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The quality of group tacit knowledge ☆

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Abstract

Organizational knowledge creation theory explains the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it to an organization's knowledge system. What individuals get to know in their (working) lives benefits their colleagues and, eventually, the wider organization. In this article, we briefly review central elements in organizational knowledge creation theory and show a research gap related to the quality of tacit knowledge in a group. We advance organizational knowledge creation theory by developing the concept of "quality of group tacit knowledge." Based on this concept, we further develop a comprehensive model explaining different levels of tacit knowledge quality that a group can achieve. Finally, we discuss managerial implications resulting from our model and outline imperatives for future theory building and empirical research.

Keywords: Tacit knowledge; Group tacit knowledge; Quality of group tacit knowledge; Improvisation; Phronesis; Collective action

1. Introduction

Knowledge is one of the most important sources of competitive advantage for firms (Grant, 1996; Nonaka, 1990, 1991, 1994; Nonaka and Takeuchi, 1995; Nonaka and Toyama, 2003). A critical factor for competitive advantage is enabling new knowledge creation that allows the firm to respond as quickly as possible to the business requirements of the near and more distant future. Thus, knowledge and the theory of organizational knowledge creation have long been discussed among academics. Organizational knowledge creation is defined by Nonaka et al. (2006, p. 1179) as "the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it with an organization's knowledge system."

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Knowledge creation is of paramount importance to a firm's strategy[1] (e.g., Bierly and Chakrabarti, 1996). Nonaka et al. (1994) argue that, in dealing dynamically with a changing business environment, firms should not only process information efficiently but also create knowledge. A changing business environment is characterized by increased global competition, rapidly changing technologies and market needs, and shorter product life cycles which all necessitate creativity and innovation (McDonough, 1993). Knowledge creation is often seen as the "front-end" of product development where tacit knowledge plays a great role in achieving innovation success. Yet, in most cases, innovation is not the product of a single person but a collective work of a group of people or a team which draws the attention to "group tacit knowledge (GTK)." GTK is socially complex and difficult to imitate, and therefore constitutes a part of a firm's intangible resources that give rise to competitive advantage (Leidner, 2000). Given its centrality to organizational competitiveness understanding its features is of critical importance. Although much theory and research exist on "individual tacit knowledge" (Gourlay, 2004; Nonaka et al., 2000; Nonaka, 1994; Polanyi, 1967; Tsoukas, 2003) and some scholars emphasize the quality of individual tacit knowledge (Doran, 2004; Koskinen, 2001; Nonaka, 1994; Noh et al., 2000; Nonaka and Toyama, 2007; Sanders, 2004), so far, academic work on organizational knowledge creation have rarely focused on GTK, nor has it systematically identified what the "quality of group tacit knowledge (QGTK)" could refer to and how one can distinguish between groups with different quality levels in their collective tacit knowledge. One might reason, for example, that the tacit knowledge of a group is the aggregation of all individual tacit knowledge and that its quality is a function of individual tacit knowledge. In this paper, we demonstrate that this is not the case, and argue that GTK has a meaning in itself and that it also is associated with various levels of quality.

The goal of this paper is to fill a gap in the literature and identify what "group tacit knowledge" and its "quality" mean. As the basis for our model development, we draw upon the SECI model from organizational knowledge creation theory (Nonaka, 1994), Aristotle's concept of "phronesis" (Aristotle, 1999; Nonaka and Toyama, 2007), theories of organizational improvisation (Crossan, 1998; Moorman and Miner, 1998; Vera and Crossan, 2005), and organizational aesthetics (Baumgarten, 1950; Strati, 2003, 1996, 1992). In the next section, we identify the existing research gap in organizational knowledge creation theory concerning QGTK. Then we introduce a model that explains the levels in QGTK. Next, we discuss the role of advanced information technology in enabling or constraining group members' socialization and derive implications for the QGTK. Finally, we discuss managerial implications resulting from our model and outline imperatives for future theory building and empirical research.

2. The quality of group tacit knowledge in organizational knowledge creation theory

In this section, we review basic concepts of organizational knowledge creation theory and point out an important research gap concerning the quality of group tacit knowledge. In organizational knowledge creation theory, knowledge is: (a) justified true belief, meaning that individuals justify the truthfulness of their observations based on their observations of the world. Justification, therefore, hinges on unique viewpoints, personal sensibility, and experience (Nonaka and Takeuchi, 1995). Knowledge is also: (b) the capacity to define a situation and act accordingly (Stehr, 1992, 1994; von Krogh et al., 2000). Here, knowledge is oriented towards defining problems, rather than the solving of depicted and manipulated pre-given problems (e.g., Newel and Simon, 1972). Finally, knowledge is: (c) explicit and tacit (Nonaka, 1991). Knowledge that can be uttered, formulated in sentences, and captured in drawings and writing is explicit. Knowledge tied to the senses, movement skills, physical experiences, intuition, or implicit rules of thumb, is tacit (see also Polanyi, 1967).

The theory of organizational knowledge creation proposes that new knowledge is created through processes of conversion between tacit and explicit knowledge[2]: socialization, externalization, combination, and internalization (Nonaka, 1994; Nonaka et al., 2000). Empirical and theoretical work has shown that knowledge creation cannot be separated from the context in which it is created. Knowledge creation and sharing is

[1] Whereas a firm's near-term survival hinges on strategies to maintain its current knowledge in the business environment, the creation of new knowledge secures future profitability (Nonaka et al., 2006).

[2] An alternative approach to the codification of tacit knowledge can be found in Galliers and Newell (2003) and Galliers (2006).

embedded in temporal contexts which include "situations, conditions, social circumstances in the before, now, and after" (Reinmoeller, 2001). In the theory, "context" is often referred to as "Ba" – a shared space for emerging relationships and practices in a group that can be physical, virtual, mental, or any combination of these (Nonaka and Konno, 1998; see also Nonaka et al., 2006, for a review).

Although organizational knowledge creation theory suggests that the origin of all knowledge is individual, it also focuses on emerging groups for the purpose of knowledge creation and innovation. For example individual creativity is supposed to contribute to the collective knowledge of the organization (Spender, 1996). Although all four processes of the SECI model play a role in GTK creation, socialization (the process of converting new tacit knowledge through shared experience) is one of the most critical steps. New tacit knowledge is socially constructed through the interactions amongst individuals or between individuals and their groups, rather than by an individual operating in isolation (Nonaka et al., 2000). Socialization occurs, for example, in a traditional apprenticeship where the apprentice learns through hands-on experience, or in informal meetings outside the workplace where tacit knowledge including world views, mental models, and mutual trust can be created and shared (Nonaka et al., 2000). As a result, two kinds of tacit knowledge might emerge: individual level and group (or collective) level (Nonaka, 1994).

Yet much of the literature on management and organization theory has treated tacit knowledge on the "individual" level (Gourlay, 2006). Individual tacit knowledge consists of technical and cognitive skills (Alavi and Leidner, 2001), and because it "resides" in individuals it is hard to externalize along the continuum of knowledge (from tacit to explicit), codify, and document (Grant, 1996). Examples include driving or swimming skills, intuitions, gut feelings, and mental models. Non-individual level tacit knowledge is studied under different names in the literature, such as "group" (Cook and Brown, 1999; Kogut and Zander, 1992), "collective" (Alavi and Leidner, 2001; Gourlay, 2006; Leonard and Sensiper, 1998; Nonaka, 1994; Spender, 1996), "social" (Spender, 1996), "communal" (Brown and Duguid, 2001) or even "organizational" (Chou and He, 2004; Kogut and Zander, 1992; Nonaka and Takeuchi, 1995) tacit knowledge. Although there are some nuance and level differences in their meanings, authors refer to tacit knowledge that is not possessed by one individual but created and possessed collectively by more than one individual. Such group level tacit knowledge is sticky and it cannot be allocated to parts or individuals, which makes it difficult to replicate or imitate (Szulanski, 1996). That is why, for example, some companies transfer and hire not only one person but a whole team with history of working together on solving very complex tasks (Durisin, 2001).

Grant (1996) suggested that when groups are confronted with complex tasks, such as innovation in products, services, and processes, they need to integrate the knowledge of individuals for problem solving and decision making. Ultimately, shared, integrated knowledge is brought to bear on tasks. Organizational knowledge creation theory posits that through knowledge conversion new tacit knowledge can become collective for the group (Nonaka, 1994). That is, the group members begin to act in a collective and coordinated manner, solving complex tasks, without explicit rules for action such as written procedures, decision rules, formal models, or even without explicit communication. Communities of practice are good examples for such groups (Brown and Duguid, 2001; Lave and Wenger, 1991). While the existence of GTK is assumed in the theory and described in anecdotes, the process of GTK has not been explained in much detail. How can this new collective and coordinated action be explained? What are the reasons that make a group of people act as a "collective body?" If one of them[3] is the group tacit knowledge, then, what are the dimensions to differentiate between various groups when analyzing the quality of the tacit knowledge they possess?

As an initial step in a major program to develop a theory of group tacit knowledge in organizations, this paper focuses on the "quality" aspect – whether or not GTK enables the group to act in a particular way. There are two reasons for this. First, in the front-end model of innovation, socialization, through which GTK is created, is a necessary, although not sufficient condition for knowledge creation (Kluge et al., 2001; Nonaka and Takeuchi, 1995; von Krogh et al., 2000). Without it, innovation is likely to fail (Nonaka,

[3] Here we want to acknowledge the role of organizational structures on the way people act. According to structuration theory (Giddens, 1984) not only structural properties of social systems (rules and resources) enable action, but also they are an outcome of social practice. In our paper, we are looking at group level tacit knowledge that enables a group to behave as a collective body in these structures.

1994). Moreover, Spender (1996) argues that collective knowledge (social tacit knowledge) is the most reliable and strategically significant type of organizational knowledge. Second, organizational knowledge creation theory is recognized for having contributed much to the concept of tacit knowledge to organization science (Tsoukas, 2003). Hence, it is very crucial to understand the contribution of socialization to a group and to identify what constitutes high quality tacit knowledge for a group.

3. Group tacit knowledge

Recently, a lot of studies focused on groups in organizations and their role in knowledge creation and sharing (e.g., Cook and Brown, 1999; Zárraga and Bonache, 2005). According to this view, organizations and groups are more than a collection of people. In the following, we briefly review previous studies and then reframe the concept of GTK by synthesizing the most relevant aspects.

Our focus of interest for the paper is on "group" level tacit knowledge. "Group" refers to a collection of people in a close relationship taking part in an interrelated activity with the aim of performing a task or achieving a common target (Weick and Roberts, 1993). There are six main characteristics of what we call GTK. First of all it is socially constructed; or simply stated, is a result of social interactions, i.e., socialization. Socialization means that members of a group not only come to understand each other's definition of shared situations but also agree on a common definition and come to hold justified true belief about how to act in that situation (von Krogh et al., 2000). As a result of socialization, group level knowledge is created which includes collective practical skills, expertise, and cognitions. Second, GTK is deeply rooted in action. Tacit knowledge can not be learnt by reading, talking, or just "seeing." This implies that GTK hinges on activity in and with the group where members indwell in the practice with their mind and body. It is the knowledge that enables a group to act as a "collective body and mind" without necessarily having the help of explicit rules and procedures. "The collective mind can be conceptualized as a pattern of implicitly coordinated, heedful interrelations of actions in a social system" (Weick and Roberts, 1993). According to Weick and Roberts (1993), heedful performance is a result of thinking, feeling, and creating a shared purpose together.

> "Actors in the system construct their actions (contributions), understanding that the system consists of connected actions by themselves and others (representation), and interrelate their actions within the system (subordination)... As heedful interrelating and mindful comprehension increase, organizational errors decrease..." (Weick and Roberts, 1993)

The authors give the example of flight deck activities on an aircraft carrier focusing on the mindfulness of the collective practice. Taking into account their explanations, one can conclude that GTK is not likely to emerge before individuals engage in collective practice. GTK does not reside in individuals separately but is found in the interconnected relations and activities of individuals. Thus, the collective performance of a group depends on how heedfully people interrelate in action. The relation between collective action and GTK can be compared to a growing loop: GTK is achieved by collective action and used to act collectively. Madhavan and Grover (1998) explain team interactions in a similar way by using the term "shared mental models." They argue that teams create a shared understanding of particular situations with the help of prior shared knowledge. Shared mental models represent unconscious assumptions about probable actions of individuals, a shared oral language with its own vocabulary, a shared body language with its own clues, "taken for granted" understanding, and shared memory (Madhavan and Grover, 1998; Nonaka, 1991). Another important aspect of GTK is that it provides a group with synchronization of action with a common understanding of timing. The way members connect their activities makes the system mindful (Weick and Roberts, 1993). As soon as the group builds a collective mind, members will be able to act as a collective body. Without the mind, the body cannot function, and vice versa! If this kind of mindfulness is maintained, the actions of people can be coordinated and connected even in unfamiliar and complex situations. The spontaneous, unplanned actions of groups in unfamiliar situations are studied in organizational improvisation literature (Crossan, 1998; Vera and Crossan, 2005). The collective improvisation necessitates collective intuition which is also a kind of GTK. In Section 4, the relevance of collective improvisation to GTK will be explained in more detail.

Third, GTK depends on requisite variety[4] and is more than the "algebraic sum" of individual tacit knowledge. In other words, collective action leads to synergy and the capabilities of the group exceeds the "algebraic sum" of individual capabilities (Brown and Duguid, 2001). Kogut and Zander (1992) define "group know-how" as recipes of organizing such as Tayloristic methods or craft production. Although the definition takes a very important aspect of GTK, namely "self-organizing" character, the example of "Tayloristic methods" does not correspond to our understanding of GTK. Tayloristic methods are based upon well-defined procedures and rules. They ignore individual differences and uncertainty by assuming that the optimal way of performing a task is the same for everyone. Contrary to this, organizational knowledge creation theory would suggest that GTK depends on the variety in capabilities of group members where each individual has specific strengths and weaknesses and the optimal way of doing things, solving problems, and performing tasks may change from person to person. Despite these differences, a group with tacit knowledge may[5] still act as a "collective body and mind" by compensating the weaknesses via dynamic coordination and heedful interrelating (Weick and Roberts, 1993).

Fourth, GTK is embedded in group culture, norms, routines (Spender, 1996) and is rooted in commitment, ideals, values, senses and emotions (Nonaka and Takeuchi, 1995). Group culture, norms, and routines emerge as a result of shared experiences and lead to collective sense making.[6] Witnessing the same situation at the same time is necessary but not sufficient to talk about the shared experience. It asks for "legitimate peripheral participation"[7] (Lave and Wenger, 1991) of members in the practice. Moreover, in order to convert a shared event into a shared experience, it is important that the group pays attention[8] to the same stimuli (D'Eredita and Barreto, 2006) and at the same time shares a common goal orientation. Group culture gives rise to group identity, group language (oral and body), definition of group boundaries, and feeling of shared belonging. As a result, it motivates group members take an active role in the welfare of other group members. One of the most important aspects of group identity is that people are able to interpret clues used within the group and contribute to production of new ones. Such clues allow people to understand what other group members do, what their intentions are, what help they need to solve tasks and problems, as well as opportunities for knowledge sharing. Clues are particularly important for sharing tacit knowledge (for more, see von Krogh, 2002). Routines and norms enable shared understandings, help to coordinate (Feldman and Rafaeli, 2002), and provide a team or group with the activity to reproduce the task over time ensuring continuity in collective performance. Consequently, the members gain a representation of others' probable actions, interdependencies of these actions, connected relations, and the ability to act intuitively in unknown situations (Cohen and Bailey, 1997; Weick and Roberts, 1993). It is also important for GTK that each group member understands (implicitly or explicitly) the indispensability of other members for collective action. In order to achieve GTK, the group benefits largely from the mutual insights of members into the reactions of others (von Krogh et al., 2000). Similarly, Cook and Brown (1999)[9] label GTK with "organizational genres."[10] In the organizational context, "genre" applies not only to literary artifacts but also to various physical and social artifacts such as technologies and ways of doing certain things, and shows the meaning associated with these artifacts by the group. These organizational genres are acquired in practice as a result of shared experience, held in

[4] "According to Ashby's (1956) Law of Requisite Variety, a system can adapt to its environment (and thus exhibit intelligence) only to the degree that its internal variety matches that of its environment" (Sandelands and Stablein, 1987).

[5] Here we use the word "may" on purpose. As will be explained in the next section, the ability of the group to act collectively depends on the quality of their GTK.

[6] Sense-making is the process of creating situational awareness and understanding in situations of high complexity or uncertainty in order to make decisions. It is "a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively" (Klein et al., 2006).

[7] "Legitimate peripheral participation refers both to the development of knowledgeably skilled identities in practice and to the reproduction and transformation of communities of practices" (Lave and Wenger, 1991).

[8] Here, we want to stress the role of leaders in "attention drawing."

[9] Cook and Brown (1999) mention distinct forms of knowledge (explicit/tacit and individual/group) which constitute "epistemology of possession." In addition, these authors discuss an "epistemology of practice" which focuses on "knowing." They argue that "knowing" is a part of practice as well as possessed in the "head" of practitioners. Organization knowledge creation theory accepts that "knowing" is a-priori included in GTK. This is underscored by the notion that tacit knowledge is deeply rooted in action.

[10] In literary terms, genres mean types of literature such as a "novel," "biography," etc., and enable the reader make sense of and use a text (Cook and Brown, 1999).

common, and have meaning in the unique group context. They are a kind of GTK which are not taught or explicitly defined but rather constituted collectively and implicitly by the group.

Fifth, GTK is the capability of a group to agree on the best action for "common goodness" and to find the means to actualize it. In order to be able to act collectively not only should a group have shared understandings and collective sense making mechanisms but also should determine and undertake the best action for "common goodness" in a specific situation. That is, the group should define what "good" for the group is; accordingly what their goal is and which path they should follow to reach their goal. This is related to the concept of "phronesis." The concept and its relation to GTK are explained in the next section.

Sixth, GTK not only reduces uncertainty, but also allows the group to deal with uncertainty (see also Liebeskind, 1996). In every group (and other social systems), two interacting people face a so-called "double contingency. We can explain this situation as: "both know that both know that one could also act differently" (Vanderstraeten, 2002). In a group of more than two people where simultaneous action by many is inevitable, this situation is even more complex. In such situations, we can talk of "multiple contingency" which may reduce the group's ability to act in a coordinated and orchestrated manner. The members of a group with tacit knowledge have the ability to "guess" what the others may act like in different situations. This enables the group to deal with "multiple contingency" which as a result facilitates the collective improvisation. Collective improvisation is the capability of a group to cooperate and act spontaneously even in uncertain and unfamiliar situations.

As seen above, there are different contributions in the literature regarding the meaning of GTK each suggesting particular aspects of the concept. In sum, group level tacit knowledge has very much to do with team coordination in complex work (Hedlung and Nonaka, 1993). It is the capacity of a group to act as a collective body using their collective mind in situations that are familiar as well as unfamiliar and complex in the absence of explicit rules or directions. GTK allows the group to deal with uncertainty, to define new tasks and to solve predefined tasks. While doing this, "group identity" and "group boundaries" are dynamically reproduced and become key for the recognition of GTK. Yet, GTK does not guarantee that every group manages to perform well in all situations. Why can some groups coordinate and perform better than others although all possess some kind of GTK? What makes the difference? It is possible to speak of the quality of group tacit knowledge. Above, we defined GTK in general without referring to "quality" differences, while mostly referring to work on groups such as deck crews on aircraft carriers that have high quality GTK. So one should not assume that all groups with some tacit knowledge are able to act like a collective body and mind. In the following part, we will propose how to differentiate between different quality levels of GTK and which characteristics a group possesses in each level.

4. Quality of group tacit knowledge: Towards a model

Tacit knowledge is a comprehensive justification of beliefs that are embedded in the human body and mind leading to such characteristics as "gut feelings" and intuitions (Varela et al., 1991). It is deeply rooted in action, commitment, and involvement (Nonaka, 1994). Tacit knowledge, therefore, cannot be easily externalized along the continuum of knowledge (from tacit to explicit), encoded or documented and sharing it necessitates the "here and now" interaction of people. Because it is bound to people, it cannot be judged or measured separately. Speaking of "quality," therefore, poses a particular challenge because this notion is often not "measurable" (e.g., Mileage before a car breaks down, or the comfort of a coach from the viewpoint of a customer). The perception and recognition, cognition styles, heuristics and biases in judgment, mental models, and the skills of individuals influence the quality of tacit knowledge (Maqsood et al., 2004). This is why two people experiencing the same situation may develop different levels of expertise and tacit knowledge. According to Nonaka (1994), the quality of personal tacit knowledge is affected by two factors: the "variety" of an individual's experience and the "knowledge of that experience" (also see Sanders, 2004). The knowledge of experience is "an embodiment of knowledge through a deep personal commitment to bodily experience"[11] (Nonaka, 1994) which is very much dependent on the characteristics of the individuals.

[11] "Commitment to bodily experience" means intentional self-involvement in the situation that transcends the subject–object distinction, thereby providing experience as "pure experience" (Sanders, 2004).

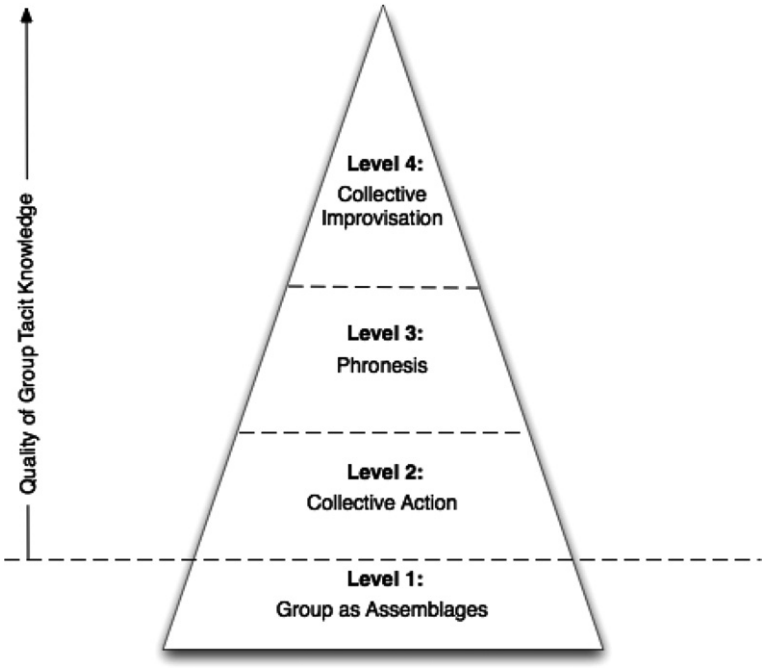

Fig. 1. Different levels in the quality of group tacit knowledge.

Although "quality of personal tacit knowledge" is mentioned in some studies (Doran, 2004; Koskinen, 2001; Nonaka, 1994; Noh et al., 2000; Nonaka and Toyama, 2007; Sanders, 2004), the QGTK has so far not been isolated, analyzed and studied in academic research. Given the lack of conceptual work on this subject, this section aims to develop a model of the QGTK. According to the explanations in the previous section, GTK is created by the inherent collective action of a group (Alavi and Leidner, 2001). It is the ability of a group to act or perform with a collective mind as a collective body. How successful these actions are in real situations depends on the quality level of the GTK. Although a group may be very successful in collective action under certain conditions it may fail under unfamiliar ones. In this section, we identify the characteristics of different levels of quality in GTK and argue for a model of four levels ranging from a modest quality level to the highest. The model is depicted in Fig. 1. It resembles a model of "expertise development" (Dreyfus and Dreyfus, 1986), but it applies distinctly to groups. The model shows the levels of developing high quality of tacit knowledge in a group. Groups at a given level do better than groups at previous levels by adding extra capabilities onto it. In the following part, we explain each level separately beginning with the lowest quality level.

4.1. Level 1: Group as assemblages

At this level, the group can be specified as a "collection of people." Group members are like "foreigners"[12] to each other with nearly no shared experience. There are weak group ties, identities present and there are no shared memory, shared understanding, or shared norms that can be attached to the group. In short, one cannot speak of GTK at this level. As an example, we can think of a newly formed basketball team with members from different colleges, nations, age groups, different experiences in the game and different understandings of its rules and so on, who have never met before. This level corresponds to the team's very first meetings where there is no shared history and no collective understanding of mutual differences, responsibilities, or skills.

[12] Here the term "foreigner" implies that people do not know how the others would act and coordinate themselves within the group while performing a task. Although they might be good friends in everyday life, it does not guarantee that they will not be "foreigners" while jointly performing a task. For example, a group of good friends, all able to play basketball well, may not play well as a team if they have no history of playing together.

4.2. Level 2: Collective action

The group advances from the first level to this level through gaining exposure to shared events and developing shared experiences. Groups at this level exhibit certain characteristics. First, they develop a shared memory and the members understand the nature and value of "collectively acting." Shared memory and understanding enable the group to solve familiar tasks automatically by repeating pre-experienced activities. Each member knows how the others will act in certain situations due to previous experiences and coordinates herself accordingly. The group becomes a collective body and mind for certain familiar situations where the function of each component is well defined.

Second, group-based routines are generated and the group acts according to these routines and procedures. Group routines are recurring patterns of behaviors of group members involved in a collective action (Feldman and Rafaeli, 2002). They are embedded experiences and successful solutions to complex tasks, as well as the coordination of solutions to various tasks. These routines are not explicitly defined but stored as "tacit memory" and are bound to customs (Cohen and Bacdayan, 1994). The group tacitly knows how the routines work depending on the interrelated actions of the members. At this level, the group is not capable to act beyond the routines in uncertain and unfamiliar situations.

The third feature of this level is the existence of "group culture." Through experiencing collective action group-specific languages, clues, and values are developed. Accordingly, group boundaries are defined and "collective identity" is strengthened. At this level, although members possess a shared culture and a feeling of shared belonging, their conflict resolution mechanisms are still not capable to exploit the individual differences and strive for a negotiated result under unknown situations.

At the collective action level, our basketball team automatically draws upon the previously gained knowledge and plays in a coordinated manner following the tactics they developed during trainings. The players know well how the others act sequentially when they perform a specific tactic and how rival team members could act and react in the match. Yet, the team members are not capable of dealing with uncertainty as a collective body. That is, if the rival acts in a way in which the team's tactic fails, the team does not have the ability to do something totally different from what has already been practiced before. The team is bound to the planned tactics. In other words, it cannot adapt to the new, unknown situation. During the performance, the team does not need to communicate explicitly which tactic to choose; players use some clues that evoke specific tactics. However, it may fail to choose the best one that could work for a certain context. The team is not qualified enough to play flexibly and change the tactics wisely according to the progress in the game. Therefore, they need to follow the instructions of their coach in order to choose the appropriate tactic. Moreover, some crisis may emerge due to the conflicting interests. For example, some players may avoid passing the ball to other players which may destroy the collective team atmosphere.

4.3. Level 3: Phronesis

The concept of "phronesis" was discussed in organizational knowledge creation theory by Nonaka and von Krogh (2007) and Nonaka and Toyama (2007). The concept was introduced by Aristotle. In his book *Nicomachean Ethics,* he defines three different kinds of knowledge namely: *episteme*, *techne*, *and phronesis*. *Episteme* is universal, context-free, explicit, and objective knowledge that can be interpreted as scientific knowledge. *Techne* is practical and context-specific technical know-how. It includes tacit knowledge such as skills and crafts. The concept of *phronesis* can be roughly translated as "prudence," "practical wisdom," and "practical rationality." It describes the ability to determine and undertake the best action for "common goodness" in a specific situation (Nonaka and Toyama, 2007). Spender (1996) defines *phronesis* as an understanding of social activity and politics. For example *episteme* is the knowledge of the scientific fact that a ship can float in water according to Archimedes' principle, *techne* is the knowledge how to make a good ship, and phronesis is the knowledge of what a "good" ship is for certain situations and how it can be designed accordingly (a good ship for transportation of passengers differs from one for transportation of oil). Phronesis is mostly studied and mentioned on an individual level. If we adapt the interpretation of phronesis to a group level, phronesis for a group is high quality collective tacit knowledge gained from collective practical experiences that enables the group to decide heedfully and to take appropriate actions for

specific situations guided by group values, group culture, and shared goals (Nonaka and Toyama, 2007). Phronesis is "synthesizing glue" between contextual and universal knowledge (ibid.) which provides the capacity to define goals for specific context that are shared and accepted by the group and to figure out the means to reach them (Halverson, 2004).

When it comes to the definition of "good," one can pose the following question: goodness for whom? In Nonaka and Toyama (2007), it is the "good" for "common goodness" for a particular context that can be defined as a result of a compromise between individual perspectives. The meaning of "good" therefore is parallel to the meaning of "truth" used in the definition of knowledge: a dynamic process of justifying personal belief towards the "truth" (Nonaka and Takeuchi, 1995). "Good" and "truth" are both socially constructed. What is "true" and "good" depend on who decides on it (values) and under which conditions it is decided. In a social setting, individuals have different interests, make diverse contributions to activity, and hold various viewpoints. Robert Bellah (1991) argues that "a good community is one in which there is argument, even conflicts about the meaning of shared values or goals and certainly how they will be actualized in everyday life." It is impossible to ignore differences in individual interests, egoisms, and "I-intentions" (e.g., see Bagozzi and Dholakia, 2006). However, the group can find ways to exploit the individual differences and strive for a negotiated result. According to Gilbert's plural subject theory, in collective action people tend to behave and think as jointly through which "we" or "us" is conceptualized (Gilbert, 1989). There are some examples from open source software user communities (Bagozzi and Dholakia, 2006) and product development teams (Nonaka, 1991) showing that people manage to convert "I-intention" to "we-intention."[13] This result depends on the presence of group identity and boundaries, mutual understanding, and common goal orientation (Bagozzi and Dholakia, 2006). It can be achieved by synthesizing various subjective interpretations and objective rules into collective knowledge. A group needs to fulfil the following requirements to become a collective entity and to define what "common good" is in specific situations: "mutual responsiveness among members to the intentions and actions of others, collective commitment to the joint activity, and commitment to support others involved in the activity" (Bagozzi and Dholakia, 2006).

Phronesis is not only the ability to identify common goodness and to establish consensus on a common goal. It is also the ability to find the means to reach this goal. Thus, phronesis may also mean that the group members use general, universal, explicit knowledge in a particular situation and make their explicit knowledge inform action (tacit knowledge) in a particular context. Therefore, phronesis necessitates the ability to collectively grasp the essence of particular situations with the help of common sense (Nonaka and Toyama, 2007). In order to find ways to reach the goal, it is necessary for group members to share their perceptions, interpretations, intuitions, and judgments with the group which leads to a collective understanding of the situation. To do this, they also need to communicate their subjective insights to others. At the "phronesis level" group members share their tacit knowledge and allow it to become a resource which all can draw on (von Krogh, 2002). Moreover, there is a collective decision-making mechanism and each member becomes committed to the end decisions. At this level, the group is able to choose the best action for common goodness and in order to accomplish it all members commit to collective decisions, even if they do not necessarily (totally) agree. In addition, group members do not necessarily need the guidance or directives of a leader. The group has autonomy and people collectively sense that its decisions have meaning and impact (Druskat and Wheeler, 2003). Similar to self-managed teams a team at this level is empowered to make its own decisions.

To sum up, a group at this level advances from the "collective action" level by gaining the capability to (1) convert "I" intentions to "we" intensions, (2) decide on and commit to the "common goodness," (3) grasp the essence of particular situations, (4) take the best action for "common goodness," and (5) manage itself. Returning to the example of the basketball team – at this level, the players learn about each other's physical as well as emotional and cognitive strengths and weaknesses. The meaning of "common goodness" may change depending on the context. For example, whereas in trainings, common goodness may imply the team members learn how to play in different positions, in a match it could refer to beating an opposing team by using the best positioning in a match. At this level, all the members commit to the team's welfare and play

[13] "A we-intention is a special kind of intention in which the agent we-intends to perform an action jointly with the others or to see it jointly with others that a certain state or event comes about" (Tuomela, 2005).

for the common "goodness;" a kind of "one for all, all for one" understanding emerges. The team can use collective "practical wisdom" during the play and choose the best tactic that can be applied in a specific situation. It means the coach does not need to extensively intervene and guide the play. The players avoid egoistic behaviors and do their best to support collective success. Thus, crises due to conflicting interests are more easily overcome compared to the collective action level. The team plays "wisely" because it is capable of choosing the most appropriate tactic within the play. However, it is still not able to come up with totally new tactics within the play itself, i.e., to improvise.

As another example we can give experienced consultancy teams working on a specific subject in a professional services company. These teams can decide on the best action required for a specific problem without the directions of a leader. The function of the leader is not vital for such teams. The leaders do not decide in detail how to solve the problems if it is not a very unfamiliar situation. If the situation is entirely new and unfamiliar, the leader needs to be involved more in the problem solving activities. However, in most cases, the function of the leader is to give ideas in order to improve the chosen solution instead of showing the best action to solve the problem.

4.4. Level 4: Collective improvisation

"Collective improvisation" is the highest level of tacit knowledge quality a group can achieve. In an effort to understand how firms and groups can respond to fast environmental changes, unpredictable events, and the need for continuous innovation, "improvisation" has taken the attention of scholars in management and organization studies (Vera and Crossan, 2004, 2005). There are different application areas of improvisation of which jazz groups (Organization Science special issue on jazz improvisation, 1998), theater (Crossan, 1998; Vera and Crossan, 2004), education, team work (Vera and Crossan, 2005), and strategy (Crossan, 1998) are the most well-known. Nonaka and Toyama (2007) suggest that "the social ability to improvise is the ability to react quickly and appropriately to an unpredictable situation." Good improvisation is "about negotiation among team members, setting each other up for success, and trusting and respecting others while enacting the ongoing scene" (Vera and Crossan, 2005). The joint action of individuals that are themselves improvising produces "collective improvisation" (Moorman and Miner, 1998) which again is more than the "algebraic sum" of individual improvisations. Therefore, at this level it is important that each member is an expert in what she is expected to do because this enables her to improvise individually. Credibility becomes vital, and is defined as members' beliefs about the accuracy and reliability of other members' knowledge (Akgun et al., 2005). Without competent and credible members, a group will not be able to improvise collectively as collective improvisation results from a chain of individual improvisations. If one link breaks, the entire chain breaks.

In improvisation, there are no predetermined roles and rules. The most important dimensions are spontaneity and intuition (Crossan and Sorrenti, 1997). Hence, in order to be able to improvise in unexpected situations, a group should have developed a collective mind which leads not only to coordination in certain situations but also to collective intuition (such as a kind of "gut feeling" in unfamiliar situations). Collective intuition means that each member intuitively acts in a way that is consistent with the actions of others. This demands that each member gives full concentration and attention to others' actions over time and thereby overcomes multiple contingencies. This level of GTK does not reduce uncertainty but it allows the group to deal with uncertainty. Hutchins (1991) gives the example of how a ship crew whose navigational system has broken down found their way to the harbor with the help of collective improvisation. Although no crewmember understood the complete system, their collective action worked through acting collectively and intuitively in an unknown situation. In our terms, the crew possessed a high quality group tacit knowledge.

There are different levels of improvisation, too (Moorman and Miner, 1998). Whereas in some cases improvisation may lead to an incremental change to existing routines, in others it may turn out to be radical creativity (Vera and Crossan, 2005). In both cases, improvisation is "intuition guiding action in a spontaneous way" (Crossan and Sorrenti, 1997). Vera and Crossan studied collective improvisation and its effect on innovative team performance (Vera and Crossan, 2005). They argue that there are several dimensions that impact on the effectiveness of improvisation: (1) the team's task relevant expertise, (2) teamwork quality by which they mean cooperation and trust, (3) the context for effective improvisation such as experimental culture and real-time information and communication, and (4) training. The authors believe that improvisation

can be taught through exercises like games. Good improvisation "is a tool that complements planning efforts but, because of its creative and spontaneous nature, it is not necessarily tied to success, the same way planning is not necessarily associated with success" (Vera and Crossan, 2005). For the QGTK, the relevant aspect is not necessarily that improvisation leads to success *per se* but that the group is able to make sense and improvise collectively even in complex, unfamiliar, uncertain, and urgent situations.

At this level, the basketball team is not only able to act according to the previously exercised tactics and to choose which tactic is the best for specific situations but also create entirely novel tactics while playing. These are coordinated actions of members developed spontaneously within the play. According to the rival's play members position themselves and each one contributes to the collective "play" in a way that would best fit to the context. The "play" may partly exploit the previously learned tactics but it is not constrained by them. The team adapts itself to the situation and improvises collectively. Another example for the groups at this level could be new product development teams. Some of these teams generate novel action patterns without advance planning, which may decrease time to market especially in a turbulent environment (Akgun and Lynn, 2002).

Finally, we want to emphasize two important points about the model of QGTK. The first one is the fact that not every team/group needs to posses the highest level of tacit knowledge quality in order to be successful. The required quality level for a task depends on the task specifications. Achieving the highest quality level in GTK is a costly process; the group should make investments in the form of time, money, attention, etc. Thus, QGTK has an opportunity cost as well: if the task is not demanding a high QGTK the resources and capabilities that are necessary to achieve a high quality level can be devoted to other productive events.

The second point is the importance of aesthetics[14] for the QGTK. GTK rests on the "subjective *feeling* of shared belonging" (Strati, 2003) and is acquired through the filter of aesthetic judgment. Strati (ibid.) defines aesthetics as a form of organizational knowledge. It is the "aesthetic knowledge that gives rise to interaction and the construction of social relationships." At the same time, aesthetic sentiment is formed by negotiations amongst team members (Strati, 2007). There is a very close relationship between the aesthetic judgment of individuals in a group and the QGTK. For example, in a team, how individuals feel about the team atmosphere, and what they find beautiful or see as unpleasant, all affect their feelings of belonging and contributions to collective action. In an unfamiliar situation, it is the senses, feelings, and aesthetic knowledge that give rise to unconscious and spontaneous action. If each individual has a different aesthetic judgment, collective tacit coordination will be difficult to realize in the course of acting. In a group of no common aesthetic understanding, we cannot expect a high QGTK that enables the group to act as a collective body and collective mind. A feeling of shared belonging moderates the relation between aesthetic knowledge and QGTK. The importance of aesthetics varies for different levels of group tacit knowledge quality. The higher the quality becomes, the more critical the impact is. When the quality level rises, shared aesthetical values become more crucial like the oxygen needed to survive on a mountain summit.

5. Conclusion and discussions

GTK is an important driver for collective creativity and innovation success in organizations. Until now, the QGTK in organizational knowledge creation has not constituted a central research topic. In this paper, we have identified and tried to address a part of this gap. The scope of the paper was restricted to the definition of GTK and the QGTK. We have reviewed some of the central elements in organizational knowledge creation theory and combined these with "collective action," "phronesis," and "improvisation" which constitute a theoretical background. We have proposed a model that explains what different levels of QGTK refer to. This model is a contribution to organizational knowledge creation theory (Nonaka, 1994; Nonaka and Takeuchi, 1995; Nonaka et al., 2006; von Krogh et al., 2000) by filling a gap related to the GTK.

[14] Aesthetics is the sensitive judgment of feelings, phantasms, fiction, and other things that the intellectual judgment cannot capture (Baumgarten, 1950). Aesthetic judgment depends on perceptive and sensorial capabilities of people (Strati, 2003) and concludes about what makes something beautiful, disgusting, fun, entertaining, harmonious, boring, etc. Yet, the criteria used to make aesthetic judgments are gained within social settings and may show differences depending on culture. According to Strati (1999), aesthetics in organizational life "concerns a form of human knowledge and, specifically, the knowledge yielded by the perceptive faculties of learning, sight, touch, smell, and taste, and by the capacity for aesthetic judgment." It is a yield of "feeling," "understanding," and "knowing" (Strati, 1999).

There is great value in focusing on GTK for organizations. When managers bring people together for a project, the challenge for everyone is how to use the potential and to leverage it to be more than just the sum of what the individual members know. Group tacit knowledge with high quality is a resource that organizations can rely on when confronted with unexpected and unfamiliar situations which require intuition and spontaneous collective action. The model developed in the paper enables researchers and managers to understand the role of different quality levels in group outcomes. Managers concerned about knowledge creation, innovation, and creativity in organizations should pay close attention to factors that provide a group with high quality tacit knowledge. Regarding the QGTK, the responsibility of the leadership is to mobilize tacit knowledge that is unevenly distributed and create the context necessary for collective action, while finding ways to enhance the quality of tacit knowledge on all levels (Nonaka and Toyama, 2007). Love, care, trust, and commitment are crucial to gain high quality group tacit knowledge (Koskinen, 2001; Nonaka et al., 2000; Ron et al., 2006; von Krogh, 1998). Organizational knowledge creation theory suggests that managers should create a "ba," which may be "virtual," "mental," or "physical," that directly or indirectly gives rise to such feelings (Nonaka and Konno, 1998). Moreover, leaders' behavior is very important for peoples' perceptions of fairness, commitment, and trust (Cohen and Bailey, 1997). In addition, they can provide organizational members with workshops, exercises and games that can help to develop skills for improvisation (Vera and Crossan, 2004).

The major challenges in organizational knowledge creation are to define knowledge sources, make them available to the members, and combine the existing ones. Information technologies (IT) may help to overcome these challenges, especially time and space constraints (Ramarapu et al., 1999). IT is known for its capability to facilitate data and information exchange, that is, to combine, organize, and distribute explicit knowledge (Leidner, 2000). The problem with tacit knowledge is that it is bound to people and, therefore, cannot be externalized along the continuum of knowledge (from tacit to explicit), encoded, or documented easily and sharing it necessitates the "here and now" interaction of people. Thus, some scholars argue that IT can never substitute face-to-face interaction where people can share their tacit as well as their explicit knowledge (Fahey and Prusak, 1998). We definitely support this argument; nevertheless, we still believe that IT may have a major effect in facilitating tacit knowledge sharing which, as a result, affects the QGTK. IT can serve as a kind of group memory for knowledge, through which people can access past experiences, in particular overt clues, documented experiences, written reflections and so on, and thereby recollect an image of past events. This kind of memory may also include a database of best practices, or organizational stories, or the information that guides people to address the right person, such as the Yellow Pages. A good example for this kind of usage is the customer resource tool developed by Syngenta, called the "Agronomic Brain" (Chin, personal communication 2007). The tool helps to visualize the communal, tacit knowledge of call center people by presenting the contacts and connections they make to respond to questions from customers. It is used to visualize the emerging knowledge of the call center agents as they act and coordinate as a community, and therefore belongs to the community. In this way, the tool also helps leverage the value of tacit knowledge for example in linking together hitherto unrelated thoughts and may provide comprehensive solutions to customer problems. When these solutions are reused on related new problems, and reflected upon by the call center agents, new tacit knowledge may also be created. The tool exemplifies how knowledge flows from individuals to communities, how tacit knowledge can be converted to explicit knowledge on the continuum; and how this in turn stimulates the creation of more knowledge, completing the cycle. The advantage of the Agronomic Brain is that it combines the distributed knowledge of call center agents and as a result increases the efficiency and effectiveness of the call responses and facilitates the training of new agents by mapping the necessary connections to reach a specific knowledge.

von Krogh (2002) suggests that information systems may play a vital role in the formation of a community. Information systems, such as email, chat rooms, collaboration platforms, and bulletin boards, help to develop weak ties (Constant et al., 1996) and from that they may further develop into strong ties. This plays a great role in helping a group to crate a GTK, i.e., to pass from the "group as assemblages" level to the collective action level. Moreover, information systems may assist in creating care and trust in a community which are necessary for the sharing of explicit and tacit knowledge amongst group members (Sambamurthy and Jarvenpaa, 2002; von Krogh, 2002).

The paper is limited to the development of a model based on the concepts of GTK and QGTK. In the future, the factors that lead to high quality group tacit knowledge should be identified across organizational

settings. In order to accomplish this, we believe in-depth field studies are greatly needed. Task performance may be used to evaluate whether or not individuals share tacit knowledge that mutually improves the quality of their work. Yet, high quality tacit knowledge might not only be reflected in the performance of a planned, executable, and measurable task but also in people's ability to spontaneously design tasks, improve them, and discard old solutions and improvise new approaches. In the theoretical literature, the notion of tacit knowledge quality has been linked to experiences. However, empirical work is needed to explore how various experiences play out in the organization, thereby enabling us to better capture the means of attaining quality in a work setting, especially when uncertainty is high.

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