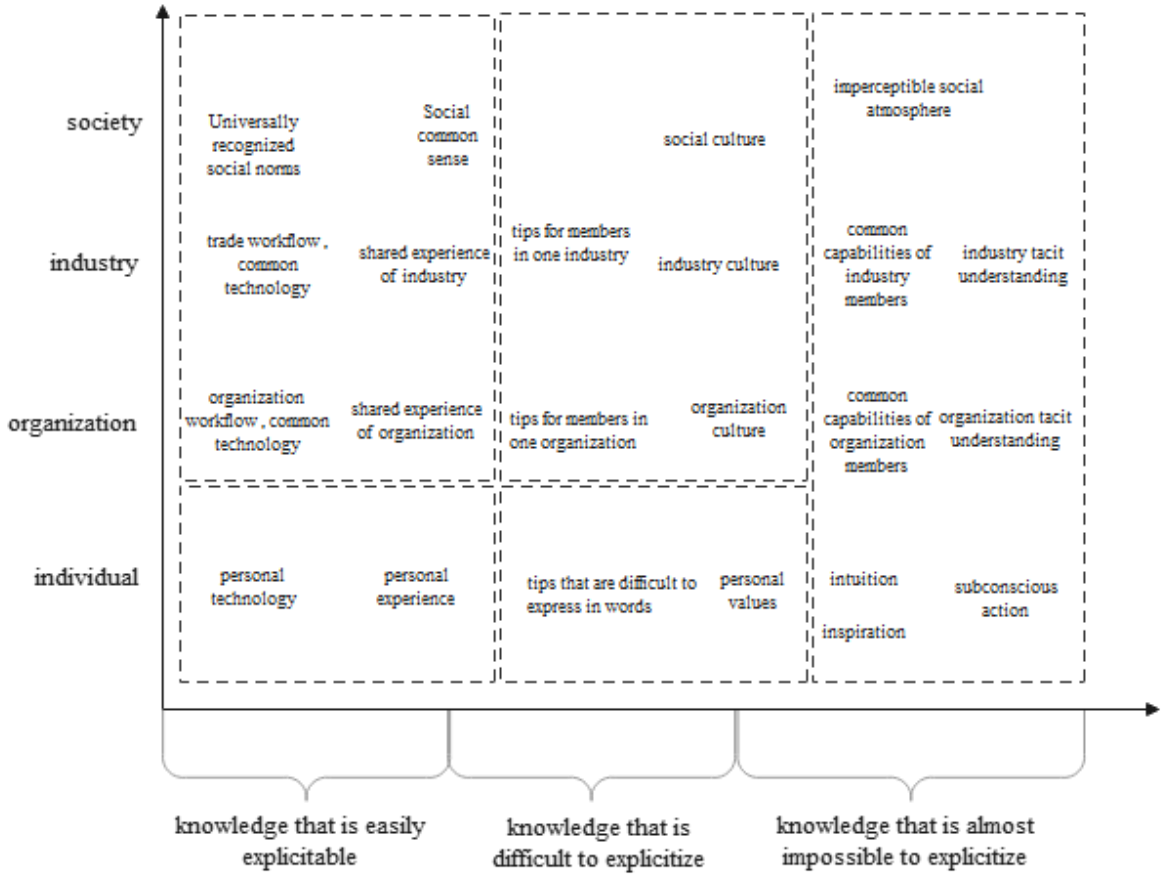


Figure 2. tacit knowledge coordinate system

According to the perspectives of Clemen J [13] and Xiaofei Ren [14], an important criterion for explicit knowledge is whether the knowledge subject is conscious of the knowledge or not. The abilities shared by organizational members, industry shared abilities, organizational/industry tacit understanding, and implicit social atmosphere differ from the previous ones in that the subject can or cannot be aware of the existence of such knowledge. If they are aware, it is "difficult to explicit knowledge"; if they are not aware, it belongs to "inexplicit knowledge".

2.4 Integration of various classification methods

Various methods of classification can be integrated into this coordinate system. For example, "weak tacit knowledge" roughly corresponds to "personal skills", tacit knowledge concerning one's body roughly corresponds to "inexpressible personal tricks", and strong tacit knowledge roughly corresponds to a band-shaped area from "social common sense" to "implicit social atmosphere". In the knowledge classification of the World Economic Forum, "know-what" and "know-why" are roughly in the lower-left corner of the coordinate axis, "know-how" is roughly near "difficult-to-explicit personal knowledge", and "know-who" is roughly distributed elsewhere.

The "different degrees of tacitness" mentioned earlier are essentially at the level of tacit knowledge utilization. The conditions that tacit knowledge located at different positions on the coordinate axis needs to meet are different. For personal tacit knowledge that is relatively easy to explicit, it only needs to satisfy "visible results" to be utilized. For example, telling a new employee the placement location of goods on a shelf, he or she can immediately handle goods like an experienced employee. For tacit knowledge that is difficult to explicit, not only visible results but also visible processes are required to be met. For example, Shijian Luo [15] defines the tacit knowledge of experienced designers in motion phone exterior design as "the ability to express conceptual images in abstract design language". However, it is still difficult for outsiders to know how the designer expresses conceptual images in abstract design language during the design process. That is, the tacit knowledge of experienced designers in the design process is still unknown to other individuals and has process invisibility.

In essence, "result", "process", and "context" are three components of knowledge. For personal knowledge that is relatively easy to explicit, results can reflect processes (such as the knowledge of placing goods on a shelf mentioned earlier), and this knowledge does not involve context (context must involve a group in its definition). Therefore, it is located in the lower-left corner of the coordinate axis, and visible results are sufficient for utilization. The reason why tacit knowledge that is difficult to explicit or cannot be explicit encounters difficulties in the explicit process is that the current level of technology cannot extract one or both of the "process" and "context" (mainly the process). For example, ancient Chinese alchemists might mix some chemicals to manufacture other chemicals, and they formed a set of inherited experience systems. In ancient times, this belonged to "inexpressible personal tricks that can only be mastered through practice", but in modern times, it may be just one or several chemical equations, and high school students only need to follow the experimental procedures strictly, such as heating potassium permanganate to 220 degrees Celsius to obtain oxygen. This is the progress of technology that enables people to master "process" knowledge that was not previously mastered, thereby increasing the level of knowledge explicitation. If humans make breakthroughs in the study of the brain in the future, they may decipher "where the genius intuition comes from", and previously unexplicit knowledge may become explicit.

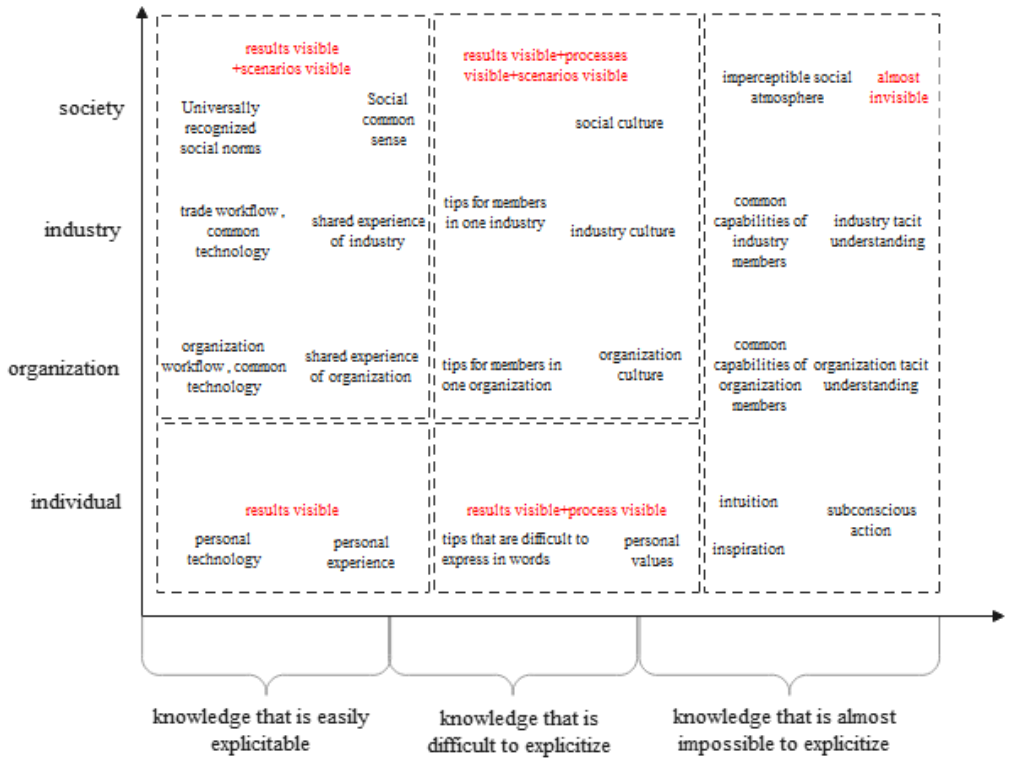


Figure 3. The tacit knowledge coordinate system with the degree of tacit knowledge added

From the perspective of Marxist philosophy, all knowledge arises from practice. The initial knowledge that directly arises from practice is sensory, personalized, subjective, and belongs to the category of implicit knowledge. As humans continue to progress in labor and transforming nature, these implicit knowledge begin to be made explicit in order to better guide production. In this process, it is necessary to explain and record practical knowledge within the brain using logic and rules that can be expressed in the human symbolic system. This is the process of knowledge explicitation. From this perspective, some knowledge cannot be made explicit or is not fully explicit because the current level of human science or social development is insufficient to support the complete explicitation of this knowledge. For example, to transform "intuition," which is incomprehensible and non-reproducible implicit knowledge, into explicit knowledge that can be used repeatedly, a thorough understanding of the working mechanism of the human brain is needed. The explicitation of knowledge about social customs and culture also requires the joint development of disciplines such as anthropology and sociology. Moreover, because there is a set of logical rules behind implicit knowledge, similar practices can yield similar implicit knowledge. For example, most people have similar experiences when learning to ride a bike: they fall easily at first, but after finding their balance and adjusting to the bike, they learn to ride it. This is also the reason why implicit knowledge is still able to spread without being explicit. From the perspective of Marxist philosophy, all explicit knowledge originates from implicit knowledge. This has been recognized by experts. Tsoukas pointed out when discussing the relationship between explicit and implicit knowledge, "even the most explicit knowledge is transformed from implicit knowledge."

Regarding implicit knowledge, information management mainly focuses on how to achieve efficient explicitation of easily explicitable implicit knowledge and the part of difficultly explicitable implicit knowledge that can be explicitated efficiently through appropriate technology and management methods, and provide intellectual support for enterprises and other organizations. Anthropology focuses on the study of implicit knowledge such as social customs and culture, while psychology and biology focus on the study of the logic behind personal intuition and subconscious behavior.

3. New Expansion of the Concept of Implicit Knowledge

With the development of big data technology, the meaning of tacit knowledge has started to expand. Yi Su [16] et al. classified tacit knowledge into two types: traditional tacit knowledge, which refers to knowledge stored in the human brain that is not explicitly expressed, and data-based tacit knowledge, which mainly refers to knowledge hidden behind big data that has not yet been explored. The "environmental tacit knowledge" mentioned by Leping Song earlier belongs to this category. With the widespread application of big data technologies such as cloud computing and data mining in different industries, a large amount of unstructured, semi-structured, and structured data quickly accumulates, forming the intangible assets of acquiring companies. However, the knowledge hidden behind this data needs to be mined to be useful. There have been some achievements in mining tacit knowledge based on big data, such as using the CART algorithm proposed by Jie Ma et al [17]. to mine tacit knowledge in traditional Chinese medicine case texts. However, the differences and connections between this type of tacit knowledge and traditional tacit knowledge have not been clarified, and the two types differ greatly in definition and research methods. Therefore, it is suggested to distinguish between the two types of tacit knowledge, limiting the definition of "tacit knowledge" to its classical definition and its extensions. Another term can be used to refer to data-based tacit knowledge. Perhaps this type of tacit knowledge can be called "hidden knowledge," while tacit knowledge stored in the human brain can be called "tacit knowledge."

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