

# Virtual Communities of Practice: Design Directions for Technology-mediated Collaboration in the Early Warning Activity

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## ABSTRACT

The performance of early warning activities involves the management of complex situations as uncertainty is common, information is frequently scattered and the number of stakeholders affected is large. In this context, the performance of early warning activities is distinguished by the significance of internalized experience as well as the generalized use of cultural knowledge, internalized domain knowledge and tacit knowledge. A suitable and well-known way to endorse the creation and exchange of this kind of knowledge –usually called soft knowledge- is the application of communities of practitioners. Based on the review of the communities of practice approach, its principles and rationale, this paper proposes a set of design guidelines aimed at addressing the technological design of technological platforms that support the creation, exchange and acquisition of soft knowledge for its application in early warning activities.

## Keywords

Early Warning, communities of practice, soft knowledge, virtual crisis management, design guides.

## INTRODUCTION

Knowledge Management (KM) is a research field that comprises a wide range of initiatives to realize, capture and spread knowledge (Nonaka, 1991). Traditionally, KM literature has conceived knowledge as “*a commodity that can be codified, stored and transmitted*” (Alavi and Leidner, 1999); nevertheless, at the beginning of the current century a new trend arose as an alternative to this vision. According to this trend, there is some knowledge that simply cannot be quantified (Hildreth, Wright and Kimble, 1999), avoiding its codification and sharing. As a consequence, knowledge should be considered as a duality (Hildreth and Kimble, 2002) that embodies both the knowledge that can be observed and represented -defined as ‘hard knowledge’- and the knowledge that can be transmitted but neither codified nor stored -defined as ‘soft knowledge’-. Examples of soft knowledge include skills, tacit knowledge, internalized experience as well as cultural knowledge embedded in practice (Hildreth and Kimble, 2002). In the context of emergency and crisis situations, we can find an example of soft knowledge in the early warning activity. Early warning is aimed at “*empowering individuals and communities, threatened by hazards and crisis situations, to act in an appropriate manner so as to reduce the possibility of personal injuries and material damages*” (IDNDR, 1997). Such an activity is mainly determined by the experience of participants, involving a number of skills, abilities and practices that are difficult to verbalize and explicitly transfer to other participants.

**Reviewing Statement:** This paper represents work in progress, an issue for discussion, a case study, best practice or other matters of interest and has been reviewed for clarity, relevance and significance.

Acquiring soft knowledge is a social process in which people participate in a collective way at different levels depending on their experience, authority or reputation in the group (Lave and Wenger, 1991). Based on such ideas, different authors (Wenger, 1998; Lesser and Storck, 2001; Kimble and Hildreth, 2004) have proposed the creation of communities of practice as a suitable solution to create, acquire and share soft knowledge.

Communities of Practice (CoP) are defined as “*groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis*” (Wenger, McDermott and Snyder, 2002). It is therefore an informal structure based on interacting, participating and sharing either competences or experiences on a specific domain. The application of communities of practitioners to the emergency management context is not completely original. Organizations such as the ‘Community Emergency Response Team’ (CERT) or the ‘International Committee of the Red Cross’ (ICRC); networks such as ‘Famine Early Warning Systems Network’ (FEWS NET), the ‘Australian Early Warning Network’ (EWN) or the Spanish ‘Red de Radio Emergencias’ (REMER); and services such as the ‘Radio Amateur Civil Emergency Service’ (RACES) are based on the participation of volunteers to either assist or manage crisis situations. Nevertheless, the transference of the CoP concept from the lived-in world, in which it is deeply rooted, to the virtual one is a non-trivial task but a complex process that requires the appropriate guides and principles to be adapted to the context of interest (Lueg, 2000).

This paper aims at identifying and defining a set of directions for designing technological platforms that support the involvement of Virtual Communities of Practice (VCoP) throughout the process of identification, evaluation and warning of hazards. These directions may be conceived as a discussion framework that stimulates the debate prior to implementing specific tools that allow the systematic assessment of such directions. The rest of the paper is organized as follows. The next section explains the rationale that justifies the application of the VCoP approach to the early warning activity. Design trends and guidelines are described in the third section. Finally, conclusions and recommendations for further work are drawn in the last section.

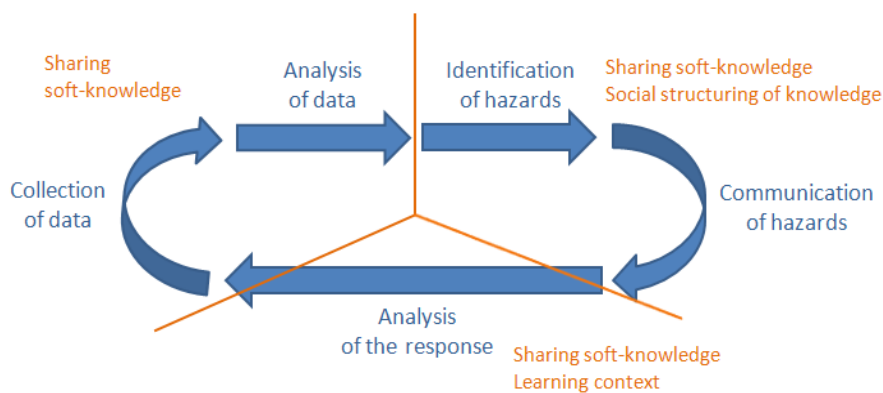
## RATIONALE FOR VIRTUAL COMMUNITIES OF PRACTICE

Although the application of social networks and VCoP to the emergency management context has been suitably explained and justified through previous work (Plotnick, Ocker, Hiltz and Rosson, 2008; White, Plotnick, Kushma, Hiltz and Turoff, 2009), the particularity of the early warning activity recommends us to rationalize the concept of VCoP and its role in such an activity. As far as the concept of CoP is concerned, not every group of people should be considered as a CoP. For considering a group of people as a CoP, the following three characteristics must be met (Wenger, 1998):

- The *domain*. CoP should have an identity defined by sharing interests in a specific domain. Members of a community of practice therefore share competencies, abilities or experiences that distinguish them from other groups of people. In our case, members of an ‘early-warning CoP’ should share their concern and knowledge –whether hard and soft- about hazards and crisis situations that can produce victims and damages. For instance, a CoP focused on earthquakes would include seismologists, emergency responders and experts – such as architects- concerned about the effect of earthquakes. Similarly, a conflict-prevention CoP would be formed, among others, by mediators, sociologists or political scientists.
- The *community*. In order to achieve the objective of a CoP its members have to interact with each other. Having the same hobby or profession does not necessarily create a CoP unless its members collaborate with each other. Thus, receivers of alerts are not necessarily regarded as members of an ‘early warning CoP’. On the other hand, a community can be composed by both volunteers and professionals who collaborate to create, share and acquire knowledge.
- The *practice*. A CoP is not merely a community of interest. Members of a CoP should be self-conscious practitioners who regularly both develop and share resources by using specific instruments, tools or mechanisms to exchange information, resolve problems and externalize knowledge. As an example, a CoP focused on conflict prevention should be either encouraged to debate about specific policy issues or provide detailed information on development regarding conflicts.

In addition, the creation of a CoP whose practitioners are not co-located is not enough to define a VCoP. A VCoP relies on a virtual environment not only to participate but also for the reification of knowledge, understanding reification as “*the process of giving form to our experience by producing objects (...) that include making, designing, representing, naming, encoding and describing as well as perceiving, interpreting, using, reusing, decoding and recasting*” (Wenger, 1998). As a consequence, the use of generic electronic media -such as email, voice mail or video conferencing- to communicate and cooperate should be complemented with specific services -as synchronous interaction, discussion groups or document management- that support such reification of knowledge.

Early warning is a decision context characterized by the prevalence of complex and chaotic situations (French and Niculae, 2005) in which soft knowledge is especially relevant. As we said above, the CoP approach is a natural mechanism for acquiring soft knowledge (Kimble and Hildreth, 2004) as well as a suitable instrument for managing this kind of knowledge. Autonomy, practitioner-orientation, informality, crossing boundaries are also characteristics that make them a challenge for exchanging explicit knowledge in structural organizations (Wenger et al., 2002), as those in which rest the issuance of the early warning labor (IDNDR, 1997). In addition, CoP are a natural way to support and motivate learning, meaning and innovation (Lave and Wenger, 1991); essential activities to encourage and support improved early warning practices, particularly those related to the identification and measurement of hazards. Figure 1 shows the relationship between the dimensions enclosed by CoP –sharing knowledge, social structuring of knowledge and learning context- and the cycle of activities - collection of data, analysis of data, identification of hazards, communication of hazards and analysis of response (Rupesinghe, 2009)- that defines the early warning process. According to such a relationship, the early warning process has been divided into three groups. For instance, the identification and communication of hazards is based on the experience of practitioners –sharing soft-knowledge- to recognize crisis situations as well as the use of structural organizations –social structuring of knowledge- that allow the controlled exchange of such knowledge. As far as the analysis of the response is concerned, not only sharing soft-knowledge is required but also the long life learning based on previous situations and experiences.



**Figure 1. The early warning activity and its relationship with Communities of Practice (CoP) dimensions**

## DESIGN TRENDS AND GUIDELINES

In this section we compile a number of design trends and guidelines that might be useful to design technological platforms to support VCoP. These design directions will be classified according to the taxonomy defined in (Dube, Bourhis, and Jacob, 2006) that identifies the 21 most meaningful structuring characteristics of VCoP and classifies them into four categories: demographics, organizational, membership and technological. Since the demographics compiles characteristics related to the behavior of the community -as orientation, life span or level of maturity-, which are specific to each particular community and cannot be generalized, the demographic category will not be considered in our work. Then, the design directions (enumerated as DDi) will be classified into the following three categories:

- **Organizational.** A CoP is a social structure through which individuals cooperate to achieve a purpose. A community should therefore have a presence in the life of its members in order to provide an additional value. Within this category we consider three activities and a set of design directions.
  - Encourage participation. Practitioners belong to the community because it is related to their interest; nevertheless, community members should feel the value of working as a community (Wenger, 1998). The following design directions are conceived to show the value of being a member of the community with the purpose of encouraging participation.
    - DD 1. Ensure the visibility of members to feed their ego. Provide mechanisms such as members directories, presence awareness and subscription reminders. Visibility of members' reputation within the community might be also a resource to provide additional value (see next activity).
    - DD2. Promote a rhythm of participation to dynamize the community including tools such as calendars, reminders, hot topics, tip of the day, etc.
    - DD3. Ease involvement by supporting different access options including electronic newsletters, content filtering, ordering mechanisms, etc.

- Create value. Although the creation of value is not apparent when a community is formed, this should be the final aim of this activity. A community needs mechanisms that help value to emerge.
  - DD4. Achieve top-down transmission of knowledge. Top-down flows of information are essential in the early warning activity as a way to enhance the learning of new aspects of crisis situations (IDNDR, 1997). Top-down transmission of knowledge requires mechanisms that allow members of the community to acquire knowledge from experts, specialists or proficient practitioners.
  - DD5. Achieve a culture of participation. The early warning activity requires bottom-up flows of information in order to acquire and share experience, practices and competences (IDNDR, 1997). A VCoP should foster and support rich ecologies of participation (Fischer, 2009) with the purpose of assuring the creation of bottom-up flows of information.
  - DD6. Promote life-long learning (Lave and Wenger, 1991). The education of members should be guaranteed by applying tutorials, online help, FAQs, virtual tours, etc.
- Crossing boundaries. A community of practices is not an isolated structure (Wenger, 1998) but it is part of a more complex or general space: the emergency management activity.
  - DD7. Guarantee integration with other virtual or real environments (Wenger et al., 2002). For instance, publishing news and feeds, announcing external events, or attaching alerts and warnings.
  - DD8. Facilitate the creation of subspaces about specific hazards or emergency situations. Early warning is not a homogenous activity but a complex reality whose analysis and management depends on the specific emergency situation or hazard considered (Rupesinghe, 2009).
- *Membership*. A CoP is formed by people who have a personal identity –biography, role, personal trajectory- and a community identity –value to the group, success history, community trajectory- both of which should be considered (Wenger et al., 2002). The activities and design directions considered in this category are:
  - Personal identity. Members have a personal identity that should be brought to the community (Dube, Bourhis, and Jacob, 2006) in order to develop and shape their participation.
    - DD9. Define the professional and personal profile of members. Each has a set of personal characteristics by which are recognizable as a member a group.
    - DD10. Provide different levels (roles) of participation as stated in user profile (Aedo et al, 2007).
  - Community identity. Memberships have a set of behavioral characteristics that determine their identity –status, reputation, influence- as members of the community (Dube, Bourhis, and Jacob, 2006).
    - DD11. Access to the virtual community should be neither free nor anonymous. Early warning is a critical process that relies upon confidentiality and authority (IDNDR, 1997).
    - DD12. Provide participation background and personal history within the community.
    - DD13. Provide mechanisms to judge the value of members to the community (Wenger, 1998).
- *Technological*. A CoP deployed in a virtual environment (VCoP) requires a technological platform. The activities and design direction in this category include.
  - Participation. The reason for existence of a community of practices is practicing (Lueg, 2000). A software tool that supports a CoP should be designed to support participation.
    - DD14. Provide multiple channels and forms of interaction for different purposes (notification of events, sharing knowledge, etc).
    - DD15. Provide mechanisms that support the reification of soft-knowledge. Electronic media should be complemented by specific services –such as synchronous interaction, discussion groups or document management- that support the externalization and exchange of tacit knowledge.
  - Verification. Early warning is a critical activity that requires accuracy and trust (Rupesinghe, 2009). A software tool that supports a VCoP should guarantee them.
    - DD16. Define administration, coordination and curation (Fischer, 2009) roles.
    - DD17. Provide tracking and monitoring services.
  - Community development. CoP are structures in permanent evolution (Wenger et al., 2002). A software tool that supports a community of practices should be designed to promote and control change.
    - DD18. Support the constant reconfiguration and personalization of both the community and the software tool that supports it (Wenger et al., 2002).
    - DD19. Provide assessment tools about both the technological platform and the behavior of the community in order to improve their administration and management, respectively.

## CONCLUSION

Virtual Communities of Practice (VCoP) refers to groups of people that share interest or concerns, and use virtual environments as an instrument for participation and reification. As the application of VCoP is not a trivial process, in this paper we propose a set of directions, conceived as a discussion framework, that stimulates and focuses the debate on the application of VCoP to the early warning activity. Further work will lead to the elaboration of technological platforms that allow the evaluation of these design directions, as well as their refinement or refutation. The final aim of our work is to define a theoretical artifact that identifies which principles should be considered depending on the context, goals, features and kind of memberships of a VCoP.

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