Knowledge transformation among virtually-cooperating group members

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Abstract
Purpose – The purpose of this paper is to present how in a virtual setting a cooperating group of individuals could transform their tacit knowledge, and what is the necessary infrastructure needed for such transformation.

Design/methodology/approach – The paper highlights the different perspectives on knowledge as well as its classification and perception by researcher’s to-date. It also examines current theoretical questions of knowledge management and knowledge transformation. Opinions and ideas are introduced as the easier parts of tacit knowledge that can be transformed into explicit form. The paper also introduces a knowledge management definition, which presents three phases for managing knowledge among virtually cooperating group members.

Findings – The paper has the following items as vital for knowledge transformation among virtual group members: a definition for knowledge management among group members; adoption of classification of knowledge as explicit, embodied, and not-yet-embodied (Scharmer); and opinions and ideas as the parts of tacit knowledge which could be easily transformed.

Originality/value – Knowledge management and knowledge transformation have been addressed in the literature at the organizational level. The paper addresses these issues from a group level and introduces definition, concepts, and ideas that form the backbone of such management and transformation. The points raised are expected to be of interest to researchers working on knowledge management and transformation among virtually cooperating group members.

Keywords Knowledge management, Tacit knowledge, Ideas generation

Paper type Conceptual paper

Introduction

It is not the intention of this research to be part of the current literary debate on what knowledge is, whether or not it can be transformed onto other forms, or what are its ‘components’. The literature provides many definitions and classifications of knowledge as well as techniques on how it can be transformed (Collins, 1993; Nonaka and Takeuchi, 1995, Wathne et al., 1996; Vasconcelos et al., 2000; Scharmer, 2000; Geyer, 2001; Awad and Ghaziri, 2004; Jarvenpaa and Eerikk, 2004). It is the position of this paper to approach knowledge from its very basic definition as having both explicit and tacit components. This duality is the base from which all other existing forms of knowledge are derived. This paper suggests that the context under which knowledge is perceived plays an important role in the ‘what, why, who, and how’ of knowledge. For the sake of clarity to the already existing ‘terminological ambiguity’, this paper adopts Scharmer’s (2000) classification of knowledge as explicit and tacit (embodied and not-yet-embodied) knowledge.

Explicit knowledge is the knowledge in books, files, databases, and others. Tacit knowledge exists in two forms: embodied and not-yet-embodied knowledge. Embodied knowledge is associated with an individual’s awareness of his/her know-how, his/her ability to articulate it (verbally or textually) in an understandable form to others, and his/her ability to make others master it in an effective way. Embodied knowledge is embedded in the consciousness of the individual and accumulated through expertise, experiences, work practices, and learning
by doing. The not-yet-embodied knowledge is unconscious knowledge, which lies dormant until articulated in an understandable form because it is based on the individual’s perception, instincts, design ability, innovation, and creativity. This class of knowledge resides in the unconsciousness of the individual and in some cases, he/she may not be aware of its existence until a trigger acts as a stimulus for the articulation of such knowledge. Figure 1 represents the authors’ interpretation of these different types of knowledge.

Explicit knowledge resides traditionally in easy accessible physical media such as databases, books, files, and organizational or group memory; it can be easily interpreted and used by individuals for a variety of purposes. Individuals may either alter the contents or reflect on them to amplify embodied and/or not-yet-embodied knowledge that is expressed in words or text. Consequently, it can be articulated or transformed to an object known as codified knowledge of know-how that can be made readily available to others.

Embodied knowledge is marked by the individual’s own awareness and articulated as an object in the form of procedures and processes. The not-yet-embodied knowledge relies on factors, which are purely personal and requires the individual’s analytical abilities, reflections, synthetical abilities, logical analysis, and creativity. It is articulated as an object in forms such as solutions, design, innovation, design, opinions, and ideas.

Generally, tacit knowledge (embodied/not-yet-embodied) is acquired through interaction with the world. It is heavily based on experiences, culture, education, and qualifications that are developed and internalized by individuals over a long period. In addition, intelligence, instincts, analytical as well as mental abilities play an important role in the formation of not-yet-embodied knowledge. Tacit knowledge has been systematically investigated in the literature (Polanyi, 1967; Reuber et al., 1990; Nonaka, 1994; Sveiby, 1997; Vasconcelos et al., 2000). The intellectual property of an individual or organization as well as organizational

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**Figure 1** Knowledge interpretation

![Knowledge Interpretation Diagram](image-url)
culture, project experiences, task heuristics and human competencies that are not easily externalized are examples of such knowledge (Vasconcelos et al., 2000).

The essential logical difference between tacit and explicit knowledge lies in the fact that one can critically reflect on something explicitly stated, in a way in which one cannot reflect on one’s tacit awareness of an experience. An individual’s tacit knowledge, even though, he/she may not be able to identify it accurately is the hidden driving force for all pursuit of explicit knowledge (Polanyi, 1967). Explicit and tacit knowledge are not separate entities but mutually complementary. It is true that without experience, knowledge cannot be accumulated, but it is also true that this knowledge can only have meaning if it is articulated and shared. The literature provides examples of this form of knowledge: Nonaka & Konno (1998) as Originating Ba, Schon (1983) as reflection-in-action, Von Krogh (1998) as notion of “care”, Senge (1990) as personal mastery, Jaworski et al. (1997) as emergent field, and as not-yet-embodied knowledge.

Knowledge transformation

The literature stresses that, social interaction (Lave and Wenger, 1991), physical interaction (Lave and Wenger, 1991; Finerty, 1997; Cook and Seely, 1998), learning (Nonaka, 1991; Hildreth and Kimble, 2002; Gamble, 2001), sharing (Nonaka, 1991; Hildreth and Kimble, 2002), and the use of technology (all of the above researchers) are imperative components for the proper management of knowledge in face-to-face interactions. In such environment, people share their knowledge by adopting different techniques of articulation, mainly, verbal discussions and brainstorming. Wasko and Faraj, 2005, stated that “prior studies consistently find that knowledge sharing is positively related to factors such as strong ties, co-location, demographic similarities, status similarities, and a history of prior relationship.”

Today, globalization has imposed on businesses remote communication and interaction which consequently necessitated different perspectives of knowledge sharing. The main dilemma is how a group of geographically dispersed people can articulate their knowledge? The different knowledge classifications presented earlier explain its meaning in relation to the beliefs and perceptions of the person who is trying to either classify or define it in a given context. Knowledge is still considered by the majority of researchers as a tangible structured object that can be codified, hence, transformed. The research in this paper is based on both an epistemological and an ontological analysis.

Epistemologically, the authors adopt Scharmer’s (2000) pluralistic approach to knowledge classification. A group’s formation, interaction, and memory form the backbone of the ontological perspective of this work. This necessitates a group support system that would help in:

- systematically turning “parts” of the group members’ tacit knowledge into explicit knowledge through successive and consequential building of ideas and opinions in the form of documents;
- providing a platform for the asynchronous cooperative capture of the parts; and
- providing a platform for the organized retention and later access of the saved opinions and ideas.
Not all knowledge can be easily codified and stored in an explicit format; otherwise, there would be no need for a new paradigm. Tacit knowledge is “there to stay” and it is considered by many to be the main differentiating factor for competitiveness:

It is widely acknowledged that many things are tacitly expressed and understood. It can thus be argued that it is the very inability of the information system to handle knowledge that has brought about much of the current interest in KM (Stenmark, 2001).

Knowledge can be captured socially, through sharing and interactions using “a” technology as a platform or using a cognitive/representational approach. Therefore, it is necessary to provide the appropriate support for groups to capture and transform knowledge where group members are dispersed over time and space. The authors argue that communication and interaction is accomplished by the use of a group support system that facilitates interaction among geographically dispersed group members by a process which simulates face-to-face interaction.

**Knowledge transformation in a virtual setting**

The authors introduce the following proposition:

**P1.** Opinions and ideas are the parts of tacit knowledge that are easier to be transformed into explicit knowledge by group members engaged in an asynchronous setting.

The opinions and ideas of a person are the easier “parts” of tacit knowledge that can be captured and transformed into explicit knowledge among geographically-distributed group members engaged in an asynchronous setting. Transforming “all of” tacit knowledge based on the existing definitions and classifications in the literature is of higher order complexity. This paper’s approach is to transform easier types of tacit knowledge in the form of opinions and ideas, and later generalize the findings to other types of tacit knowledge. Opinions and ideas refer to knowledge that group members release, and then nurture in a given context, based on the group’s predefined goals and objectives.

Table I (El-Den, 2004) presents similar characteristics between tacit knowledge and opinions/ideas, as well as how they relate to each other. The table also shows that not all instances of opinions and ideas have corresponding instances in tacit knowledge. Following the common features introduced in the table, this paper proposes that the transformation of an individual’s opinions and ideas is consequently a transformation of parts of his/her tacit knowledge.

Opinions and ideas form the basis for the knowledge management concepts introduced in this paper. Knowledge is what the members nurture during their interaction and cooperation. To a group, a document that is being built progressively and consequentially forms the infrastructure for interaction while containing explicit, tacit-embodied, and not-yet-embodied knowledge. Personal knowledge is released into documents. It becomes the source of knowledge for other members who nurture it by amplifying its contents and thus, creating more knowledge. This process is helped by the transformation of knowledge from one type to another. The table below introduces the authors’ view of transformation of knowledge in a virtual setting and compares to Nonaka and Takeouchi’s face-to-face knowledge transformation.

The complexity in virtual settings is the lack (and may be the impossibility) of face-to-face interaction among the members. Consequently, this research adopts a document structure for interaction among group members. The research also assumes that a member’s textual articulation of the opinions and ideas correspond to the verbal articulation in face-to-face interaction; hence, the reflection process is “reflection” on what has been released by individuals.

The following points explain how knowledge is transformed from one type to another based on Table II. Emphasis is put on the not-yet-embodied knowledge because its transformation to explicit knowledge is the most difficult to verify.
<table>
<thead>
<tr>
<th>Tacit knowledge</th>
<th>Opinions</th>
<th>Ideas</th>
<th>How they relate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subconsciously understood and applied</td>
<td>Judgment based on special knowledge provided by experts</td>
<td>Special concepts arising from empirical knowledge and intelligence; seem to point beyond nature</td>
<td>Some issues can't be explained but are still adopted</td>
</tr>
<tr>
<td>Difficult to articulate/document</td>
<td>Judgment/sentiment, mind forms of person/things</td>
<td>Thoughts/concepts in mind as products of mental activity, opinion, conviction, principle</td>
<td>Experts tend to understand what other inexperienced people take for granted</td>
</tr>
<tr>
<td>Developed from direct experiences and actions</td>
<td>Belief shared by most people; Formal decision, expression of view called upon to consider and decide upon</td>
<td>Plan/suggestion, dictate what to do in a particular situation</td>
<td>Impressions can only be established through experiences</td>
</tr>
<tr>
<td>Shared through interactive conversations</td>
<td>Message expressing a belief</td>
<td>Used to encourage people, tell them that they are doing something right</td>
<td>Sharing occurs in the form of group collaboration and consequently decisions will be taken/adopted</td>
</tr>
<tr>
<td>Story telling</td>
<td>Belief shared by most people</td>
<td>Plan/suggestion, dictating what to do in a particular situation</td>
<td>People can be encouraged through stories about prior success</td>
</tr>
<tr>
<td>Shared experience</td>
<td>A person belief not founded on proof/certainty</td>
<td>Concepts, philosophies, images, issues, provide psychological stimulus to solve problem/adjust to environment</td>
<td>Common practice</td>
</tr>
<tr>
<td>Informal/un-codified</td>
<td>A person belief not founded on proof/certainty</td>
<td>Picture/impression in minds of something/ somebody</td>
<td>The fact that it has not been found on proof or certainty renders it informal</td>
</tr>
<tr>
<td>Ephemeral and transitory</td>
<td>Belief/view of group of people</td>
<td>Heart of message, content of piece, main theme</td>
<td>Some things just last forever, and may come up again any time</td>
</tr>
<tr>
<td>Formal/embodied</td>
<td>Belief/view of group of people</td>
<td>Some things are taken for granted</td>
<td></td>
</tr>
</tbody>
</table>
Tacit → tacit. Tacit to tacit conversion is a process of reflection on released knowledge by group members in the form of opinions and ideas. In face-to-face interaction, tacit-to-tacit is a socialization process that converts tacit knowledge through interaction between individuals and relies on the experiences gained from the interaction. In virtual interaction, this knowledge is transformed through a mental reflection on textually available knowledge. The latter interaction is not only mental but also physical through documents. The result is a nurture of the individual's knowledge which might lead to an amplification of this individual's tacit knowledge.

Tacit → explicit. Tacit knowledge is transformed into explicit knowledge through the release and documentation of the member's thoughts, opinions, and ideas into shared documents. These opinions and ideas are the not-yet-embodied knowledge.

Explicit → tacit. Explicit knowledge is transformed into tacit knowledge through a process of accessing and comprehension of the "contents" of a document which holds each member's opinions and ideas. In this case, group members should have reliable access to retained information or knowledge.

Explicit → explicit. Explicit-to-explicit transformation of knowledge can be achieved through augmenting/documenting the shared document by knowledge released by the members. The process consists of retrieving, using, amending, and storing/documenting any existing documents in the system.

Finally, attempting to capture the thinking of individuals with the help of audio or by videotaping meetings will only result in the collection of a staggering volume of tale. Furthermore, trying to preserve tacit knowledge during face-to-face interactions as reports, meeting minutes, design documents, presentations, and memos or even with the help of a project historian on board will fail to capture comprehensive informal knowledge communicated between group individuals. As McInerney (2002) suggested, instead of "extract[ing] knowledge from within employees to create new explicit knowledge artifacts," the focus in organizations should be on creating a "knowledge culture" that encourages learning as well as the creation and sharing of knowledge. Hence, the authors adopted Mandviwalla and Olfman's (1994) argument that a group-authored document is a common form of collective memory and that collaborative writing is a cognitive process in which a portion of group memory is formalized.

Managing knowledge among virtual group members

This paper defines knowledge management among virtual group members as:

The set of activities which focus on the initiation, creation, capture, transformation, retention, and access of opinions and ideas imbedded in a group’s memory and intellect satisfying a set of predefined goals and objectives.

Jarvenpa and Eerikki (2004) stated, "The management of knowledge is the management of what people know". Knowledge management aims at identifying the corporate knowledge in collective memories and facilitating communication and coordination between people who create it and people who need it (Wathne et al., 1996). Management of knowledge has to
take into consideration aspects that surpass the identification of knowledge. Knowledge has no value if it is not captured, retained, reused, and communicated among people.

The management of explicit and tacit knowledge is different; so is the process of their respective transformation. Knowledge management should be based on the individual's perception, reflection, and formation of opinions and ideas in a given context. It is also based on the proper identification of a predefined set of goals and objectives. The context provides the infrastructure for the individual's contribution in this development of knowledge within a set of goals and objectives. One's perception of these goals and objectives dictates one's contribution to the progressive building of knowledge captured in documents. Given one's stage of involvement in the building of knowledge one would use either explicit, tacit-embedded (implicit) or not-yet-embodied (tacit) knowledge. The authors look at knowledge management as a process that encompasses knowledge creation (knowledge initiation/release and knowledge nurture), knowledge filtration, and knowledge retention. The authors propose a knowledge management cycle that includes all three steps depicted in Figure 2.

**Knowledge representation as an object**

The paper introduces a second proposition:

P2. Tacit knowledge, in the form of opinions and ideas, can be created and transformed into explicit knowledge by virtually dispersed group members through the progressive and consequential building of shared documents.

Cooperating group of people engaged in a virtual setting can create and transform their tacit knowledge, in the form of opinions and ideas, by progressively and consequentially building shared documents. These opinions and ideas should be treated as objects released in textual form by the members of the group forming the basis of representation and manipulation of tacit knowledge. The literature supports this knowledge-as-object approach, e.g. (Walsham, 2004).

Accordingly, the paper differentiates between two object structures: a cognitive object in the brain of the knower (embodied and/or not-yet-embodied knowledge), and a physical object in a textual form (embodied and/or explicit knowledge). Such representation is important because it assumes that knowledge is a cognitive object that can be initiated or released by individuals and then captured as a physical object in a document. This knowledge may evolve into other text or retained as a “group memory document” due to interactions and

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**Figure 2** The knowledge management cycle

![Knowledge Management Cycle Diagram](image-url)
discussions among different members of a group. It should be noted that, through communities of practice, there are several alternative platforms to the knowledge-as-object approach (Lave and Wenger, 1991; Wenger, 1998; Brown and Duguid, 1998). These alternatives include the practice-based theory of knowing and learning (Blackler, 1995; Blackler et al., 2000, and the context approach in designing and implementing knowledge management initiatives (Walsham, 2004) which involves information and communication technologies (Walsham, 2001).

Interaction among members of a group is the basis for transforming knowledge from the cognitive to the physical state and vice versa. This transformation is manifested in two ways: First, through the release of each cooperating member’s individual knowledge into the shared document. Second, it is manifested through reflection on that explicit textual knowledge. This latter action might trigger the release of more individual knowledge due to a process of reflection and amplification. Furthermore, the mapping between the two states cannot be a complete transformation of the “content” of the cognitive to the physical. The interaction and discussions on the content among members nurture further mapping to maintain as much transformation of knowledge as possible.

The conceptualization of knowledge as an object is effective for building technology-based applications since it allows for the transferability of the knowledge. Walsham (2001) proposed a basic communication model (Figure 3) describing Polanyi’s (1967) interpretations of tacit/explicit knowledge transformation. Polanyi argues that the transformation of tacit into explicit is not a complete transformation of what was intended by the originator of the message.

Person “A” may not have articulated all of his or her tacit knowledge in a written form; which means that Polanyi’s argument that “we are always short in telling what we know” still holds to true. This representation constitutes the first step towards the articulation, capture, and initial transformation of tacit/explicit knowledge into a readable form. It may not be a complete representation of its cognitive likeness in the case of the not-yet-embodied knowledge, but it is a total mapping of embodied and explicit knowledge; it represents the articulation of the individual’s know-how in the form of procedures and processes.

Although the transformation in Walsham’s diagram may not be complete, it is possible to capture more of the tacit knowledge and transform it into explicit knowledge. This is accomplished through a process of nurturing the thoughts, opinions, and ideas that are released by group members engaged in a cooperative process; Polanyi (1967) also supports this view. Figure 4 represents the authors’ view on knowledge formation as a process of knowledge amplification, which is the result of reflection, release, interpretation and discussions of existing knowledge released in textual form as opinions and ideas. Figure 4 also shows that different types of existing knowledge support the process.

Through the access of the released knowledge captured in a document, group members may discuss specific contents with the person who articulated that knowledge. This discussion might awaken dormant knowledge (not-yet-embodied knowledge) within the originator or the other members exposed to it. As mentioned earlier, the articulation of such knowledge allows for the sharing of opinions and ideas. This “initial” articulation of knowledge can subsequently be improved through discussions and interactions between readers and people who know. This process might fuel additional opinions and ideas as it could trigger dormant knowledge in an individual’s consciousness. Evidently, opinions and ideas are the property of the individual’s unconsciousness as long as there is no trigger or

![Figure 3](image-url)
incentive for articulation. The moment a person starts to articulate his/her opinions and ideas, an initial mapping of the knowledge in the brain is articulated in a textual form.

**Knowledge creation**

The creation of knowledge has to go through two important complementary steps; namely, knowledge initiation and knowledge nurture. Creating knowledge is a process of an individual's knowledge release and nurture. This process may result in amplifying the released knowledge due to cooperation, discussion, and message exchange among members of a group. The success of the highly interactive knowledge creation process with the support of constantly available external resources, is a reflection of an individual’s past experiences, intelligence, his/her ability to nurture and amplify existing knowledge, and his/her ability to initiate/release new knowledge.

**Knowledge Initiation.** Initiation is based on a member’s understanding of the context and his/her associated group’s predefined goals and objectives. It forms the basis for the subsequent steps in the proposed KM cycle. The initiation of an opinion or idea can either be an individual’s articulation of “new knowledge” based on his/her mental analysis of the context or an articulation of amplified knowledge based on the individual interpretation and understanding of existing knowledge previously released by other members. Initiation of “new knowledge” is not based on the analysis of existing knowledge within the group. This “new knowledge” can be explicit, tacit-embodied knowledge, or not-yet-embodied knowledge. The initiated knowledge is based on the member’s thoughts, beliefs, interpretations, expertise, and know-how. Once initiated, this knowledge forms the infrastructure of discussions and interpretations among group members during the knowledge nurture step. Hence, it becomes existing knowledge. Schon (1983) pointed the importance of “reflection in action” (reflecting while experiencing), and discussed that individual knowledge is enlarged through the interaction between experience and rationality. This enlargement is subsequently crystallized into a unique perspective original to the individual. Knowledge is amplified and released thanks to reflection on previously released/accumulated group knowledge. It remains personal until articulated as a text in a shared document. Therefore, amplified knowledge is a result of the member’s interaction with other members of the group, accessibility to available knowledge, and the group released perception, reflection, and interpretation of that knowledge.

**Knowledge nurture.** Knowledge remains within the individual until it is textually articulated. Only then, it becomes available to group members for discussion. The nurture of knowledge is a step where members cooperate to amplify and/or create new knowledge. During this process, some initiated or released knowledge might be disregarded if it does not satisfy, or at least lead to, the satisfaction to predefined goals and objectives. Members “fetch” this knowledge and form “understandability of its content” (action/reflection). The nurture of
knowledge is a process where existing knowledge is understood and new opinions/ideas are formed based on it (reflection). This process requires a high level of interaction (messaging and/or document augmentation) among the members in order to nurture the knowledge initiated/amplified in the previous step. This iterative process might result in the formation of new knowledge that contributes to the overall development process. A member’s perspective on existing knowledge is brought upon by its availability and the ease of its access. Knowledge nurture is a continuous process based on both the individual and the group’s interpretation/perception of existing knowledge. The nurture of knowledge should result in the emergence, formation, and creation of new concepts. It is regarded as a necessary amplification of members’ previously released knowledge.

The knowledge nurture process. Knowledge nurture is an individual’s process of reflection, concept formation, concept amplification, justification and externalization/documentation. This knowledge is then integrated within the group’s memory (Figure 5).

The nurture of knowledge is both an iterative and cooperative process, which requires high-level of interaction and discussion among the members; particularly during the justification of the concepts. This interaction: the member’s awareness, and accessibility to each other’s released knowledge, as well as the sharing of information/knowledge among the members, exposes each member’s experiences, know-how, and opinions/ideas. This might trigger the formation, creation, and release of new knowledge; and consequently, the amplification and augmentation of the group’s knowledge.

The nurture of knowledge is the collective group members’ ability to form new concepts by reflecting on existing knowledge through cognitive analysis. This process might trigger past dormant expertise and/or knowledge in the unconsciousness of the individual. Reflection on

Figure 5 The nurture process
previously released knowledge, expertise, and the understandability of each other’s mental analysis is necessary and complementary for the individual’s creation of new knowledge. An individual’s past experiences form the basis of his/her perception and comprehension of existing concepts. This process is heavily based on the intellectual, analytical, and experimental abilities of the individual.

A member’s reflection on existing/released textual knowledge is a mental process of comprehension, conscious analysis, concepts understanding, and learning through exposure to others’ know-how, and opinions/ideas. This mental process may trigger knowledge imbedded in the unconsciousness of the individual resulting in the formation and articulation of his/her dormant knowledge.

Exposure to textually available “tacit” knowledge articulated by individuals resembles knowledge formation in face-to-face interaction. In face-to-face interaction, creative ideas are the result of discussions and interactions at the conscious level. Interaction among individuals is an important factor for innovation, which is a result of immediate concepts formation within the individual’s consciousness. In this case, the individual formulates concepts from the unconsciousness and verbally articulates them during face-to-face interaction.

The situation is more complex among virtually interacting, geographically dispersed group members. Virtual teams working towards delivering a product or service should be provided with a support that facilitates the simulation of face-to-face interaction. This paper assumes that the member’s textual articulation of knowledge in the form of opinions/ideas onto documents, supported by a powerful message interface provided by a group support system, forms an infrastructure that can effectively replace face-to-face interaction and communication.

The virtually located members should be able to articulate their knowledge in any form (explicit, tacit) and make it available so that others can access and later reflect upon it. This knowledge, which contributes to the overall product development, could carry with it part of the not-yet-embodied knowledge. The nurture process provides the infrastructure that allows for more of this knowledge to be articulated by further exposing the members’ opinions/ideas. O’Reilly et al. (1998), stated, “The diversity of information that is functionally dissimilar which individuals bring to the group improves performance in terms of creativity.”

Knowledge filtration

The filtration step is a process where the knowledge created during the development process is tested to conform to the predefined goals and objectives. It is an important iterative process because any knowledge that does not fall within the boundaries of the goals and objectives must be filtered from the document. This step requires a high level of interaction among the members in order to mutually decide on the components of knowledge that must be retained or removed. The availability of an interaction platform can help in making the existing knowledge more accessible. This process is a group effort; the group members should agree on the knowledge introduced and crystallize it into a concrete textual form.

Knowledge retention

This step allows for the saving of the group’s knowledge in the group’s memory or the system’s memory and makes sure that it remains accessible. In this case, knowledge

“Today, globalization has imposed on businesses remote communication and interaction which consequently necessitated different perspectives of knowledge sharing.”
organization plays an important role because it is the retained knowledge that forms the backbone of the group memory system.

Conclusion

This paper adopted Scharmer's (2000) decomposition of tacit knowledge as embodied and not-yet-embodied knowledge. It argued that not all types of tacit knowledge could be transformed into an explicit form; opinions and ideas were identified as the easiest parts for such transformation. The paper introduced a knowledge management cycle that shows the management and transformation of knowledge among virtually cooperating group members. The cycle mostly addressed the management of the not-yet-embodied knowledge and not the more-easily articulated explicit and embodied knowledge (know-how, processes, and procedures). The challenge in developing the cycle was to provide a walkthrough that helps members articulate their not-yet-embodied knowledge.

This work shows that by following the knowledge management cycle, it is possible to make “parts of tacit” knowledge explicit. Conklin (2000) stated, “The senior challenge is transparent capture that preserves relevance and meaning, in other words, capture of informal (tacit) knowledge as well as formal (explicit) knowledge. Capture of informal knowledge is complex and expensive. However, if one shifts the emphasis from “how to capture all this stuff?” to “how to improve the process of teamwork such that capture happens by itself?” one gets a surprising answer”. Therefore, If tacit is to be used in knowledge management it is imperative to try to “make it” as explicit as possible.

The paper stresses that knowledge transformation among virtually dispersed group members is possible through the articulation of members’ opinions and ideas into a shared document. This document provides the infrastructure for the interaction among the members by exposing them to each other’s opinions and ideas. The setting of goals and objectives by the cooperating members is a vital starting point for any particular group since the final document must be filtered to conform to these goals and objectives.

This work also introduced new insight on how tacit knowledge can be transformed into explicit knowledge through the progressive and consequential building of a shared document. The authors argued that it is an iterative process based on member’s reflection on textually articulated knowledge followed by opinions and ideas formation, followed by textual articulation of new knowledge and then by interpretation and reflection on the articulated knowledge by others and discussion among them on the newly articulated knowledge. The authors developed these ideas in order to provide the cooperating members with an environment, which mirror the face-to-face interaction and where ideas and opinions formation are a result of perception of verbally articulated knowledge.

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