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Postprint

This is the accepted version of a paper presented at *Information systems research seminar in Scandinavia (IRIS) 2016*.

Citation for the original published paper:

Öberg, L.-M., Nyström, C A. (2016)

Evaluation of the level of collaboration in a regional crisis exercise setting: - the use of Community of Inquiry.

In: *Proceedings of Information systems research seminar in Scandinavia (IRIS) 2016*

N.B. When citing this work, cite the original published paper.

Permanent link to this version:

<http://urn.kb.se/resolve?urn=urn:nbn:se:miun:diva-29640>

Evaluation of the level of collaboration in a regional crisis exercise setting - the use of Community of Inquiry

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Abstract. Planning for regional security and crisis management could be supported by well performed exercises. These exercises should be evaluated from different views in order to investigate the participants learning from the exercise. Since the evaluation seldom rest upon established learning theories it will be difficult to evaluate if the exercise will lead to the stated goals. Authorities in the counties of Jämtland and Västernorrland, intend to implement such exercise spring, 2016. The Theme for the exercise is “Flooding” - “Höga flöden” based on a scenario describing extremely high rainfall which could affect hydroelectric dams. The authorities should act and collaborate based on local crisis plans and how the scenario changes over time. We intend to use the Community of inquiry model when evaluating how the participants act, reflect and learn from the exercise. The Community of inquiry (CoI) model consists of three elements: social presence, cognitive presence and teaching presence. The model assumes that learning occurs within the Community through the interaction of this three core elements. We intend to use a validated version of a survey instrument connected to the CoI model (Arbaugh et al, 2008). Hence, the aim of this paper is to propose an evaluation method to evaluate levels of communities in regional exercises.

Keywords: community of Inquiry, regional security and crisis management, exercises, evaluation, learning, presence

1 Introduction

Our society is affected by different type of crisis such as flooding, powerful storms, sabotage and terrorism. There are a lot of examples such as “9/11, “Storm Sandy” and “Hurricane Katarina”. In the Nordic countries we have the “22 July” in Norway and the large forest fire in Sweden 2014. The response to larger crisis often requires entire collaboration between a numbers of organization to minimize the effects of the crisis. Boin et. al (2004) state that this have contributed to a faster development of crisis awareness. The evaluation that follows often points out that the actors should have put more resources into training. The baseline in the arguments is that it would have done the actors more prepared to handle the situation. The number of exercises has during the last decades also increased according to Boin et. al (2004) and Aradau & van Munster (2012).

In the Swedish context exercises that aims to increase the ability to collaborate have been in focus. There are a lot of examples of evaluations and reports from these

type of exercises on international, national and regional level. However, there are few examples of research that have explored the effects of exercises and thereby what the participants learn. Perry (2004) is one of the few that performed a quantitative study and the result is empirical evidence that exercises contribute to “perceptions of participants” when it comes to knowledge of response systems and team work (Perry 2004 p.71). Berlin and Carlström (2015) have emphasized the need for more research when it comes to study the effects of collaboration exercises and whether or not they contribute to the skills of collaboration. Andersson et. al (2014) have performed a qualitative evaluation of collaboration exercises and their results indicates that exercises tend to focus on the internal routines and skills rather than developing the collaboration skills. Berlin and Carlström (2015) have focused on field exercises and presented a model and surveys which could be used to measure the effects of collaboration exercises. Their quantitative results shows that collaboration exercises (performed on the field) could contribute to higher skills in collaboration but they also argues that there is a need for further research. Borell and Eriksson (2013) have developed a theoretical framework that present an idea how to manage and learn from discussion-based crisis management exercises. Andersson et. al (2014) propose the importance of identification of boundary objects in exercises enabling creation of situations that require collaboration. Asproth et. al (2013) also present ideas how to measure the effects of exercises. They have used surveys before and after the exercise.

Within the pedagogical field the social dimension of learning have been emphasized for some years. Garrison (2016) means that thinking is socially situated and that thinking in a collaboration is in human nature. Further on he means that “Thinking collaboratively is an essential component of innovative thinking and learning” Garrison 2016 p. 2). Above we have described the field of crisis exercises and that there are a lot of exercises designed to make the participants collaborate and learn about collaboration. There are however few examples of models or ideas how to build exercises that we can anticipate will lead to these type of learning. In this paper we will therefore adapt a well-known model for learning in collaborative settings, Community of Inquiry (COI) to the crisis exercises context. The model is developed in an online learning context and is well-known. The type of exercises that have been studied in this research the participant communicate and collaborate using different type of IT. They will thereby build some sort of community and since the underlying aim of all crisis exercises is learning this model seems suitable.

The starting point and necessary conditions for collaboration, are functional groups characterized by a high degree of trust. Collaboration within and among communities is also depending on the participants belonging to their own community. There might be a conflict, if participants belonging to several level of communities – sub communities of teams – have a feeling of interest conflicts. Where are the main belongings?

The aim of this paper is to propose an evaluation method to evaluate levels of communities in regional exercises.

The rest of this paper is structured as followed. First a brief background is presented to situate the context where the proposed evaluation method will be used, before the theoretic frame of Community of Inquiry is presented. The research approach explains the process of the validation and revision of the instrument undertaken and

thereafter the findings are accounted for. The paper ends with a discussion about the implications for the future use of the proposed method and thoughts about the meaning of different levels in a community.

2 Description of the context – HUBBE 1

Different authorities, municipalities and other interested parties in the event of a common crisis, are going to implement an exercise called HUBBE 1. HUBBE 1 will take place in Mid Sweden. The Theme for the exercise is “Flooding” - “Höga flöden” - based on a scenario describing extremely high rainfall that could affect hydroelectric dams. The participating organizations should act and collaborate based on local crisis plans and how the scenario changes over time. The exercise will take place during the weeks 21-24, spring 2016. Each of these weeks has a special theme, when the different organizations will work with different tasks. Each week starts with a trigger, when the exercise management will give input to the organizations. Every Wednesday there will be a common telephone meeting with all organizations where various pressing issues and problems can be discussed. The telephone meetings are pre-scheduled. They can also use one-one phone calls if there is a need for it. It will then be the facilitators that will phone each other because it will be their number that is available in the documentation. The pre-scheduled meetings follows a national standards for crisis meetings. Every Friday, results from the different tasks during the weeks, will be uploaded in a web based information System - WIS (run by the Swedish Civil Contingencies Agency). WIS is a system that is developed to make it possible for actors to share information about a crisis before during and after a crisis. It will be possible for all teams to see the information that the other teams download in WIS.

The facilitators for each organization, will have a meeting on Fridays. The different themes are: week 21 - crisis plans (implementation of crisis plans and identification of completing crisis plans), week 22 - situational awareness and technology (create and develop routines for information management between the participants), week 23 - Management and collaboration (identification of the participants ability concerning management and collaboration in the actual event and daily concerns), week 24 - evacuation and receiving vacated (plan for evacuation and investigation of vacation possibilities for people and animals). There will be approx. 15-20 organizations concerned with the exercise. The different actors are populated with members important for the different organizations where they belong, in a crisis situation such as “Flooding”. The number of participants will probably vary between around 3 and 6-7 persons. Total number of participants are estimated to around 100 persons. Each organization will be lead and managed by a facilitator.

2 Theory

The community of Inquiry model have been widely used - mainly in different kind of educational settings. However, exercises and collaboration in exercises is not an obvious educational task, but should be understood as learning opportunities so the model would be suitable also for such contexts as exercises.

The model is well-known and is becoming increasingly influential for explaining and prescribing the effective conduct of online learning according to citations in Google Scholar - 3049 citations (March, 2016). The model describes and explain how three elements are essential for educational transactions: cognitive presence, social presence and teaching presence. These elements have been further analyzed and categorized. Cognitive presence: e.g. triggering events, social presence: e.g. emotional expression, teaching presence: e.g. instructional management. Each of these categories, are exemplified by indicators. Arbaugh et al (2008) have developed a survey instrument in order to measure and test this Community of Inquiry framework with a multi-institutional sample. The instrument - a 34-item instrument - is further described and exemplified below.

The origin concept of community of Inquiry, was grounded in John Dewey's progressive understanding of education (Garrison et al, 2001). Dewey was among other, an American Philosopher and educational reformer whose ideas have been important and influenced education and social reforms.

The model has been further developed and applied to online education by the Canadian researchers Randy Garrison, Terry Anderson and Walter Archer (Garrison, Anderson and Archer, 2000). The model describes and explain "three elements essential to an educational transaction - cognitive presence, social presence, and teaching presence." (ibid, p 87). Indicators for each of these three elements emerged from the analysis of computer conferencing transcripts. These indicators described represent a possible template or tool for researchers to analyze written transcripts as well as a heuristic guide to educators for the optimal use of computer conferencing as a medium to facilitate an educational transaction (Garrison, Anderson, and Archer, 2000).



Fig. 1. Elements of an Educational Experience (Garrison et al, 2000, p 88).

The model was completed with development and validation of an “instrument to measure classroom community” by Rovai (Rovai, 2002) and “developing a community of inquiry instrument: testing a measure of the Community of Inquiry framework using a multi-institutional sample” by Arbaugh et al (2008). The latter is an operationalizing of the CoI framework of Garrison et al from 2000. In this article, it is a revised version of the instrument from Arbaugh et al (2008) which has been used. In the table below, the three elements in the CoI are related to Categories and examples of Indicators.

Table 1. Community of Inquiry Coding template (Garrison et al, 2000).

Element	Categories	Indicators
Cognitive Presence	Triggering Event	Sense of puzzlement
	Exploration	Information exchange
	Integration	Connecting ideas
	Resolution	Apply new ideas
Social Presence	Emotional expression	Risk-free expression
	Open communication	Encouraging
	Group Cohesion	collaboration
Teaching Presence	Instructional Management	Defining and initiating discussion topics
	Building Understanding	Sharing personal meaning
	Direct Instruction	Focusing discussion

According to Garrison et al (2000), cognitive presence is most basic to success in higher education. Cognitive presence is taken to mean “the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication.” (Garrison et al, 2000, p 89). Furthermore, cognitive presence are essential for critical thinking which much be present in all higher education. Social presence is defined as “the ability of participants in the community of inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as “real people”” (ibid, p 89). Teaching presence consists of two general functions which in common, might be performed by any participant in a CoI. In educational settings, these functions are a primary responsibility of the teacher. The functions are: 1) design of educational experience (e.g. choice of learning materials, organization and presentation of course material and activities). 2) Facilitation. The latter function might be shared by the involved teachers, assistant teachers and other involved in the educational setting at hand. This is also common in higher education. In either case, the teaching presence should support and enhance the other presences: social and cognitive presence for the purpose of realizing educational outcomes which should be in focus. The CoI Framework survey instrument by Arbaugh et al (2008), consists of 34 items with ordinal responses scored using the scale 0=Strongly Disagree to 4=Strongly Agree. Items from this instrument is shown in table 2 below with examples from the different elements. In the original article, the survey instrument was focusing on the student perspective. Our research group have later on completed the instrument with a teacher perspective in order expand the possible use of the instrument - e.g. course evaluation from a teacher perspective as well as from a student perspective. The table below (Table 2), includes this perspective as well.

Table 2. Example of corresponding questions to the template

Cognitive presence (student) from the original article	Cognitive presence Teacher perspective - completed by our research group
23. Problems handled in the course increased my interest in course issues (Category: exploration, indicator:)	23. Problems handled in the course increased the students interest in course issues.(Category: exploration, indicator:)
25. I felt motivated to explore content related questions (Categori: exploration, indicator:apply new ideas)	25. The participants felt...
Social Presence 14. Getting to know other course participants gave me a sense of belonging in the course (Category: emotional expression indicator:)	Social Presence 14. Getting to know other course participants gave the students a sense of belonging in the course (Category: emotional expression indicator:)
Teaching Presence 1. The instructor clearly	Teaching Presence 1. The instructor clearly communicated the important

communicated the important course topics
(Category: instructional management, indicator:)

course topics
(Category: instructional management, indicator:)

3. The instructor provided clear instructions on how to participate in course learning activities
(Category: building understanding, indicator:)

The connection between the CoI model and technology, is maybe most obvious in the element “social presence” where students communicate, collaborate, and presents themselves. Hence, they must use different kind of technologies – e.g. videoconferencing, facilities for document sharing, and so on.

The CoI framework is as mentioned earlier, widely spread and used. Searching with Google Scholar, results in more than 14 000 hints which indicates the use of the framework in different areas - mainly in education but also in e.g. public administration.

3 Research Approach

We have used the 34-item CoI instrument (Arbaugh et al, 2008) translated from English to Swedish by members of our research group in a previous project. In this project, the original instrument, has been completed with a teacher perspective. Furthermore, the student-teacher perspective has been moved to a participant-facilitator perspective in the context of crisis exercises to be compared with the context of courses in education. The revision of the 34-item CoI instrument has been carried out as follows:

The starting point and theoretical foundation has been the CoI-model. The first activity was the translation from English to Swedish. Completing the instrument with a teacher perspective and changing context and review of questions. **The first validation** where the different questions have been reformulated according to the different context where mainly done from the teacher perspective. Based on the instrument made by our research group, changes such as renaming the concept of course, item, discipline, teacher and so on has been made. Some of the questions have also been removed as “not relevant” for the exercise at hand. **After that we performed a second validation** with two employees from the county council where focus was put on “is the context correctly understood and are the questions intelligible”. Some of the questions the authors had marked with a question mark, were either removed or clarified. Some other questions were removed as “not relevant”. The order of the questions according to the “different presences” were discussed and instead of starting the instrument with “teacher presence” as in the original instrument, we decided to move the questions concerning social presence first in the instrument after a discussion about how the participants would react on questions with a focus on the moderator which was not the purpose. Some questions

were after the discussion added to the instrument though we realized the importance of tracking the participant's organizational affiliation, and questions about the degree of participation (meetings during 4 weeks were part of the exercise). A **third validation** with an expert of crisis exercises was then carried out. In this meeting we used the 2nd version of the instrument. The validation did not result in any major changes, just minor changes with focus on clarifying some ambiguities. We have identified two possible communities - the main communities where the participants have their organizational affiliation, and the overall community, with interaction meetings every Wednesday during the four weeks. We concluded the importance to formulate questions so we could compare the experience of belonging to the respective community. Tracking of participants according to organizational affiliation (municipals, civil protection, hydropower companies, the police, etc.) was found to be important so comparison and statistical processing was made possible. The focus of the **4th validation** was whether or not the revised instrument in line with the intention of the original 34-item CoI instrument. This validation will be done with an expert in the field. The last validation will be performed when the HUBBE 1 exercises have been carried out. This validation will be quantitative and qualitative.

Despite the waterfall-like description above, the validation of the instrument has been conducted in several iterations. We have in some validations, noticed a lack of knowledge about the context and sometimes about the intention of HUBBE 1, and therefore, filled this gap of knowledge through contacts with different persons involved in HUBBE 1. Parallel with this validation and further development of the instrument, a development of a visualization (and description) of different levels of communities has been done.

4. Results

The aim of this paper is to present an evaluation method that can be used to evaluate levels of communities in regional exercises. The results are here presented in two main parts, the evaluation method and a conceptual figure that describe the relations between different levels of communities.

4.1 Evaluation method

Based on our own method and general ideas how to evaluate learning situation we have derived the following steps for an evaluation method.

Contextual analysis

It will be of importance to make an analysis of the context. Important questions to discuss is for example; what kind of exercise is it, what kind of technique will be used, what kind of collaboration activities are included in the exercise, what are the goals of the exercise, what is the aim and who will participate.

Theoretical analysis of levels of communities

As describe above we considered it important to discuss if the aim of the exercises is to contribute to building community and if so on which levels.

Development of survey based on our adaption on the CoI-survey

The first two steps are important input to the development of the survey. There is an underlying aim of our research to build a general survey but at this point we still

believe that each exercise will create need for some adjustments. Some questions will be specific for the actual exercise.

Validation in iterations

Our validations have shown the importance of choice of concepts. This is not something specific for this type of evaluation but nevertheless we would like to point out the need for validation with experts. Our validations have been performed with different type of experts within crisis management, crisis exercises and CoI. Based upon how the national public authority in Sweden (MSB) plan and perform their exercises the evaluation is always a collaboration between the person that is responsible for the planning of the exercise and the one that is responsible for the evaluation.

Observations

Observations of 2-3 team based communities in order to discover unknown phenomena that might occur. This observations could be an input to the survey and forthcoming interviews.

Quantitative analysis based upon survey

The survey will be send out to both the participants and the facilitators after the exercise. The data will give us possibilities to evaluate a number of things. The county is mostly interested in whether or not the exercise contributes to raise the awareness the counties capabilities of handling a flooding situation. What are the strengths and weaknesses of the region? The suggested scenario will require a lot of collaboration to be able to handle the crisis as good as possible so our main focus will be on whether or not this exercise settings will lead to increased skills when it comes to collaboration. To be able to collaborate it is seen as important to build communities and in this settings on two different levels.

Text Analysis

Our validation of HUBBE1 will also include analysis of the results from the different tasks that the actors will upload into a central information systems. At this point it is not defined how the analysis will be performed.

Qualitative interviews

After the exercises we will perform a number of qualitative interviews that aims to get a deeper understanding of how the participants evaluate the exercises when it comes to collaboration and community building.

Analysis of results

Analysis of all data that have been collected. The analysis will include both statistical methods (not decided yet) and qualitative analysis (not decided yet).

Feedback of results to participants and exercise planners/designers

Earlier research within the field have emphasized the need for feedback and debriefing. The facilitators and managers of the exercise plan to perform a seminar where the results from the evaluation is presented and discussed. It is then a challenge to reach out with the findings from the evaluation to all that participated in the exercise.

4.2 Levels of communities

The insight of the importance of levels of communities was raised during the validation rounds'. During the discussion of how to adapt the CoI-survey to the crisis exercises context we realized that within this exercise context of HUBBE 1 there are

several important levels of communities. Within the original model of CoI the community is seen as all students are part of a course. Within the crisis context this could easily be transferred to all the participants in an exercise. Hence, early we started to discuss whether or not the exercise will lead to participants describing that they have been part of such a large community. The participants will perform the exercise within their own organizations and discuss based on the scenario and the trigger of the week. How will they respond to questions in the survey that are asking for reflections about other participants? Will they interpret that as participants in other organizations or in their own organization? To be able to discuss those different levels (within organization and outside) we made a conceptual figure that describes the levels.

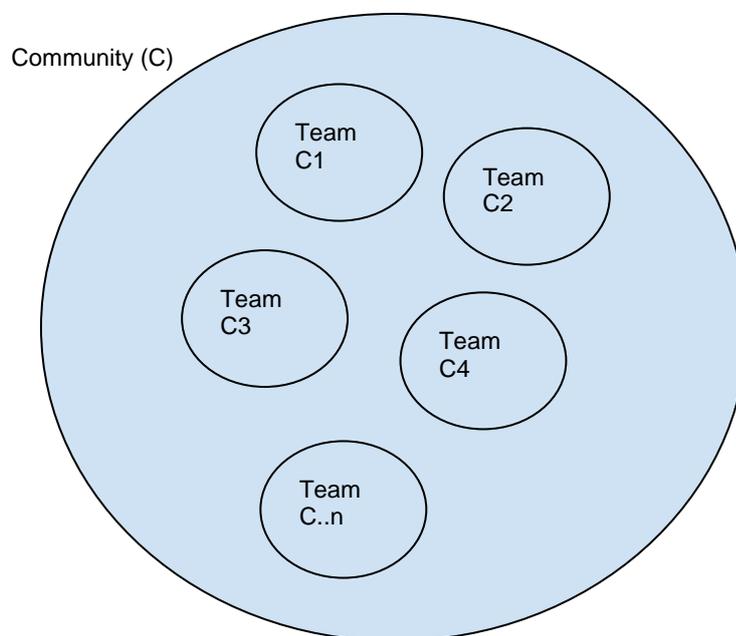


Fig. 2. Conceptual figure that visualize two levels of communities

So in Figure 2, the community that is described as the classroom community in the CoI-model is labeled Community (C). In the crisis community we propose that this should be understood as all the participants that are included in the actual exercise. This might sound as an easy thing to decide but experiences shows that there are actors stating that they would like to take part in arranged exercises but they seldom or never got any invitation. This is for example discussed by Kvarnlöf et. al (2014) and Asproth et. al (2013). Typically the actors invited are the ones that traditionally have been seen as central such as police, fire brigades, ambulance, municipalities, public authorities and the counties. Recent crises in Sweden such as the large forest fire and the increased level of refugees shows that a lot of “new” organizations take a

very active part of the actual work in a crisis. It is different type of volunteer both individual initiatives and emergent groups of volunteer but also organizations such as Missing People and different types of churches. Which actors that will be involved in a crisis exercise is also dependent on the scenario which make the delimitation of actors even more complex. Within HUBBE 1 the scenario is “Flooding” which makes actors such as municipalities central but if the scenario is a car accident the municipalities will not be included.

The second level of community has here been defined as Team based community. This level is not part of the original CoI-model so it is an extension connected to the adaption to the crisis exercises context. The Team is in this context participants from one actor and could also be described as creating community within the own organization. It could be argued that it seem as a paradox that is necessary to discuss the team based level if the main challenge with collaboration exercises is collaboration with others. And there might be that the coming results shows that there can be problematic to strengthen two levels of communities at the same time. But within the crisis context the team based level is considered important of multiple reasons. Even though it is common knowledge that ability to handle a larger crisis it is important to collaborate it is important to remember that a lot of work tasks will be performed by one actor not several. The collaboration and communication are necessarily for negotiation and decision about who is responsible and if there is a need for several actors to act together. One example of a collaboration activity could be to decide which message should be sent out to the public. When this is decided all organization will be responsible of sending this message in their channels this will be performed by the communicators in each organization. Another reason why it is important to build the team based community is that in many organization the team that will work with a crisis will be temporarily arranged. The combination of staff in the crisis. There is thereby a need for community building also within the organization. Each actor will have a facilitator. The facilitator have been involved in the planning phase and are responsible of facilitate the team in their work with the tasks. They are supposed to have a rather active role and in a real crisis situation they would be involved in the crisis management and or work so we have chosen to see them as responsible for the teaching presence. The facilitators will also evaluate their experience of the exercise.

We have used our figure during our expert validation sessions. This has led to two things. First of all a confirmation that both levels are of importance within the crisis exercise context and that it is important that it is clear for the participants which level that we purposed. Looking at this from a CoI-perspective make us think that there might be a need for add this perspective to the CoI-model.

4.3 Building communities at several levels – a way to reach collaboration

As already described the CoI-model describes one level of community (classroom) but it describe the importance of three elements to be able to build this community. Those three elements are; social presence, cognitive presence and teaching presence. So far our understanding is that those three elements are of equal importance for the team based community as for the community as a whole. On a logical level we do not

think this will be challenged but what we hoping for to be able to evaluate and measure with the quantitative validation is whether or not an exercise lead to building communities on both levels. Results in Söderback et. al (2016 forthcoming) indicates that if a learning situation is designed to build the team based level it might have drawbacks for the building on the community level. Earlier research within the crisis exercise field have shown we have little knowledge about whether or not collaboration exercises results in increased skills in collaboration (Andersson et. al 2014; Berlin & Carlström 2015) our results indicates that there is a need for research that also include different levels of communities.

5. Discussion

Collaboration skills are of great importance in crisis management and there is a need for exercises that lead to increased abilities to collaborate. To be able to evaluate whether or not an exercises lead to the intended goals evaluation is central. As mentioned earlier in this paper, there might be problematic to measure this if the participant have feelings of belonging to different communities. Human beings strive for security and will probably prioritize their “own” or closest community - in our case the team based communities. Stakeholders in the exercise setting, and the management of the exercise, is not used to think in terms of communities and levels of communities. It is obvious that this is a challenge in this context - both to thinking in community terms - designing communities in themselves and designing the interface between these levels, but also to create a balance between this levels. The role and presence of IT and IS, will play an important role in this interfaces especially in settings where the participants are distributed. Enabling participants in the team based communities belonging to the exercise community, demands suitable and transparent tools for communication and information exchange.

The choice of CoI as model and the survey instrument compared with traditional instruments, is based on both our own curiosity and the fact that the instrument includes variants of traditional questions usually asked in surveys in these kind of evaluations. Hence, we got the opportunity to both test a new model including an instrument with the focus on the three elements social presence, teaching presence and cognitive presence, and answer of more traditional questions. Much effort must be put on constructing questions about the belonging to different levels so we can measure potential conflicts and the importance of these.

We have no ideas or hypotheses about the importance of the different elements in the CoI model in the HUBBE 1 setting. The results from measuring this elements, will give input to future exercises according to the design of the exercises, choice of IT and IS, and probably, opinions about the role of the facilitator.

We will test our evaluation method in the HUBBE 1 exercise and then evaluate the outcome. The result will be a first version of a possible generic evaluation method. Finally we see many possibilities for future research, such as: Are there any problems with belonging to several sub- and supra communities - in this context: team based communities and exercise communities? Where are the main belongings and could there be conflicts with several belongings?

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