

THE DEVELOPMENT AND APPLICATION OF THE COMMUNITY ASSESSMENT TOOLKIT

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Session E-2

Abstract

This paper introduces the Community Assessment Tool (CAT) as a method for the assessment of Communities of Practice (CoPs) and provides an overview of its construction. It shows that the methodology is based on current theories with regard to CoPs and group dynamics. The method was also tested in practice through a pilot and a study among members of 7 communities of practice (N = 271) in order to do reliability tests and scale analysis. The method is unique in the sense that it provides feedback on the overall performance of CoPs on the individual, group and organizational level. The systematic nature of the CAT questionnaire enables comparisons between communities both within and between organizations. The CAT may be used for further scientific research into CoPs as well as for the analysis of community effectiveness for companies.

Keywords: Communities of practice, assessment method, knowledge management, performance, evaluation.

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Suggested track: E Communities of practice, knowledge networks and networking

1 Introduction

Communities of Practice (CoPs) are 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 & Snyder, 2002). Research on CoPs is dominated by case studies, which rely on observations and interviews as the primary methods of investigation (see Davenport & Prusak, 1998; Huysman & De Wit, 2002; Wenger et al, 2002, for examples). Case studies provide detailed insight into the nature and operations of the specific community under study. Although these cases provide a rich source for inspiration, it is often hard to

systematically compare the functioning of various communities. Another limitation forms the selection of informants for interviews. Often only a very limited set of core members is approached for an interview, since a larger number, let alone peripheral members, are hard to involve.

In order to get systematic insights in the characteristics and performance of CoPs and of the opinions of CoP-members, the Community Assessment Tool (CAT) was developed. This tool appears to be useful both for scientific research and for the practical assessment of CoPs. The CAT enables comparative research between CoPs both within and between organizations. One of the scientific objectives for its development is its role in the analysis of the relation between community processes, outcomes, and success conditions. The practical value of the CAT lies in the fact that the analysis provides an overview of the performance of CoPs within a relative short time frame and that it enables benchmarking.

2 Theoretical underpinnings

The term CoP is used for a diversity of organizational forms and practices but the central focus concerns the exchange and development of knowledge around a specific topic (Brown & Duguid, 1991, 2001; Davenport & Prusak, 1998; Lave & Wenger, 1991). In our research we use the following definition:

Communities of Practice are inter- or intra-organisational, often geographically dispersed, groups of people that have a long-term orientation on knowledge sharing or knowledge creating activities. The groups have their own identity and focus their knowledge processes around a certain practice, i.e. a professional discipline, skill or topic.

The idea of communities as platforms for sharing experiences and for developing innovative concepts has found an open ear and eye in modern organizations, partly because of the failure of computerized systems to support knowledge exchange and innovation. Another reason for the growth of CoPs is the fact that many organizations are project and market oriented. The traditional functional departments, where specialists of the same discipline were working side by side, have made room for product-oriented groups where knowledge sharing between colleagues of the same disciplines often not possible. The formation or facilitation of CoPs is therefore now a common practice in many organizations. Although CoPs have become relatively

popular ways of organizing knowledge transfer and development in organizations, little is yet known about their way of working and what would constitute useful success conditions.

The conceptual underpinnings of the CAT are derived from two distinct sources: CoP theory and group dynamics. The theoretical background of both sources will be described below.

2.1 Group dynamic theory.

Since CoPs are a special kind of groups, the study of CoPs should be guided by theories on group performance. The Dynamic Group Interaction (DGIIn-) model was used as the theoretical framework for group dynamics (Andriessen, 2002). In this model elements of several theories with regard to group performance are brought together. Three levels of behavior are taken into account, i.e. individual goal directed behavior, group processes and a macro-social perspective. The various notions are brought together in a heuristic model concerning group processes. They are related to traditional input-process-output schema's (see e.g. McGrath and Hollingshead, 1994) and are enriched with interpretative and structural notions and feedback cycles (see Andriessen, 2002 for an elaborate presentation of the model). The DGIIn-model was used to structure the items of the CAT in terms of *characteristics* (forms, goals and roles), *processes* (activities, communication, coordination, and ICT use), and *outcomes* (individual rewards, group vitality and organizational products). The nature of the characteristics and the quality of the processes determine the outcomes and therefore form the conditions for community success in terms of the three types of outcomes.

2.2 CoP theory.

The other source for the development of the tool consists of various theories concerning communities and CoPs, including contributions from the area of knowledge management,

Knowledge Management strategies: Personalisation and Codification.

Communities of Practice can be considered as an element in a knowledge management strategy of an organisation (McDermott, 1999a; Botkin, 1999). Hansen, Nohria, and Tierney (1999) propose that companies in their KM strategy can – and should - emphasise either codification of knowledge (through explicating and storing it in large databases) or emphasise a personalisation strategy by focusing on the

interpersonal exchange of knowledge. Possibilities for this can be provided through meetings, knowledge officers, master apprentice relationships and Communities of Practice. In the personalisation strategy the role of ICT applications is limited to that of communication tools (email, video etc.) and to 'yellow pages' systems, that contain information on where to find certain experts. Other authors assert that a balanced integration of interpersonal exchange of knowledge and codification in systems should be developed (e.g. De Bruijn, & De Neree tot Babberich, 2000).

The CAT measures both types of activities, i.e. the extent of interpersonal interaction and the support by ICT applications. In order to study the actual and desired role of ICT support for CoPs, the CAT assesses the availability, the frequency of use and the perceived usefulness of two types of ICT support, i.e. communication tools and information tools.

Purposes of communities of practice. Knowledge sharing in CoPs appears to serve various purposes, such as personal learning, finding experts or developing best practices for the company. With regard to learning activities a distinction is made between two types of learning:

- a. The adoption of existing knowledge from others, which implies learning to do existing things better: i.e. first order learning or single loop learning (Argyris and Schön, 1996), or learning for exploitation (Nooteboom, 2000).
- b. The development or discovery of new knowledge, which implies learning to do new things: i.e. second order learning, double loop learning or learning for exploration.

Besides the purpose of learning, other outcomes may be also important, such as developing contacts (networking) and social interaction. Many CoPs and members have various purposes, and it is relevant for the results of CoPs to have consensus of the dominant goals.

Parallel to the discussion about goals runs the discussion about the actual activities (in the service of these goals) and outcomes. According to McDermott (1999a) the 'first level' output of CoPs is basically of three types: personal knowledge, relationships and data (documents). These outcomes may lead to 'second level' outcomes for the company and for the members, such as innovation, better service to customers or career improvement. In discussions about CoPs, some parties require that the

outcomes of CoPs are as much as possible expressed in dollar value, so that the Return on Investment of CoPs can be established unequivocally. Although some success stories elaborate on the millions of dollars that have been earned by certain CoPs, it is generally considered that the main value of CoPs is to be found in faster and better ways of exchanging information and in improving the conditions for innovations. These issues are only to be 'measured' through the perception of the people involved. Therefore, the CAT contains questions concerning both type of learning and also several other purposes, in terms of purposes of the members, in terms of concrete activities and in terms of outcomes.

Types of communities. Related to the discussion concerning purposes of communities is the distinction between types of communities. In the literature one can find many types, such as the distinction between 'communities of practice' and 'communities of commitment' (Collison, 2000). Communities of practice have low contract value and formality. Bodkin (1999) distinguishes between 'communities of practice' and 'knowledge networks', which differ in the dimension of *visibility* and *task orientation*. McDermott (1999b) considers the dimension of '*degree of community identity*' as very central. He distinguishes three types of groups along this dimension: an *interest group* has a weak identity, while a *CoP* has a very strong one. According to his terminology, a *network* is placed in between the other two.

More or less covering these types, Andriessen et al. (2001, 2004) identified five types of communities which differed in the following characteristics: *purpose*, *formalisation* (of initiation and roles), *boundary* (open or closed), *composition* (only experts or experts plus newcomers), *virtualness* (face to face interaction or mediated) and *size*. Five 'configurations' of these characteristics, i.e. five types of communities of practice could in actual practice be found:

- The '*Daily Practice community*', consisting of both experienced employees and newcomers, often working in different project teams, but in near physical proximity, coming together regularly and face to face to discuss daily experiences. These groups resemble to some extent the original craft based communities of practice described by e.g. Lave and Wenger (1991).
- The '*Formal Expert Community*', consisting of a limited number of geographically and organisationally dispersed experts, rather formally instituted as group, with the purpose of exchanging or developing strategic knowledge.

- The '*Informal Network Community*', an informal, freely accessible, group of people, formed to discuss a common issue of interest. Generally, members are geographically and organisationally dispersed and communication is often exclusively through the ICT media.
- The '*Problem Solving Community*' consisting of all (geographically and organisationally dispersed) company employees of the same discipline, such as all 500 Oracle employees on ERP systems. Through the ICT network they exchange questions and answers concerning the solution of certain practical problems.
- The '*Latent Network Community*', a group of persons, often working in different organisations, who know each other well, but interact mainly in other settings, such as governmental committees or conference organisations. The group as such rarely comes together. Their mutual knowledge is high and their interaction individually may also be high but their interaction and identity as a group is rather low.

The characteristics mentioned are measured in the CAT and the data will allow for an empirically based identification of types of communities.

Formalisation and support by management. Communities are often considered to be the opposite of traditional organisational structures. They form the expression of the individual's personal fascination of knowledge sharing with like-minded peers and should therefore not be formalised and institutionalised. To be innovative and creative, communities need room to explore a field; members should be able to spontaneously 'bump' into enthusiastic peers and brainstorm informally with a long-term view in mind. However, when CoPs are viewed as knowledge sharing and innovation 'tools', organisations can hardly avoid wanting to control these tools, e.g. by directing the selection of group members, the roles they are going to fulfil, and, most important, the deliverables they have to provide. Wenger and Snyder (2000) identify the paradox that although communities are self-organising and resistant to supervision and interference, they sometimes need specific managerial efforts to develop and integrate them into the organisation.

The question then is: 'to which extent can and should company management be managing CoPs?' In our view the answer to this question is different for different types of CoPs. In general we expect that interest and facilitation by management is required

for continuity, but that direct supervision and a very strong focus on products may stifle free exchange and creativity.

In the CAT several questions gauge the attention by top management, the facilitation given, the level of formalisation (e.g. of roles) and the focus on products.

Knowledge processes. According to the model developed by Nonaka and Takeuchi (1995) the exchange of information and the creation and learning of knowledge proceeds through four knowledge processes, based on well-known distinction between explicit knowledge and tacit knowledge:

- Socialisation: sharing tacit knowledge among people by working together
- Externalisation: making tacit knowledge explicit, by translating experiences into systematic explicit forms
- Combination: combining explicit knowledge from diverse sources
- Internalisation: turning explicit knowledge into tacit knowledge (e.g. in practical teaching).

The four knowledge processes may all be found in communities, but conditions and results may relate differently when certain processes dominate. The CAT contains items to measure these activities, so CoPs can be characterised by the extent to which one or more of these processes dominate.

Social identity, cohesion, and the willingness to share. Communities can provide the context in which participants develop their identities and the social context that helps those identities to be shared. Members of such groups collectively develop an outlook on work and the world 'that may reflect the organization as a whole, but will most intensively reflect the local community' (Brown and Duguid, 2001). But how important is the role of identity, cohesion, and trust. Or should they have strong 'cognitive distance', i.e. differences in expertise and background to foster creativity (Bogenrieder and Nootboom, 2002)? Does effective knowledge sharing require a small, cohesive group, where members have developed a common identity, and know and trust each other, or can effective knowledge sharing and creation also take place in large loosely coupled groups? Certain CoPs seem to be able to be successful, even if they are large, when members do not interact very intensively and when the membership changes continuously. This happens where large groups have common practice, such as in scientific associations. 'Where practice is common, communication

can be global' (Brown and Duguid, 2001). The possibility to establish such communication depends on:

1. The type of organisational culture: in a company like Shell all two thousand drillers, distributed globally feel a strong sense of identity as Shell driller and are therefore motivated to help colleagues at the other side of the world with finding a solution to a problem.
2. The type and purpose of the community: general problem solving communities require less cohesion and mutual trust than small formal expert communities.

We expect that mutual trust and a common identity are very crucial for the willingness to share knowledge and develop innovative ideas, perhaps not of the superficial type but particularly for sensitive knowledge.

Where identity and trust refer to the social-emotional integration of groups, cognitive distance refers to the cognitive integration. Cognitive distance is the extent to which people differ in knowledge and common understanding (due to different backgrounds, cultures, disciplines etc. and lack of communication and developing shared understanding). For learning to take place cognitive distance should not be too small (then there is nothing to learn) and not be too great (no common frame of mind and understanding). For first order learning cognitive distance should be relatively small, for second order learning cognitive distance should be relatively large (Bogenrieder & Nooteboom, 2002).

In order to study these phenomena, the CAT includes measurement of, on the one hand common identity, trust and willingness to share and on the other hand of cognitive distance.

3 The development of the tool

The CAT consist of three parts:

1. *CAT – Members*: An on line questionnaire for members of Communities of Practice, mainly consisting of closed items.
2. *CAT – Coordinator*: An open questionnaire, to be used in a (telephone based or face to face) interview with CoP coordinators.

Through these two parts, information is collected on organization, functioning and performance of the community and its context.

3. *CAT – Context*: A checklist of open questions to be used with a high level key informant of the organisation. This checklist provides information concerning the general knowledge management strategy of the organisation, and the relevant available structures, processes, communities and technical tools.

The characteristics, processes and outcomes, and their specific forms as based on CoP theory, were ‘operationalised’ in the two questionnaires through various types of items. A first pilot version of the CAT was administered in an IT services company. A large number of descriptive items (e.g. on size, type of meetings, roles etc), was presented to both members and coordinators. The analysis of the pilot data resulted in the following improvements:

- Many descriptive items were brought together into categories
- It was decided to administer the three different parts as described above with a combination of a questionnaire for members and interviews for coordinators. The advantage of this modular approach is that community members have to answer fewer questions on context items with regard to the background of the community. It occurred that many members are not always aware of the history of their CoP so coordinators proved to be better candidates for providing background to the community.

After the pilot, an alpha-version was applied in a study in a large company. The core of the Community Assessment Tool is an on-line questionnaire. The on-line nature of the questionnaire enables the participation of a large sample of members.

4 Results of data analysis

In our study, participants of 7 communities of this large organization filled out the on-line questionnaire. In this contribution we will present the results of this study, which were used to fine-tune the tool.

4.1 Sample and procedure

Data were collected through a comparative analysis among 7 Communities of Practice within a large software development firm. The communities were all relatively large with members across Europe. All communities were in a specific domain with regard to

software development and were lead by part-time coordinators. For each of the communities an interview was held with the coordinator. After, each interview, the URL link to the questionnaire was sent to the 7 coordinators with the request to distribute the link to the members of their community. In this case, members were targeted as members of a specific community. From the pilot we had learned that people are often member of more than one community so it is vital to ensure that they answer the questions with regard to the community under study. Another advantage of this procedure is that the organization does not have to share internal distribution lists with the researchers.

In total, 271 questionnaires were returned - a 14% response rate. Among the respondents we find both peripheral members and active core members, since about half of the respondent report to spend only a few hours per month, and the other half report to 5 to 8 hours or even more hours per month.

Table 1 presents the response rates for each of the communities in our study.

Table 1 Communities of Practice and their response rates

COP	Number of members	Returns (%)
1	100	38 (38%)
2	180	17 (9%)
3	500	49 (10%)
4	395	32 (8%)
5	390	43 (11%)
6	250	85 (34%)
7	120	7 (6%)
Total	1935	271 (14%)

4.2 Measures

The dataset with 271 respondents enabled us to do scale analysis and reliability checks. The overall procedure of data collection results in a set of data that can be turned into a profile of each community assessed. The basic data are converted into composite indicators and into scale scores. Table 1 shows an overview of the specific context variables that are part of the interview with the coordinator.

Table 2 CAT context conditions (N = 7)

Context (mainly coordinator data)	Nr of items
- Age of the community:	1
- Average length of membership of respondents:	1
- Size:	1
- Stability: high – medium – low	1
- Core/peripheral members:	1
- Composition: Mixed or Experts-only	1
- Existence of subgroups: yes/no	1
- Inter/intra organisational/competitors: score = 1-3	1
- Virtuality Index (0-6)	3
- Formality: Total index: 0-8	8
- Organisational support: Total Index: 0-7	5
- Availability of ICT: total of item: 0-11	11

As the descriptive data are derived from the interview with the coordinators (with n=7) no scale analysis was done. With regard to the data of the on-line questionnaire box 1 shows a number of sample items.

Box 1 Sample items from on-line questionnaire for COP members

How important are the following *goals* for you personally as a member of the community (5-point scale):
 Hearing about new knowledge
 To advance in my career
 Etc.

On average, how many *hours* do you spend on the community per month?

How useful do you think the following *means of communication* are (or would be) particularly for your community's work? (5-point scale)
 E-mail
 Video connection
 Etc.

To what extent do you think the *members* of the community.....
 Have a good common understanding (5 point scale)
 Trust each other
 Etc.

To what extent do you think *the community* has.....
 Contributed to cost savings for the organisation (5 point scale)
 Etc.

Table 3 shows the scale statistics of the scales developed to measure the input variables. All items were measured on a 5-point scale. In addition to the results from our case study described above we received feedback from our colleagues from Helsinki University of Technology who used the CAT for their research on small communities (see Ruuska & Vartiainen, 2003). The second column of alpha's in the following tables is based on their data, i.e. on questionnaire results of 150 members of 11 communities in 5 companies.

Table 3 CAT on-line questions for member with regard to input variables
(N = 271/N=150)

Input	Nr. Of items	Alpha
<i>Perceived Goals</i>		
- Knowledge sharing	6	.70 / .73
- Organisational benefits	3	.59 / .70
- Personal Benefits	4	.61 / .58
<i>Attitudes</i>		
- (Perceived) Motivation	1	-
- Willingness to share	4	.60 / .69

The Cronbach's alpha's for most of the scales seem acceptable given the fact that these items do refer to quite separate goals. The Cronbach's alpha's of the scales with regard to processes are higher (see table 4).

Table 4 CAT on-line questions for member with regard to processes variables
(N = 271/N=150)

Processes	Nr. of items	Alpha
Communication frequency	4	
Participating	2	.68 / .72
Coordinating	8	.86 / .80
Knowledge exchanging	6	.75 / .71
Cooperation	6	.83 / .77
ICT usefulness		
- Total	14	.85 / .81
- Traditional	3	.78 / .60
- Normal electronic	6	.79 / .73
- Advanced	4	.74 / .58

Table 5 shows the scale statistics of the scales developed to measure the outcome variables. All items were measured on a 5-point scale. The Cronbach's alpha's of the multiple item scales were over Nunally's (1967), often mentioned, .70 criterion.

Table 5 CAT on-line questions for member with regard to outcomes (N = 271/N=150)

Outcomes	Nr. of items	Alpha
General Attitude to CoP	3	.62 / .74
Individual Learning	5	.91 / .91
Individual Benefits	5	.85 / .87
Group vitality	4	.89 / .87
Organisational Benefits	6	.91 / .89

The overall scale analysis helped to improve the formulation of some items and lead to a reduction of the number of items in final version of the CAT.

5 Final version, next stage

On the basis of the analysis of the data the CAT itself and the procedure for applying it in organisations has now been finalised.

As far as the questionnaires are concerned, the results of the above-described studies, has resulted in discarding certain items and reformulating a few others. Quite a few items were also added to the checklist for the coordinator.

The procedure can now be described as follows:

Step 1: Key informant interview. In an extensive interview with a key informant of the organisation, the general structure of the company, the knowledge management activities and the role of knowledge communities are discussed. The communities are identified that will be studied.

Step 2 Interview with CoP-coordinators. These interviews follow an open questionnaire with questions concerning descriptive issues as mentioned in table 2. A procedure for approaching the community members is discussed along the lines presented above, i.e. the URL link to the questionnaire is sent to the coordinators, who distribute this to the members of their community.

Step 3. Administration of the CAT survey. The internet link allows the members to complete the CAT survey. The data are automatically stored and available for the researchers.

Step 4. Reporting. Two types of reports can be constructed, a short version which is also available for the participating members, and a longer version for coordinators and management. Preferably the results are presented to the organisation and further discussed.

6 Discussion

We have presented the construction of a method for the assessment of Communities of Practice. The methodology is theoretically based on current theories with regard to CoPs and group dynamics. The method is unique in the sense that it provides feedback on the performance of CoPs on the individual, group and organizational level. An important part of the methodology is an on-line questionnaire addressed to all members (both core and periphery) of the community but the overall method is modular in nature. Before the questionnaire is administered two interviews are done with regard to context conditions on both the company and community level. This has the benefit of parsimony on the level of the questionnaire as well as the advantage of addressing people as members of a specific community. As coordinators are responsible for the distribution of the questionnaire, companies do not need to share distribution lists and members remain anonymous but answer the questions specifically for the community under study. The tool provides a useful method for analysing communities and forms a welcome addition to current qualitative methods for the assessment of the effectiveness of communities. The systematic nature of the questionnaire enables comparisons between communities both within and between organizations. The CAT may be used for further scientific research into CoPs as well as for the analysis of community effectiveness for companies. We propose the following agenda for further research on CoPs through the use of the CAT methodology:

1. What Cops can be distinguished? Such questions may be answered through an analysis of the descriptive items for a sample of CoPs. We therefore strive for obtaining a database with results from many different CoPs. Presently we assess other CoPs, while colleagues in Finland and Italy also collect these data.
2. What are major success conditions for CoPs? What is the relation between input and process factors on the one hand, on knowledge sharing activities and output factors on the other?

3. What is the difference in functioning and success conditions, between various types of CoPs?
4. What are the determinants of 'willingness to share'?
5. Which differences do exist between certain types of members? For instance, between core members and peripheral members or between new and 'old' members.

Besides the benefits of the CAT methodology, a serious limitation of the approach is the fact that the method can only be applied to visible communities with identifiable members in organizations. Ad hoc communities and other spontaneous groups of people sharing a domain cannot be studied through the CAT. Given this limitation, the wealth of information provided by the CAT is quite substantial. Moreover, the CAT enables the collection of data of many different kinds of communities. In order to stress the research agenda, a dataset for benchmarking is currently developed and will lead to more insight in success conditions for CoPs within different contexts.

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