Draft of From communities of practice to innovative knowledge communities

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Abstract

The purpose of the present article is to examine the concept of Innovative Knowledge Community (IKC) that appear to help to understand communities typical for advanced knowledge society that the notion of Community of Practice (COP) even if both communities rely on shared goals, practices and stories, the former diverge substantially from the latter. Firstly, IKCs function in an environment in which the criteria of successful performance are constantly tightening. Secondly, the main focus of IKCs is the production of knowledge and innovations rather than transmitting tradition. Thirdly, there are not so strict differences concerning knowledge and competence between newcomers and oldtimers in IKCs than in COPs; heterogeneously distributed expertise and symmetric knowledge advancement rather than one-directional flow of information from experts to novice is typical of IKCs. The present analysis relies on a comparison of three models of IKC, i.e., Nonaka & Takeuchi’s model of knowledge-creating companies, Engeström’s expansive learning models, and Bereiter’s knowledge-building approach. These three approaches constitute a novel approach on learning and expertise that we call 2knowledge-creation metaphor”.

Introduction

According to Anna Sfard (1998) learning and acquisition of new knowledge may be characterized by using two metaphors of learning, i.e., knowledge acquisition and participation metaphors (see also Anderson, Greeno, Reder & Simon 2000). Knowledge acquisition metaphor fits very well, together with everyday conceptions of human mind and learning. From the perspective of this metaphor, acquiring and building new knowledge structures to the human mind is an essential aspect of learning. Participation metaphor, in contrast, conceptualizes learning as a process of participating in cultural practices and activities in which knowing in practices is emphasized instead of conceptual knowledge. It is assumed that cognition and expertise
cannot be located to the human mind, but those are distributed between agents and embedded to their environment of their activity. Learning may be understood as a process of growing up to a social community and a culture, a process in which the development of one’s identity is central.

These two metaphors of learning conceptualize very different types of learning processes. Neither of these metaphors does not focus on learning processes that focus on overcoming or surpassing existing or prevailing knowledge and understanding or in which knowledge emerging from learning may be understood as an external shared object or product (as separated from mental states) or learning. Nevertheless, there are models of learning and knowledge processing that focus on creation of new knowledge or transformation of social practices. The present investigators have proposed that it is justifiable to distinguish a third approach on learning (or more generally to cognitive activity), i.e., "knowledge-creation metaphor" (Paavola, Lipponen & Hakkarainen, 2002).

The purpose of the present article is to examine the notion of communities of practices (COPs) and how one may expand examination of communities of practices toward innovative knowledge communities (ICKs) (Hakkarainen, Palonen, Paavola & Lehtinen, in press). The concept of COP is very important when we try to understand the role of social communities in learning. This approach does not, however, capture all essential aspects that are needed for understanding processes relevant for innovative communities. The article is structured in the following way: Firstly, we will examine the idea of COPs. After that we will introduce three models that represent approaches to learning that are compatible with knowledge-creation metaphor. These are Nonaka and Takeuchi’s model of knowledge-creating company, Engeström’s expansive learning model, and Bereiter’s knowledge-building approach. By using these three models as a starting point, we will finally characterize aspects of IKCs as separated from COPs.

Community of Practice as a unit of intelligent activity

In his book "Communities of Practice: Learning, Meaning, and Identity" Etienne Wenger (1998; see also Lave & Wenger, 1991) proposed that expertise and competence are mediated/transmitted through intensively functioning COPs. The concept of COP is used to describe groups of people working within a particular field and representing specific skills and competencies who are an intensive mutual interaction in order to attain shared goals or pursuing shared project or enterprise. While relations among participants of this kind of community may be shaped by formal organizational relations, COPs are largely informal in nature, representing informally implemented or actualized rather than formally mandated relations among actors. Beyond workplaces, COPs can be found from every arena in which people are jointing together to attain shared informal objectives, whether they are groups of young people, close friends, organizers of neighborhood, practitioners of specific hobbies. COPs are so deeply integral aspect of our daily life so that we usually do not become aware of their existence at all.

The starting point of COP is pursuing a shared enterprise, project or so other collective ”thing” from which the participants collectively agree or jointly take mutual responsibility of. Joining the community indicates a commitment to participate in pur-
suing the collective goal. Shared practices tend to bind the participants to one another even if each participant would not personally interact with every another one. These kinds of communities do usually also involve deliberate attempts to take care of the community and invest deliberate efforts to keep it together. A COP produces constantly accumulating resources of shared tools and instruments of activity that may take the form of tools, concepts, stories, icons and so on. Professionals “war stories” are instances of these kinds of resources of collective activity (Orr, 1990).

According to Wenger (1998), COPs represent locally explored and negotiated ways of coping with the requirements and problem situations that emerge in small intensively interacting communities. COPs help to regulate intellectual efforts and find ways of avoiding too strong external control of activity; this allows a community to increase autonomy of its activity. A workplace organization’s official organizational structure does not, for instance, provide direct information concerning what is really going on in the organization in question. Consequently, workplace organizations need to develop way of dealing with challenges diverging from the official distribution of labor that were not taken into consideration when work plans were initially created.

Wenger (1998) pointed out that COPs are not necessarily very innovative and that these communities should not be unnecessarily admired. While COPs may function as facilitators of human growth and development, these communities may equally or more likely function against these kinds of desirabilities due to their tendency to develop rigid and fixed practices and become overly conservative and resist all changes. For instance, Wenger, McDermott, and Snyder (2002, 139-159) analyzed the role of COPs in workplace communities and used a whole chapter for examining the dark side of COPs, i.e., aspects of COPs that are negative from the viewpoint of innovativeness and dealing with novelty.

As valuable as the tradition of COPs is for understanding collective intellectual activity, it does not appear to provide a sufficient basis for understanding innovative knowledge communities that characterize advanced knowledge society (Ahonen, Engeström & Virkkunen, 2000; Engeström, 1999b; Hakkarainen et al., in press; Miettinen, 2000). The theory of COPs originally emerged to conceptualize educational practices in aboriginal and traditional cultures, such as the Maya culture of Yucatan Peninsula and tailor’s of Ivory Coast (Lave & Wenger, 1991). These cultures are relatively stable in nature. Research on COPs describe how competence gets transmitted from one generation to another without a noticeable, essential or deliberate cultural transformation. In traditional COPs main part of knowledge is crystallized or embedded in shared practices, tools, and culture of activity. These types of communities that change relatively slowly do not usually allow significant alteration or transformation of practices. The communities in question may also sanction actors that break the tradition. It is not uncommon that apprentices are forbidden and prevented from developing new ideas. This may happen, for example, by taking a part of knowledge to be outside of all criticism and providing an access to it only after the apprentices are fully immersed to the culture, totally conditioned to follow the practices, and near to the completion of their socialization process. Change is often experienced as threatening also in workplace communities of our own society because it may force all participants to change their practices and regular ways of doing thing.
Innovative knowledge communities

Innovative knowledge communities as the basis of knowledge-creation metaphor

There are various models concerning how innovative communities typical for our age function. In the following, we will introduce three such models: Ikujiro Nonaka’s and Hirotaka Takeuchi’s (1995) model of knowledge-creating company, Yrjö Engeström’s (1987, 1999a; Ahonen et al., 2000) model of expansive learning, and Carl Bereiter’s (2002) model of knowledge-building community (see a more detailed comparison in Hakkainen et al., in press; Paavola et al., 2002).

In the book *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation* (1995), Nonaka and Takeuchi presented their model of innovation that is well known and influential in business world. The starting point of the model is a distinction between two types of knowledge, i.e., tacit and explicit knowledge. According to these investigators, the Western tradition has overemphasized *explicit* (articulated, specific, and conceptual) knowledge. Consequently, this tradition was not well prepared to understand and explain processes of knowledge creation. In the process of innovation more important than explicit knowledge is *tacit* knowledge. The notion of tacit knowledge is currently used extensively with varying emphasis, but here it means primarily personal hunches and impressions embedded in individual and collective experiences, as well as intuitive conceptions, values and beliefs. The dynamism of Nonaka and Takeuchi’s model emerges from the interaction between tacit and explicit knowledge. It is based on a spiral model in which individuals’ tacit knowledge is transmitted to be used at the level of a community, an organization and, perhaps, even at the inter-organizational level. Correspondingly, it is assumed that communal or organizational knowledge gets transferred to guide an individual actor’s activity through internalization.

Yrjö Engeström’s *expansive learning* model is based on the cultural-historical activity theory. The basic unit of the model is culturally (through material and conceptual tools and practices) mediated activity in a specific environment of activity. Engeström’s model of expansive learning in a workplace communities is based on a learning cycle in which models of new practices are deliberately developed through questioning and problematizing current practices and developing methods for overcoming and solving tensions, disturbances and ruptures of prevailing practices that are assumed to be signs of deeper contradictions. The novel models are examined and assessed in practices so as to create a basis for new expansive transformations (see Engeström 1999a). During this kind of expansive cycle the participants are reconceptualizing their activity system in relation to shared objects of activity Engeström and his colleagues (Engeström, Engeström, & Kärkkäinen, 1995; Ahonen et al., 2000) have developed an intervention method that they call “boundary-crossing laboratory” or “change laboratory. The idea of the boundary-crossing laboratory is to guide workplace community to reflect is prevailing practices with the help of researchers (who provide mirror data for reflection by shadowing employees and vide-
The method is used to support organization change processes in various domains of activity, such as health care or enterprises working with new information and communication technologies.

According to Carl Bereiter (2002), knowledge is an object of deliberate and intentional development and creation within an advanced knowledge society. It is a collective object (or "thing") that participants of knowledge communities are deliberately producing and sharing among themselves. While developing a theoretical and practical model for future education, Scardamalia and Bereiter (1994) developed a notion of collaborative knowledge building. Knowledge building refers to collective work that focuses of advancing, articulating and further elaborating the development of conceptual artifacts, such as product plans, business strategies, marketing plans, theories, ideas and models. These are, according to Bereiter, objects that occupy Karl Popper’s (1972) work of cultural knowledge (World 3) as separated from physical world (reality, World 1) and mental world (subjective World 2). World 3 is particularly important for human beings because people do not only function in the mental worlds but are able to understand and develop these cultural and conceptual artifacts.

A central aspect of Bereiter’s theory is to make a conceptual distinction between learning and knowledge building; accordingly, learning is focuses on transforming mental knowledge structures whereas knowledge building concerns public and collectively articuable world of cultural knowledge. From this perspective, knowledge work appears to represent knowledge building rather than learning (if understood as an internal and mental process). Correspondingly, scientific research groups are working for developing theories and models that can be understood these kinds of shared knowledge objects rather than mere representations of mental states. Naturally, also learning takes place in business world and scientific research but it is not the central focus of this type of communities.

The above-examined models challenge prevailing conceptions concerning what learning and knowledge are all about. All of then appear to provide guidance concerning how school and workplaces can in practice be transformed toward more innovative ones (see, for instance, Ahonen et al., 2000; Bereiter, 2002; Engeström et al., 1995; Hargreaves, 1999; Hakkarainen et al., in press; Scardamalia, in press). A compressed comparison between the models is presented at Table 1.

Table 1.
Three models of Innovative Knowledge Communities (IKCs)

<table>
<thead>
<tr>
<th></th>
<th>Nonaka &amp; Takeuchi</th>
<th>Engeström</th>
<th>Bereiter</th>
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<tbody>
<tr>
<td><strong>Main focus</strong></td>
<td>Externalizing tacit knowledge (Insighting)</td>
<td>An interplay between material and conceptual knowledge in practices (Acting)</td>
<td>Knowledge objects (Conceptualizing)</td>
</tr>
<tr>
<td><strong>Type of processes focused</strong></td>
<td>Emphasize personal experience and impressions</td>
<td>Emphasize material object-oriented activities</td>
<td>Emphasize solving of knowledge problems</td>
</tr>
<tr>
<td><strong>Source of innovation</strong></td>
<td>Transforming tacit knowledge to explicit</td>
<td>Overcoming tensions, disturbances, and am-</td>
<td>Working deliberately for extending and cre-</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Scope of framework</th>
<th>knowledge</th>
<th>biguities by expansive learning</th>
<th>ating new knowledge objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different ontological levels from individuals, groups to communities, and organizations</td>
<td>Activity systems and networks of activity systems</td>
<td>Knowledge-building communities and organizations</td>
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</tbody>
</table>

In spite of diverge theoretical foundations and basic assumptions, these models appear to complement each other rather than to be in an unsolvable conflict with one another. The basic tenet of each model is the development of new knowledge and/or practices. The present investigators regard all of the models to represent a conception of learning that is very close to the knowledge-creation metaphor (Paavola et al., 2002). Nonaka & Takeuchi criticize Western thought due to overemphasis on knowledge rather than processes of knowledge creation. Engeström’s expansive learning model is explicitly focused on overcoming starting point/approaches/situations that take context and learning tasks to be something given or fixed. Bereiter’s and Scardamalia’s knowledge-building model relies on an ideas of expertise as a form of collective progressive problem solving and continuous work at the edge of one’s competence aimed at overcoming existing knowledge and competence.

Interesting in these models of IKCs and knowledge-creation models in general is that those appear to help to overcome false dichotomies and contrasts emerging from the distinction between the acquisition metaphor and the participation metaphor. The acquisition metaphor emphasizes importance of individual agents, especially individual mind and mental representations, i.e., a Cartesian notion of human activity. The participation metaphor, in contrast, highlights participation in social and cultural practices. Models of IKCs involve aspects of both of these metaphors. The models of IKC emphasize significance of communities and social practices without, however, forgetting an essential role of individual agents. Individuals may have crucial role, for instance, in questioning prevailing practices or pursuing novel ideas or perspectives. These models also criticize too strong emphasis of conceptual knowledge, but this does not mean that conceptual knowledge would not be significant, quite contrary. An interaction between practices and weaker forms of knowledge (e.g., knowledge embedded in practice, tacit knowledge and so on) is a central concern of IKC models. For Cartesian dualism between mind and matter is not searched for a monist solution in which everything is reduced to cultural practices. In all of the three reviewed models the role of mediating factors, such as conceptual and material artifacts, models and metaphors, activities and practices, and problems is extremely important.

From communities of practice to innovative knowledge communities

In this article characteristic communities for knowledge society are called innovative knowledge communities. By using as a starting point the models of IKCs presented above, we will delineate those general features that are characteristic for these types of communities. These communities resemble informal COPs. Also IKCs create similar reserve of collaborative activities, tools, practices, and methods, as well as shared stories and understanding that is the case in COPs. Although IKCs then share many features with COPSs, they also differ in many respects.
COPs operate in environments that are relatively stable. In these, so-called *first-order environments* communities and their members are oriented toward meeting a relatively fixed set of conditions. Innovative knowledge communities, however, are operating in *second-order environments* (Bereiter & Scardamalia 1993), where the conditions to which an agent must adapt change dynamically as a function of the other actors' (individuals or organizations) progress in the environment. In science, in knowledge-intensive industries, or in sports, a development of a new method which improves for example the exactitude of the measurement, the effectiveness of the process, or the achievement level, will change the reality of all communities involved. If they are going to keep up in with the competition, they are forced to reach this new level. Dynamic knowledge communities create criteria of an assessment with gradually tightening levels, which regulate how complicated problems are encountered. It means that the level of requirement that is taken as the minimum or acceptable, moves higher all the time. This does not concern just some special fields of society but also everyday life. For example, among people being enthusiastic gardeners the special skills and knowledge develops so that the minimal level of theirs is something that is well beyond those criteria that people outside that culture of expertise have.

Both COPs and IKCs are units of cultural learning. These communities transmit cultural tradition to new agents and develop practices, tools, and instruments that embed the results of this learning. IKCs differ from COPs so that *their activities as a whole aim at creating new knowledge and practices that support this activity*. Although COPs are also engaging in gradually deepening cultural knowledge, it is characteristic only for IKCs to deliberately utilize the so-called *ratchet effect* ( Tomasello, 1999), i.e. the capacity of social communities to create new innovations on the basis of earlier ones, and use earlier intellectual achievements as a means of reaching toward new ones. Deliberate and conscious accumulation and utilization of cultural knowledge appear to lead to *locally accelerated cultural learning*, a characteristic of innovative knowledge communities (Hakkarainen, Palonen, Paavola, 2002).

In COPs knowledge and experience is supposed to transmit one-way from old-timers to newcomers. Expert cultures involve an exercise of power where newcomers are kept in a subordinate position by restricting their access to knowledge and to new skills (see Lave & Wenger, 1991; Wenger, 1998). IKCs do not go without the exercise of power either but they do not have so strict hierarchical relationships concerning knowledge and competencies (where only old-timers have access to valuable knowledge) as in traditional expert communities. IKCs appear to continuously face problems that no one within the community has ever solved. As a consequence, many newcomers to IKCs have knowledge relevant to solving significant problems (e.g., the new information, communication, and mobile technologies) that the old-timers could not have had access to. Consequently, *transmission of knowledge and competence is more symmetric* than in traditional communities (Scardamalia, 2002). In IKCs achievements of communities and the competence and expertise of individuals are in interaction, and they co-evolve so that individual achievements and competencies are used as a support for collective activity and the changing collective practices are used as stepping stones to surpass previous achievements of the individuals.

The logic of action is different in COP compared to innovative knowledge communities. Instead of progressive problem solving communities of practice often
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concentrate on minimizing problems. The central task is to find localized solutions to practical problems that hinder from achieving common goals. IKCs reflect tensions, disturbances or contradictions in their activities, and aim at deliberately providing such social changes that support the creation of knowledge (Engeström, 1987; 1999a). These communities typically take more and more challenging problems to solve in order to cope in the second-order environments (Bereiter & Scardamalia, 1993).

In COPs learning takes place unconsciously without any explicit intention to enculturation the newcomers. Enculturation of newcomers can occur by participating in the practices of experts or, for instance, by listening the narratives that the old members tell about of the community. In this sense, the community of practice does not take a full and intentional responsibility of the development of the skills and competence of the new comers. On the contrary, the advancement of the IKC relies on the development of the expertise of its individual members. On this account, IKC takes a collective responsibility of the advancement of the competence of its individual members. This is enforced by creating collectively for each individual a trajectory of personal development through systematic and professional training (Scardamalia, in press).

In IKCs, the development of expertise occurs in two dimensions: vertically (in the field of one’s own expertise), and horizontally (one is learning from the field of others'). Especially the latter, the horizontal dimension of learning, is central in multi-professional organizations. Horizontal learning can consciously be supported and cultivated, for instance, by engaging people from different fields of expertise to work together, or by recycling the responsibilities and duties with in organization (Engeström, 1999b).

In many cases, the COPS emerge as a collective response to deal with specific challenges. As distinct from the COPs, the IKCs are intentionally built to create new knowledge and innovations. In this sense, they systematically try to create activities that support the creation of new. However, not every member of IKC necessarily is aware of the specific activities that are aimed to support innovativeness of the community. In many cases, only the old members of the community are aware of the genesis of some specific practices that have been created in the process of solving the historical contradictories of the community. Commonly, these practices are taken as given by the new comers. This does not mean that they only passively adapt to the existing practices, but that participating in a community they also transform these practices.

On central difference between COPs and IKCs is that people who work latter ones are "forced" to create new forms of acting, working and learning in order to deal with the challenges of the turbulent work environments. One new form of acting is so called intensional networks (Nardi, Whittaker, & Schwarz, 2000). These are networks that individuals intentionally create and foster. A new form of work, typical for the members of IKCs, is knotworking (Engeström, Engeström, & Vähäaho, 1999). By knotworking Engeström means a "combinations of people, tasks, and tools are unique and of relatively short duration." Knots bring together "loosely connected actors and activity systems." Typical for knots is that the participants of knots have, for instance,
loose connections, short duration of relationships, and lack of shared knowledge.

Appendix presents the relations between communities of practice and innovative knowledge communities. We would like to remind the reader that the frameworks of communities that we present are not mutually exclusive. Sometimes there is a thin line between them, and rigorous definitions are impossible. Thus, they should be interpreted more as ideal-typical illustrations about the main approaches to communities.

Our intention is not to argue that IKCs are always innovative and acting creatively. Sometimes these communities can be as conservative as COPs. In any case, established (and, therefore conservative) practices are something that every community needs in order to be able to build new forms of activity (see Paavola, 2001). However, IKCs are continuously searching inputs (new perspectives, ideas, methods) form the outside in order to advance their practices and knowledge. Thus, in the development of IKC, there exists a constant dialectical tension between the already existing and the new. To cope in the turbulent working life environments this kind of activities are essential for the survival of a community.

**Discussion**

Work in the modern world focuses more and more on advancement and creation of knowledge, and production of innovations is considered to be the most important resource of social and economical development. The only permanent thing in 21st century’s society is fast technical, social, and economical change. Consequently, concepts such as knowledge, expertise, and competence characterize our activity throughout life. Some investigators propose that profound "epistemification" characterizes modern work (Stutt & Motta, 1998). Consequently, our work is more and more knowledge intensive, we are required to develop deeper and deeper expertise, and work for developing, articulating and expanding conceptual artifacts takes up larger and larger proportion of our time and intellectual resources. Epistemification of work is associated with increasing dependency from various instruments and material artifacts. Moreover, from an integration and fusion -- hybridization -- of conceptual and material aspects of our activity follows that our tools and instruments become more and more knowledge-laden and autonomous (Latour, 1993; 1999). Practically every person has to struggle for developing competencies required by productive working with knowledge, competencies that formerly characterized just a small elite.

The contention of the present investigators is that models of IKCs take these challenges seriously and help us to understand changes taking place in our society. Earlier models that examined learning and human intelligent activity from the viewpoint of the acquisition and participation metaphor are valuable approaches as such and provide complementary perspectives for overall understanding of learning (Sfard 1998; Anderson et al., 2000). Beyond these metaphors, it is essential to understand how communities which focus on creation of new knowledge and novel social practices function and how these kinds of communities can deliberately be cultivated. The concept of COP has had in important role is discussing collective processes of learning but it is not sufficient model when we are trying to understand novel requirement of expertise and competence development. There are various innovative communities and various models of such communities. Our intention in the present articles has
been to identify certain central characteristics of such innovative knowledge communities.

References


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### Appendix 1. Relations between communities of practice and innovative knowledge communities

<table>
<thead>
<tr>
<th></th>
<th>Community of practice</th>
<th>Innovative knowledge community</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main focus</strong></td>
<td>Problem reduction, to the commonly encountered: Creating practices that allow the community to function routinely to attain goals and accomplish its tasks</td>
<td>Progressive problem solving: Deliberate pursuit of social transformations by reflecting on ruptures, tensions, and disturbances of current practices</td>
</tr>
<tr>
<td><strong>Role of knowledge</strong></td>
<td>Knowledge has mainly an instrumental role supporting collective activity, often aimed at creating material products or services. A main part of knowledge is embedded in tools and practices.</td>
<td>Creation of knowledge is the main motive of collective activity. The community focuses on deliberately advancing and developing mediating conceptual artifacts by relying on more and more knowledge-laden tools, procedures and instruments.</td>
</tr>
<tr>
<td><strong>Nature of cultural learning</strong></td>
<td>Gradual accumulation of knowledge and supporting skills and practices</td>
<td>Systematic and deliberate effort to search for, accumulate, and create cultural knowledge. Capitalization on the ratchet effect.</td>
</tr>
<tr>
<td><strong>Distribution of competence</strong></td>
<td>Asymmetric and homogeneous; old-timers master critical knowledge and skills that are transmitted to newcomers. Entails more hierarchical relations between participants</td>
<td>Symmetric and heterogeneous; newcomers often have valuable knowledge and skills, being commonly selected to strengthen collective competencies. Entails fewer hierarchical and more open relations between participants</td>
</tr>
<tr>
<td><strong>Agent of learning</strong></td>
<td>Cognitive growth through social contagion of knowledge and skills, often without deliberate effort to facilitate individual learning</td>
<td>Collective responsibility for cognitive growth; intentional efforts to ensure and facilitate the development of each participant’s knowledge and competencies</td>
</tr>
<tr>
<td><strong>Environment of activity</strong></td>
<td>First-order environments: adaptation to relatively stable and fixed conditions</td>
<td>Second-order environments: criteria for successful adaptation change and increase progressively as a function of activities and success of other communities in the field</td>
</tr>
<tr>
<td><strong>Design of community</strong></td>
<td>Usually emerged spontaneously for dealing with practical tasks and collaborative ventures</td>
<td>Deliberately designed to facilitate knowledge creation, innovations and the development of expertise</td>
</tr>
</tbody>
</table>