

# **Knowledge Management in a Virtual Organization: Are embedded online communities of practice more successful than exclusively virtual ones?**

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## 1. Introduction: Online and Offline Interaction

Many argue that the Internet has the potential to make employees more productive because it provides opportunities for the sharing of knowledge (Cothrel and Williams 1999; Wenger and Snyder 2000). The realization of the potential depends on the combination of access to *information* and opportunities for the *communication* between humans. Both aspects play a role in processes of knowledge sharing on the Internet. So-called Online Communities of Practice (see chapter 2 for a definition) are an important and prominent example of how the Internet can be used for the purpose of knowledge sharing between individuals that otherwise hardly could profit from each other as a source of information. Empirical studies have found evidence for the hypothesis that the sharing of knowledge in groups on the Internet provides benefits to their users (Matzat 2004b).

At the same time during the last years it has become clear that there is no "technical automatism" in reaching this potential. There are many examples of online groups that did not fulfill the hopes that were attached to them (see Gal 2004; Stoddart 2001). This report analyzes what (some of) the reasons are that online communities of practice did not (yet) reach their full potential. It points to an important condition that might help to reduce these problems, namely the so-called embeddedness of online interaction in social networks that exist outside of the online group. Early research on the internet and computer mediated communication focused on what was specific to interaction in *online* environments and what separates it from interaction in the offline world (Jones 1997; Turkle 1997; Kiesler, Siegel, and McGuire 1984). In the meantime it became clear that that online and offline interaction often are interrelated (Wellman et al. 2001; Wellman and Gulia 1999). However, it remains unclear what the implications are for the outcomes of knowledge management efforts. The report contributes to analyzing whether the embeddedness of online interaction in social networks facilitates the overcoming of problems of knowledge management in internet groups. It does so in three ways. First, it shows that the embeddedness of online interaction in social networks is a prevalent phenomenon that can be found in many different ways on the internet. Second, it provides a number of theories that specify mechanisms of how the social embeddedness affects online interaction. Thereby the theories show what kind of effects the social embeddedness could have on the outcomes of knowledge sharing in online communities of practice. Preliminary empirical evidence for the theories, if existent, is presented. Third, and most important, this study analyzes a number of online communities of practice and compares systematically how some problems of knowledge sharing are related to their degree of social embeddedness. Thereby the report contributes to answering the question of whether "embedded online communities of practice are more successful than exclusively virtual ones".

The report is structured as follows. First, we point to a number of problems of interaction in online groups that regularly emerge during processes of online knowledge exchange. These are the problem of free riding, the problem of trust between members of online communities of practice, and the problem of group stability. We present some examples of empirical studies that suggest that these problems appear with some regularity (Chapter 2). In Chapter 3 we present four prominent social psychological theories of computer-mediated communication that often are used in empirical research. We argue that while these theories have provided lots of insights, they also have some deficiencies. They are only of some limited value for field studies that look for social conditions that affect the three problems of online group interaction. Therefore, in Chapter 4, we emphasize the interrelationship between online interaction and the structure of social contacts that exist outside of the online community. In Chapter 4.1 we point to studies that exemplify the prevalence of the

interrelationship. In Chapter 4.2 theories are presented that specify what the effects of a high degree of social embeddedness of online group interaction might be on the outcomes of knowledge sharing activities. The (limited) empirical evidence for some of the theories is presented as well. The implications of the theories for the design of online communities of practice are highlighted. The theories and findings that are presented in Chapter 4 lead to the expectation that under a high degree of embeddedness online communities of practice face less free-rider problems, less problems of trust, as well as lower degree of fluctuation of its members. Subsequently, in the empirical part of this study the three hypotheses are tested. Chapter 5 gives background information about a Dutch virtual organization that manages a number of online communities for teachers of different disciplines. These online communities were built up with the intention to stimulate the exchange of knowledge between their members. Moreover, details of the measurements of the degree of social embeddedness, the intensity of the faced problems of interaction and other concepts are given. Chapter 6 first gives more details about the online groups that were analyzed. Finally, we test the hypothesis that embedded online communities of practice are more successful than exclusively virtual ones by comparing systematically differences in the intensity of the problems of group interaction in the selected online communities of practice (chapter 6.2). The report ends with summarizing the main findings and drawing conclusions for further theoretical-empirical research on the problems and outcomes of online knowledge exchange in groups on the internet. Implications for the design and management of OLCs are discussed.

## **2. Problems of Group Interaction in Online Environments: Definitions and empirical Findings about the Outcomes of Online Knowledge Exchange**

In the literature we can find different definitions of what constitutes a so-called online community (OLC). Some authors strongly emphasize a sufficiently intensive emotional involvement of its users as a necessary criterion for an online community. For example, Rheingold (1993) defines an online community as a group of people who discuss a specified topic by means of computer mediated communication tools for a sufficiently long time with a sufficient emotional involvement and who form interpersonal relationships. Another group of authors, such as Hagel & Armstrong (1997), use the term much broader. They define as an online community any computer-mediated space that allows communication between its users or members and that is characterized by some member-generated content. So in this type of definition a high emotional involvement of its members is not a necessary pre-condition for a group of internet users to be an online community. Rather, the relevant element of this sort of definitions is that the users have a *common interest*, and not common emotional involvement. Here the term online community is used in a similar way. *It describes a group of internet users who communicate with each other, as a group, through some computer mediated communication tools. Interaction is centered on at least one topic that reflects the common interest(s) of the users.* In most cases, the group is linked to a website that gives access to a number of common communication tools. This definition describes an online community as one that is based on interests alone, but not on emotions or other characteristics. It does not capture the aspects that usually are regarded as typical for traditional communities in the general sociological sense (see Hillery 1964). The drawback has to be accepted to make sure that the terminology is consistent with the way it is used in the research literature. Many researchers realized that the term online community is not used to include only sociological communities, but as a placeholder to describe all kinds of group interactions on the Internet (see e.g., Kling and Courtright 2003; Matzat 2004c). Therefore, if an online community has additional characteristics, such as feelings of group attachment, emotional bonds to other members, or common values and norms, it will be called a '*social online community*'. Otherwise the term 'online community' is used interchangeable with the term 'online group'.



"Communities of practice" are defined as groups of professionals with similar task responsibilities who decided to share their knowledge and experience (Wick 2000). They often emerge around practical problems that their members experienced. Some authors stress that these groups often are not 'designed', but evolve in an unplanned way (Wenger and Snyder 2000). Note that communities of practice not necessarily contain an online component. In contrast, *online communities of practice* make use of computer mediated communication tools (Johnson 2001). According to the terminology used here they form a subgroup of OLCs that have professionals as their members who experience similar problems in their profession. In the empirical part of this study we make use of OLCs of practice for teachers (see chapters 5 and 6). Finally, a *virtual organization* is defined as an organization that is locally distributed, whose members have a common long-term interest and communicate and coordinate their work through computer mediated communication tools (Ahuja and Carley 1999). This study compares 33 online communities of practice for teachers that are supported and maintained by one large Dutch virtual organization.

Research on the effects of knowledge sharing in OLCs of practice either studies the use of OLCs of practice among professionals, such as employees of firms or teachers, and among researchers. Empirical case studies suggest that in large companies *employees* not seldom make use of OLCs of practice. The size of the used OLCs of practice can vary between a few dozen and more than 1000 members (see e.g., Andriessen, Huis in 't Veld, and Poot 2000; Ardichvili, Page, and Wentling 2003). Large scale survey research shows that companies with a high number of employees more often use intranet technologies than companies with a low number of employees. Intranet technologies often are regarded as a pre-condition for the use of OLCs of practice in companies. Empirical research on the effects of OLCs of practice very often consists of case studies of single OLCs. The studies indicate that OLCs of practice do have the capacity to stimulate the exchange of knowledge between employees (see e.g., Constant, Sproull, and Kiesler 1996). Knowledge management researchers stress that by using OLCs of practice employees can get access to the knowledge of known and unknown colleagues. This saves time and costs (Ardichvili, Page, and Wentling 2003). At the same time, researchers stress that a high number of OLCs of practice did not fulfill the expectations that were attached to them because members often are not sufficiently motivated to share their knowledge actively with others and because of a fluctuating membership (see Johnson 2001; Stoddart 2001; Ardichvili, Page, and Wentling 2003; Gal 2004). Many other OLCs of practice are built up for the professional development of *teachers*. Here the evidence for beneficial effects of the use of OLCs of practice is weaker. Research shows that some users *claim* to have benefited from their use (e.g. Yang and Liu 2004). There is no data that allows assessing to what extent the claims are based on real learning or emotional advantages and to what extent they are just self-justifications of the members' time investments in the used OLC. In general, researchers often come to the conclusion that the studied OLCs for teachers did not yet fully meet their ambitious aspirations (see e.g., Kling and Courtright 2003; Yang and Liu 2004; Schlager and Fusco 2003; Barab, MaKinster, and Scheckler 2003).

Knowledge sharing in OLCs of practice among *academic researchers* usually takes place in academic emailing lists and less often in academic newsgroups.<sup>1</sup> Researchers can use OLCs of practice for the attainment of information or for the making of new and the maintenance of existing contacts (Turoff and Hiltz 1998). Here the evidence for (limited) benefits of knowledge sharing is somewhat "harder" than the evidence for the effects of knowledge sharing among company employees or among teachers. Nevertheless many of the high hopes

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<sup>1</sup> I leave out new forms of knowledge sharing like wiki's and blogs. At the moment, a minority of researchers and journalists use them and it is unclear whether they will spread to a larger audience.

have not come true. For example, it was expected that researchers often would use OLCs of practice for the discussion and further development of intellectual problems in scientific fields (see e.g., Hiltz and Turoff 1978). Moreover, some predicted that knowledge sharing in OLCs of practice among researchers would reduce social inequalities in the access to information. That is, those researchers with less access to informal communication channels should profit more of the opportunities for making new contacts than well-integrated researchers with many contacts. While the discussion and further development of intellectual problems of research fields occasionally may take place, many case studies suggest that OLCs of practice are not very suitable for such a purpose (e.g., Lewenstein 1995; Harasim and Winkelmann 1990; Conner 1992; McCarty 1992). Large scale field research has shown the following. In 1999 23.3% of a random sample of English and Dutch university researchers in 8 disciplines in the humanities, the natural and the social sciences used OLCs of practice. Emailing lists were used by many more researchers than newsgroups. In the social sciences and humanities the use of such OLCs of practice was much more common than in the natural sciences. Moreover, even in academic OLCs not only university researchers could be found. Many users were business professionals such as management consultants, IT trainers, project managers, team leaders within companies, engineers, and others. There is evidence that the making of contacts via academic OLCs is an often obtained benefit. However, inequalities in the access to informal communication channels are not reduced. Rather, well-integrated and less integrated researchers profit both of the opportunities to make new contacts. Also, there is evidence that some groups of researchers get information benefits through the online exchange of information (see Matzat 2004b for the details). However, not all OLCs are equally likely to provide opportunities for the attainment of benefits. OLCs with a high communication volume tend to provide more benefits to their users than OLCs with a low communication volume (ibid.). Not all OLCs can solve the problem to reach a high enough communication volume. In a sample of 49 academic international emailing lists<sup>2</sup> the users of 36 groups (73.5%) evaluated the volume of communication as "low". The number of professionally relevant emails was evaluated as "low" in 33 groups (67.3%). These assessments were made much more often in smaller groups than in larger ones. If information is shared then the quality of the provided information often is assessed as positive. In 42 (85.7% of the groups) the quality of the provided information was evaluated as better than "all right", which is the mean point of the scale (Matzat 2001).

One can summarize the findings by saying that knowledge sharing in OLCs of practice among academic researchers as well as among professionals in many times is successful for the users, but often it is not. A substantial number of OLCs does not fulfill the expectations of its users. Consequently it is meaningful to ask which typical barriers for a successful usage of OLCs do exist. We would like to mention three problems of interaction in OLCs of practice. The three problems often are mentioned in the literature and, more important, there are good theoretical reasons to expect that the interaction problems appear with some *regularity*. The problems are the problem of free riding, problems of trust between members, and the problem of membership fluctuation.

A useful discussion consisting of an adequate numbers of discussion contributions of the members is, to a large extent, a collective good for the whole OLC. That is, every member profits of such a discussion independently of the intensity of his/her contributions. A useful contribution to a discussion (or to other collective goods like a common data base) is costly. It takes time and effort (and sometimes also financial costs related to the online time). While the

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<sup>2</sup> The 49 lists are a random sample out of a set of emailing lists that was used by a random sample of English and Dutch university researchers in 8 disciplines within the humanities, the social and the natural sciences (Matzat 2001).

contribution costs are restricted to the active members, the discussion benefits are distributed among all active and passive members. If there are no selective incentives for individuals to become active in OLCs of practice then a rational individual will decide not to take the costs, but to profit of the contributions of other members nevertheless. *Free riding* is the tendency of members to withhold information and to let others take the costs of contributing to the discussion (or to other collective goods). Free riding is one problem of interaction that is often mentioned in the literature (see Jones and Rafaeli 2000; McLure Wasko and Faraj 2000; Kreijns, Kirschner, and Jochems 2003; Kollock 1999a; Thorn and Connolly 1987; Rafaeli and LaRose 1993; Constant, Kiesler, and Sproull 1994; Cress 2004). If the tendency to free ride within OLCs is too high then there is a too low volume of communication and the members do not gain enough benefits.

The second type of interaction problems, the *problem of trust*, can appear during bilateral exchange of information between members of OLCs. If one member, ego, provides information to another member, alter, then he can have the hope that in the future their roles may change. Ego may have a question and alter may be willing to provide information to ego because he wants to reward ego for his past help and to make sure that they will stay engaged in bilaterally advantageous exchange of knowledge in the future. So the mutual exchange of information is advantageous for both members. However, the provision of information by ego is risky for himself. It may happen that alter does not reciprocate in the future. Things may even turn out worse. Alter may use the information that he received from ego in ways that are disadvantageous for ego. For example, two professionals may compete for a new job or for the acquisition of a new project. If the one gives important information to the other then he may have a competitive advantage. The situation is similar for two researchers who actively are involved in research within the same field and who try to answer similar questions. Teachers take some risk when they put examples of their teaching online. They are used to keep their teaching activities separated from the outside world and do not know to whom their materials will travel over the Internet (Barab, MaKinster, and Scheckler 2003). If problems of trust between members are too severe then members will hesitate to share their information and the OLC will fail. Problems of trust are often mentioned as problems within OLCs of practice (see Ardichvili, Page, and Wentling 2003; Ridings, Gefen, and Arinze 2002; Preece 2001; Jarvenpaa and Leidner 2000; Büssing 2000; Osterloh 2004; Barab, MaKinster, and Scheckler 2003; Kling and Courtright 2003)

Finally, in the literature it is often assumed that because of a low degree of commitment and social control on the internet many OLCs of practice would suffer from a *lack of membership stability* (Johnson 2001; Götzenbrucker and Hummel 2001; Butler 2002; Jones and Rafaeli 2000; Komito 1998; Etzioni 1999). Insufficient membership stability can make the development of trust more difficult and it may reduce the motivation to participate actively in knowledge sharing activities.

### **3. Social Psychological Theories of Computer-Mediated Communication**

In this chapter we briefly sketch the three most prominent social psychological theories of computer-mediated communication. This is not intended as a comprehensive overview of the insights of the theories and their empirical evidence. Rather, the theories are introduced to discuss to what extent they point to solutions to the typical problems of interaction in OLCs of practice. We make a distinction between the reduced social cues approach (Kiesler, Siegel, and McGuire 1984), the so-called SIDE model (Postmes, Spears, and Lea 1998), and the social information processing approach (Walther 1996). The theories point to certain "qualities" of computer-mediated communication that would characterize them in general.

Most of all, they have been tested in experimental laboratory research, although recently their ideas have guided field research as well. The starting point for the theories is a comparison of a computer mediated communication situation with the situation of face-to-face communication.

The so-called *cues-filtered-out approach* (Kiesler, Siegel, and McGuire 1984) is based on findings of a number of controlled experiments. These experiments compare interpersonal interaction via synchronous, text-based computer-mediated communication with face-to-face-communication. The authors conclude that this form of computer mediated communication filters out physical and social cues about the sender. This has a number of effects. Computer-mediated communication (cmc) tends to foster uninhibited and anti-normative behavior. Moreover, the discussion via cmc tends to be less characterized by status differences in the discussion participation. That is, the tendency that high status individuals communicate much more than low status individuals is weaker in computer-mediated communication than in face-to-face communication (Dubrovsky, Kiesler, and Sethna 1991). Some experimental findings confirm these claims. In a similar way the media-richness theory argues that computer-mediated communication would be a "leaner" communication medium than face-to-face communication because it offers less social cues. Computer mediated communication would be preferable to face-to-face communication only when the information exchange is socially insensitive and unambiguous (Daft and Lengel 1986).

The relevance of the ideas of the approach for field research, however, is under discussion. Many field researchers took the ideas of the cues-filtered-out approach as a starting point to show that in groups on the internet "socially rich" communication is possible, status considerations take place, and that in online groups intensive relations between members can emerge (see e.g., Baym 1993; Utz 2000; Hert 1997; Korenman and Wyatt 1996). Other experimental evidence has shown that status effects are of considerable relevance in computer-mediated discussions if the status of the participants is *salient* (Weisband, Schneider, and Connolly 1995). Evidence of field research also shows that *established* status differences among discussion participants are paralleled by different participation frequencies in electronic discussions (Saunders, Robey, and Vaverek 1994). Moreover, critics argue that the used experimental settings for the tests of the cues-filtered-out approach control exactly those conditions that vary between electronic groups of the Internet and that have a strong impact on how people interact via computer-mediated communication (Stegbauer 1995; Walther 1996; Walther 1996). Under the condition of a mixture of offline communication and online communication, which is not seldom found in OLCs on the internet (see Chapter 4), we can expect that the status of some members becomes more salient and that established status differences are more likely to be transferred to the online environment than in purely virtual OLCs.

The *SIDE model* (social identity model of de-individuation effects) analyses whether and under which conditions group norms influence participation in computer-mediated communication discussions. Contrary to the cues-filtered-out approach, Postmes, Spears & Lea (1998) argue that in situations characterized by a salient group identity, group norms have a strong impact on the members' computer-mediated communication behavior. The assumed causal mechanism is that computer-mediated communication fosters a de-personalization of the individual's identity and strong identification with the group as long as the member's individual identity is not referred to. Empirical evidence for these claims has been found in experimental settings. The authors admit that these experimental settings do not properly reflect the conditions that are usually found in electronic groups of the Internet. Non-experimental research is needed (Postmes, Spears, and Lea 1998). Since the free rider

problem and problems of trust might be overcome by norms that prescribe active participation in knowledge sharing activities the insights of the SIDE-model seem to be relevant. However, two comments are of interest here. First, the SIDE-model stresses the effects of existing norms. It holds their existence constant in the experimental settings to analyze how their effects vary under different conditions. The norms are induced by the experimenter. The SIDE-model is not very specific about which field conditions would facilitate the development of a norm in OLCs. The only specification of the model about the emergence of a norm is related to the duration of the group interaction. It is argued that a long duration of group interaction leads to consistencies in interaction from which the emergence of norms is inferred by the members (Postmes, Spears, and Lea 2000). The existing field research, however, suggests that cooperative norms do not evolve always in OLCs of practice, even if they exist for some longer time (see the references mentioned in Chapter 2). Second, the kind of norms that the SIDE-model analyzes is not the kind of norms that can solve free rider problems and problems of trust. For example, Postmes, Spears and Lea (2000) take the emergence of consistent communication styles within groups, such as the use of humor or the expression of emotions, as indicators of norms. Such a norm is a convention and *every* member of group profits from its compliance since it makes communication more efficient. Coleman (1990) calls this kind of norms 'conjoint conventional norms'. The problem of realizing and maintaining a conjoint conventional norm consists of solving a problem of coordination. The group members have to find a consensus about the kinds of acronyms that should be used and every member has to get the information about this consensus. In many groups this is just a matter of time. For example, the use of acronyms by members can be seen as a trial and error process that in some groups will converge, if many members use initially the same or similar acronyms. Once the consensus is reached, it is self-maintaining in a group because no member has an incentive to deviate from the norm. An important point to note is that other kinds of norms are less easily realized and maintained. In knowledge sharing OLCs of practice members with only a little knowledge may expect from members with much knowledge that they give away some of their knowledge (McLure Wasko and Faraj 2000). In such examples the targets and the beneficiaries of the norm consist of distinct groups, which complicates the argument. Moreover, within the knowledge sharing group one can expect to find conflicting interests about how much knowledge should be given away. The problem of reaching a consensus about the norm within the group does not only consist of a problem of coordination. It is a problem of cooperation that imposes *costly* contributions on some of the members. Such a kind of norm is called a 'disjoint essential norm' (Coleman 1990). Many knowledge sharing OLCs of practice face problems that could be solved by realizing and maintaining disjoint essential norms. It would be of much more interest to find out under what conditions online groups are successful in establishing disjoint essential norms.

The third social psychological approach, the *social-information processing perspective*, investigates the claim that text-based computer-mediated communication inherently reduces the transmission of social cues, as the cues-filtered-out approach argues. Walther (1995; 1996) claims that impression management plays a crucial role in computer-mediated communication. Message senders spend a considerable amount of time to portray themselves in a favorable way. Message receivers tend to idealize the sender through over-emphasizing the social cues they receive. These tendencies should be even stronger in asynchronous cmc situations because of the time lag, which makes the message sending more controllable. Computer-mediated communication can thus be "hyper-personal", which means that cmc interaction focuses much more on the social cues than face-to-face interaction. Walther (1996) argues that the empirical support for the claim that cmc is impersonal and lacks social cues is based on findings characterized by short-term interaction. Such a short-term interaction is typical for the experimental conditions used for testing the cues-filtered-out approach.

According to Walther (1996), when individuals interact with each other on a long-term basis, computer-mediated communication tools can become a useful medium for the transmission of social cues and for relational development. These claims find some experimental evidence (Walther 1995; 1996). Also there is evidence of field research. Utz (2000) analyzed the development of individual relationships between MUD users. She found that a user's transmission of social cues through the use of e.g. 'smileys' increased over time. Moreover, the degree of transmission of social cues was associated with the number of built up friendship relationships with other MUD users. She regards these findings as support for the claims of the social information processing perspective.

To summarize, the social psychological approaches and empirical findings indicate that, compared to face-to-face communication, status differences and norms may have a diminished influence on the interaction behavior during computer-mediated communication *if status is not salient and the interaction is short-term*. Under other conditions, status can play a considerable role. During computer mediated communication processes group identification can take place and norms have behavioral effects. At the moment, it is not clear which field conditions might reflect the experimental conditions that were used for some of the tests of the theories. The time duration of group interaction seems to play a crucial role. Long-term interaction in online groups seems to be favorable for the transmission of social cues.

The presented social psychological theories are useful for showing *what* types of behavioral phenomena are *in principle possible*. They are of limited value in specifying the exact pre-conditions for these phenomena to appear - especially when we are interested in field settings. They are difficult to relate to institutional or social conditions that vary between OLCs of practice and that may have a crucial impact on the problems of interaction. They hardly take into account free rider problems, problems of trust, and the problem of membership fluctuation. Moreover, they compare computer-mediated communication with face-to-face communication which implies a *separation* of online communication on the one hand and offline communication on the other hand. Therefore their predictions are unclear when it comes to the *combination* of both modes of communication.

#### **4. Another Perspective: The Social Embeddedness of Online Interaction in Offline Social Networks**

In Chapter 4.1 we show that in not a few OLCs of practice the communication is not purely virtual. In some OLCs a combination of both modes of communication, cmc and offline communication, takes place, at least for some members. Thereafter, in Chapter 4.2, we show what effects are to be expected when some members of the OLC also interact outside of the online group.

Early research understood online interaction as completely separated from what happens in the offline world (Shields 1996). Later research showed that the interaction in online groups not seldom is related to interaction between members that takes place outside of the online group. This is called the embeddedness of online interaction in social networks of the offline world. The degree of embeddedness is the higher, the more the online interaction of the members is embedded in interactions outside of the group. For different types of OLCs of practice a high degree of social embeddedness can mean different things. In *academic* OLCs of practice a high degree of embeddedness is typical, for example if a coherent scientific community is part of the OLC. In such an OLC many researchers will meet at common conferences or will be involved in the same editorial, administrative or other academic activities. In professional OLCs for *business employees* a high degree of embeddedness is

typical, for example if many members work in the same company, even if the company is spread over different localities. In OLCs of practice for teachers some of the members might interact with each other offline because they meet at the same school. What these examples show is that under a high degree of embeddedness the density of the offline network among the members is higher than under a low degree of embeddedness. If an OLC is embedded then this does *not* mean that *all* members know or interact with each other offline. Especially in very large OLCs it is likely that a typical member will interact only with a small minority of other members. Nevertheless even a low degree of embeddedness may have effects on the online interaction for all members, also for those who do not know many others (see Chapter 4.2).

In the literature on OLCs of practice the relevance of the relationships between the members and of face-to-face communication is often discussed. For example, Lave and Wenger (1991), Wenger (1998), and Brown and Duguid (1991) stress the importance of the relationships between the members of OLCs of practice. However, they do not come up with ideas how characteristics of the whole network might affect online interaction. Other researchers speculate about whether face-to-face meetings between members might be necessary (e.g. Johnson 2001). In a similar vein, some researchers argue that the greatest potential of OLCs of practice would consist of the opportunities that OLCs would offer as a *supplement* to already existing local offline communities. For example, Schlager and Fusco (2003) as well as Kling and Courtright (2003) propose to focus OLC efforts on helping and supporting pre-existing local communities of practice for teachers. Barab et al. (2003) describe face-to-face interaction as an *essential* supplement to online interaction. We do agree with these authors that OLCs of practice have a very large potential for the support of pre-existing local communities. However, the authors do not invest much time in thinking about what effects face-to-face (or more general: offline) interaction has on the online interaction. Therefore they tend to overlook that offline interaction of *some* members may change the situational constraints not only for those members who know each other already, but also for the *whole* OLC. Understood in this sense, the perspective that is presented in Chapter 4.2 implies that face-to-face (or: offline) interaction is *not* an essential pre-condition for a member to change his behavior. It is 'enough' when some other members interact offline.

#### **4.1 Empirical Findings on the Interrelationship between Online and Offline Interaction in Online Communities**

Parks (1996) was one of the first who showed that online interaction leads to offline interaction for a substantial number of users of an online group. In a study of 176 active contributors to 22 different newsgroups he found that 60.7% developed a personal relationship with another member of the online group. Such a relationship included acquaintanceship, friendship, or a romantic relationship. 63.7% of those who developed a relationship communicated in non-computer mediated ways with their partner. 33.3% included face-to-face meetings. On the average, the development of the relationship with regard to the disclosure of personal information and the emergence of trust was at a moderate level. Of all respondents, about 40% had no new online relationship, about 30% had a weakly developed online relationship and about 30% had a highly developed personal online relationship. The author concludes that the newsgroup users do not draw a clear line between their online and their offline activities. In a similar study Parks and Roberts (1998) analyzed the development of relationships among 235 users of seven educational and social Multi User Dungeons (MUDs). They found that 93.6% developed a personal relationship with another member. These also included acquaintanceship, friendship, and romantic relationships. The development of the relationship was, on the average, moderate to high, but lower than the

development of a relationship with a partner whom they first met face-to-face. In both studies many OLC members transferred their online relationships to their offline world. 37.7% of the MUD users who had formed a personal online relationship also met the relationship face-to-face. While the proportion of group members who developed relationships and transferred them to the offline world may appear high, one has to take into account that the studies had response rates of 33.3% and 20.0% so that those who formed a relationship may have answered disproportionately often. Nevertheless the numbers make clear that for a substantial amount of users of Internet groups there is a clear link between their online and offline world. Many other studies support this conclusion. Matei and Ball-Rokeach (2001) showed in a random telephone survey of Internet users in Los Angeles that 22.3% of the Internet users developed a friendship with someone they had met online. Utz (2000) in a study of 103 MUD players found that 77% of them developed a personal relationship that was transferred to the offline world. Haythornwaite (2000; 2001) shows that in learning groups on the Internet students get into contact via private emails, telephone, or even face-to-face meetings although there are only few opportunities for such meetings. Hampton and Wellman (2003) studied the adoption of high speed access to the Internet in a new suburban community which included the use of a local community emailing list. They found in multiple regression analyses which controlled for age, education, sex, and length of residence that among those who made use of the Internet and the emailing list the number of neighbors whom they would recognize on the street and would talk to was significantly higher than for the non-wired citizens. Götzenbrucker and Löger (2000), in a small study of 40 Austrian users of online fantasy communities, found that all users developed personal relationships and that 96% of the online contacts also were met face-to-face. 53% of the online relationships included some trust and 23% of the online contacts provided social support. Heintz (2000), in a study of 101 Swiss intensive users of newsgroups and chat groups, found that all made personal contacts to other users. 67% of the online contacts were met face-to-face. 11% of these online contacts were characterized as close contacts. 30% of the online contacts are multiplex relationships whereas 70% are mono-functional relationships. Matzat (2004b), in a study of a random sample of 1063 Dutch and English university researchers, found in multiple regression analyses that control for a number of other factors of influence that those researchers who made use of academic emailing lists tend to have more weak contacts and more contacts with whom they exchanged manuscripts and papers. Also, there was weak evidence that they had more collaborators than the researchers who did not make use of academic emailing list. The differences were the larger the higher the communication volume in the used emailing lists was. Matzat (2001) studied a random sample of 49 academic emailing lists that were used by a random sample of Dutch and English university researchers. He found that the emailing lists differed remarkably with regard to their social embeddedness. There were clear differences between the emailing lists concerning to what extent the members of the different emailing lists shared common interests and activities as a research community. In those emailing lists with more shared interests and activities the members tend to have a higher frequency of interaction outside of the emailing list, such as meeting each other at academic conferences, publishing in the same journal, and being a member of the same academic committee.

These studies analyze different types of Internet users. Some studies examine only very intensive users of the Internet. Some studies use a random sample frame, whereas others do not use a random selection of respondents (Utz 2000; Heintz 2000; Götzenbrucker and Löger 2000). Parks (1996) and Parks and Roberts (1998) admit that in their studies there may be a bias. Internet users who did not develop a new online relationship might have been less motivated to participate in the studies. So the proportion of members of OLCs who developed a personal relationship and who integrated some of these relationships into their offline world might be much smaller than the presented numbers suggest. What we can at least conclude



from the findings is that the development of relationships between members of OLCs does take place in substantial numbers and that it is not unusual that for some members the online relationships are combined with some kind of offline interaction. It is an open question how often a combination of online interaction with offline interaction takes place, but there is evidence that OLCs differ remarkably with respect to that.

#### **4.2 Effects of the Social Embeddedness on Group Interaction: Theories and Some Evidence**

There is much research done on problems of cooperation in group interaction outside of the Internet. A remarkable finding in the results of experimental studies on problems of cooperation is that consistently an effect of the communication between interaction partners was found (see Sally 1995 for an overview of that kind of experimental research). Individuals who verbally communicated with each other before they were faced with a problem of cooperation have significantly higher rates of cooperation than individuals who did not verbally communicate with each other. In the literature different mechanisms for this effect are mentioned. Face-to-face communication might increase the group identity, it might trigger cooperative norms of social conduct, and it might reduce the social distance between the communicating individuals (Riegelsberger, Sasse, and McCarthy 2003). All mechanisms could stimulate cooperative behavior among individuals.

It is less clear whether offline communication between members of groups does increase the cooperation rate during *online* interaction. Experimental research on *small* groups that use computer-mediated communication shows the following. Communication between group members increases the likelihood that in problems of trust subsequently the member places trust and that placed trust is honored. During free rider problems preceding communication between members increase the likelihood of contribution (see Brosig, Ockenfels, and Weimann 1999; Riegelsberger, Sasse, and McCarthy 2003 for the details). In general the findings support the assumption that so called "richer" media of communication (see chapter 3) have larger effects. That is, the effects tend to be stronger for face-to-face communication than for video & audio communication. Also, preceding personal acquaintance among members has a cooperation-increasing effect (*ibid.*).

Much less research is conducted on the effects of communication between members of *large* or *longer-lasting* OLCs. The situation in *large* OLCs is different from the interaction in small laboratory groups. First of all, one cannot expect that in all large groups, for example groups of more than 50 members, all members communicate outside of the group with each other. Haythornwaite (2000) examined four student online classes that followed a 15 week course. On the average a student had 3 strong ties, 3 strong to intermediate ties, 4 intermediate to weak ties, and weak ties with the remainder of the student's class. A weak tie was defined by monthly communication. The classes had 14-19 members. In much larger groups even monthly communication is impossible. So in OLCs of practice it might well be that two managers wish to share their knowledge who do not know each other. Additionally, it might be that one (or both) do not know *any* other member of the OLC. Furthermore, in *longer-lasting* OLCs even among those members who communicated with each other, the consequences of the communication might be much weaker because the time lag between the preceding communication and the subsequent online interaction might be very large. The crucial question for field research is *whether those who do not* interact outside of the group with other members nevertheless *will be affected* by the common offline interaction of other members. We have to look for mechanisms induced by common offline interaction among some members that change the communication situation for the whole group. In the following

first the very limited empirical evidence of field studies on effects of embeddedness is briefly presented. Thereafter we introduce three theories that specify mechanisms that show how embeddedness might change the communication situation for the whole group. Also, we present the evidence for the theories, if existent.

Field studies indicate that preceding face-to-face meetings among pupils and students who participate in an online learning course increase the rates of contribution to subsequent online discussions (Bluemink and Järvelä 2004; Cavanaugh 2001; Kleine Staarman 2003). For example, Bluemink and Järvelä (2004) analyze three small and medium-sized groups of students in an online course that lasted for two months. They found that after face-to-face meetings the discussion activity increased for some limited time. Haythornwaite (2001) found in an online class consisting of 14 students that after periods with face-to-face meetings the socializing activities and activities including emotional exchanges were much more frequent. She suggests that face-to-face interaction that occurred during a short on-campus session had a catalytic effect on these types of interaction.

The studies are not adequate for drawing conclusions about the effects of embeddedness in larger OLCs. Contrary to the experimental studies there is a clear gap in research on larger OLCs. It is completely unclear via what mechanisms embeddedness might change the communication situation in the whole group. Therefore next we focus on three different mechanisms that make clear how embeddedness influences online interaction. We focus especially on the consequences for the three problems of interaction in OLCs. We present the limited empirical evidence for the three theories, if existent.

#### **4.2.1 Social Embeddedness and the Attainment of Reputation**

Kollock (1999a) wonders how it can be that members of OLCs cooperate not infrequently with each other while they often do not know each other personally. He argues that there is a number of different motivations that would members induce to cooperative behavior. According to Kollock (1999a) purely altruistic motivations only seldom would play a role. He argues that the attainment of reputation would be an incentive for the active contribution to online discussions and other forms of cooperative engagements within OLCs. By participating actively in discussions of OLCs members could show to many others their knowledge and their achievements. In this way they could earn a reputation. The reputation model (Matzat 2002) elaborates these arguments for the case of interaction among researchers in academic OLCs of practice.

According to the reputation model researchers can earn only a limited amount of reputation through activities that are not related to the offline world. This changes dramatically if the exchange of knowledge on the Internet takes place in front of an integrated scientific community that forms a part of the OLC of practice. In such an OLC many members interact with each other outside of the Internet. They meet each other at conferences and collaborate in academic committees or in editorial boards of academic journals. The more the OLC constitutes a well-integrated scientific community of researchers the more frequent such types of offline interaction between some of the members take place. In an academic OLC of practice with a highly integrated scientific community a high degree of social embeddedness is given. In such an OLC of practice a researcher has the opportunity to earn much reputation by providing competent answers to questions that other known or unknown colleagues state. The higher the degree of embeddedness of the IDG, the more giving the right answers is a suitable means of showing that one is a competent member of the academic community. Very often the questions discussed within IDGs are ordinary problems for certain researchers who face

them regularly in their research field. Nevertheless, an academic can show to others by reacting to a question that he is still (or wants to be) one of those experts who are currently active within that sub-field. He demonstrates to others that this sub-field is still (or will be) an important part of his research schedule that is given some priority because he spends some of his scarce time on it to help others. He also shows by quickly sending a short email that he has the competence to answer these questions easily. The opportunity to earn reputation gives the member a selective incentive to provide answers to questions even if the colleague who states the question is completely unknown to him. The reputation model can be used to derive a number of predictions concerning the active participation of researchers in academic OLCs of practice.

One prediction is as follows. The higher the degree of social embeddedness of the OLC the higher the likelihood that a researcher will provide an answer during the online discussion to a question that was sent to the OLC. Social embeddedness thus facilitates the exchange of knowledge. This is the case because with the degree of embeddedness the amount of reputation that can be earned increases. Another hypothesis states that a researcher is more motivated to share his knowledge and to provide answers during online discussions if he knows that in the OLC many of his personally known colleagues are members. Again, the existence of many personally known colleagues increases the amount of reputation that the researcher earns when he shows his competence in the public discussion. These and other predictions of the reputation model found evidence in a study of 49 academic emailing lists (Matzat 2001; 2002). The reputation model shows under which conditions researchers have incentives to participate actively in online group discussions. Accordingly, under these conditions the problem of free riding is diminished.

If the predictions of the reputation model find more empirical evidence in further research then it provides a number of important practical recommendations for the social design of OLCs of practice. It emphasizes the importance of two different types of social networks for the reduction of a typical problem of interaction on OLCs of practice, namely the problem of free riding. First, the reputation model makes clear that (and why) a high density of the whole social network of the OLC that is given by a high degree of social embeddedness reduces the problem of free riding. Second, a large personal ('ego centered') network of the individual member of the OLC reduces the problem of free riding during the online interaction. The management of an OLC of practice can make use of these insights. If the management wants to reduce the amount of free riding then for the recruitment of new members it is advisable not to contact a large number of single isolated researchers. It is more efficient to contact a large number of researchers that form a cluster of related individuals. This increases the likelihood that members of the OLC have a large personal network within the online group. For reducing the problem of free riding it is advisable during the founding phase of the OLC of practice to select the topic(s) of the OLC of practice in a focused way so that they can easily be linked to an existing clearly defined community of researchers. A selection of very diverse topics would make the range of interest much broader and might attract a high number of passive members. Such a too broad set of topics, however, would reduce the social embeddedness of the OLC. It would reduce the incentives for the active participation in online discussions and other common activities of the group. A more focused selection of topics would reduce the problem of free riding. If the topics are not chosen in a too broad way then in later phases of the OLC it is possible to increase the degree of embeddedness through the initiation of face-to-face meetings of subgroups of members who are interested in subsets of the topics of the OLC. This also would reduce the problem of free riding within the OLC.

#### 4.2.2. Social Embeddedness and the Emergence of Norms

Many authors have realized the free riding problem as an important problem of interaction in OLCs of practice. Some of them propose the development of norms that would induce members to contribute actively to online discussions as a solution to the problem. Such norms could stimulate the active participation of the members (Ardichvili, Page, and Wentling 2003; McLure Wasko and Faraj 2000; Constant, Kiesler, and Sproull 1994). Unfortunately very often no conditions are specified, that facilitate the establishment of such kinds of norms. This is a serious disadvantage because the establishment of cooperative norms that solve free rider problems is no easy to solve issue. As was explained in chapter 3, such norms are essential norms that prescribe costly behavior to some of the members. For example, such a norm could prescribe that competent members of an OLC should contribute regularly to online discussions about topics that they are experts in. It would then cost time and effort for competent members to adhere to the norm. Conflicts about what constitutes regular contributions might arise between groups of members. The establishment of the norm is facilitated if those who do not adhere are punished. Theories that specify which conditions facilitate the establishment of essential norms are thus very useful. A theory that offers a solution to the problem of how to establish essential norms that diminish free rider problem is the so-called Coleman model on norm emergence (Coleman 1990). In the following first the Coleman model will be introduced. Thereafter it will be shown that the model can be used to make predictions about effects of the social embeddedness.

For Coleman (1990) a norm consists of a rule that prescribes specific actions of (some) members and proscribes other types of actions. So according to the norm certain rights of action do no longer belong to the individual but to the group. The more there exists a consensus among the members that the rights belong to the group the more is the norm in force. So the validity of a norm is not a characteristic of an individual since the concept of a norm that Coleman (1990) uses is not related to the internalization of norms by an individual. Rather the validity of a norm is a characteristic of a group. Coleman (1990) develops his explanation of the emergence of such a norm in two steps. First, he explains under which conditions group members realize the need for the existence of a norm, calling this a 'demand for norms'. Second, this demand has to be 'satisfied'. That is, the group members' wish of establishing a norm is not yet enough, but it must be converted into rules that are followed by the members. Coleman argues that demand for a norm concerning a specific action, the focal action, will arise under two conditions. First, the focal action has similar positive or negative external effects on the interests of other group members. Second, in the group there exists no opportunity to exchange rights of control of the action. The externalities awaken the interests of other actors to control the focal action. If the second condition is not fulfilled, group members can conduct bi- or multilateral exchanges to profit from the positive externalities or to avoid the negative ones. In this case a need for group consensus no longer exists. If the interests in the external effects of the focal action are sufficiently large and no market for exchange exists, demand for a norm emerges. The norm, however, is a collective good for the beneficiaries, since everybody profits from it independently of whether he contributes to its maintenance. When will the demand for a norm be satisfied?

Such a demand will be satisfied, Coleman (1990) argues, if the actor transfers his right of control of his action to the other group members. For such a transfer the employment of positive or negative sanctions is necessary, or else the group member has no incentive to do something that is of interest to others but not directly to him. The employment of sanctions, again, is a public good for the members. Every member profits from the norm independently

of whether he bears the sanction costs. Coleman states that demand for a norm will be satisfied when this public good problem has been solved. When does this happen?

This happens when the *network of social relations* between the group members is *sufficiently dense* to allow for joint actions to employ sanctions (Coleman 1990). The existence of a sufficiently dense network would offer opportunities for employing sanctions or encouragement in an easy way. "Because social relationships consist of obligations and expectations,..., and because each actor continues to control some events in which the other is interested, there exists ... leverage which can be used for the purpose of developing sanctions" (Coleman 1990). The existence of externalities of an action and the existence of a sufficiently dense network between the members who profit from these externalities are therefore the crucial conditions for the emergence of a norm, given that no opportunities for individual exchanges exist.

The above conditions apply for example to an academic emailing list with a sufficiently high degree of embeddedness in an integrated research community. A contribution to the discussion through the sending of a useful public answer has positive externalities for the members. If the topic of the emailing list is strongly linked to an offline academic community, there will be some interest in the discussion and therefore in contributions. A market for the individual exchange of answers does not exist in large emailing lists. Thus, informal rules that prescribe some degree of active participation and the provision of help to other members are welcome. Such rules will be realized in emailing lists with a sufficiently high degree of embeddedness. If an emailing list is embedded in a well-integrated research community that shares many interests and activities in common, then the informal network of the group members has a high density. If the active researchers of an emailing list meet regularly at conferences and other meetings, then plenty of informal communication takes place between them. Such informal communication presents opportunities for a researcher to stimulate a colleague to answer questions on topics he is an expert in. For example a side-remark in a bilateral email communication might refer to the discussion or to an open question within an emailing list. The same might happen in informal conversations among small groups of researchers during meetings. In such cases the embeddedness of academic OLCs simplifies the decision making and the exercise of sanctions in the group. By doing so the establishment of a norm that reduces problems of free riding is facilitated.

Empirical analyses of the discussion behavior of researchers in 49 emailing lists have confirmed the prediction of the Coleman model about a positive association between the degree of embeddedness and the probability of the emergence of a cooperative norm in academic OLCs. Moreover, it was shown that that the strength of the cooperative norm stimulates the exchange of knowledge. So the emergence of a norm has a behavioral impact. The results lead to important insights about the design and management of OLCs of practice. A high degree of embeddedness not only has direct effect that stimulates the active participation in online discussions. Additionally, it has an indirect effect. It facilitates the establishment of a cooperative norm that reduces the free rider problem. The findings have practical implications. A manager, an administrator, or a motivated member of an OLC of practice can make clear what rules and expectations are valid in the group. The Coleman model makes clear under which conditions such appeals to norms are more effective, and under what condition less effects are to be expected. Under a low degree of embeddedness appeals to norms may make clear that the wish to establish a cooperative norm does exist. The establishment itself and therefore a behavioral impact of such appeals, however, is less likely.

### 4.2.3 Social Embeddedness and Differential Forms of Social Control

The mentioned theories leave it open, which active tools for intervention are available that influence the interaction in OLCs of practice once the OLC is founded and the manager not only wants to appeal to norms. The theory of relational signals in online groups (Matzat 2004a) gives an answer to this question. The theory will be presented in four steps. First, the interests of the members and the common group interests are investigated in more detail. In a second step, we describe that the behavior of members during online discussions spreads information to other members that will make them draw conclusions about how the member evaluates his relationship to the whole OLC and to other members. These arguments are not in accordance with a line of research that takes the reduced social cues approach (Kiesler, Siegel, and McGuire 1984) as a starting point for arguing that in OLCs of practice social cues do not play a role. In a third step the intervention tools for influencing the interaction in OLCs of practice are introduced. Finally, we emphasize that the effects of the tools depend on the degree of social embeddedness of the OLC. Accordingly, a manager should take into account the degree of embeddedness of an OLC if he wants to apply a certain tool.

#### Step 1: Different types of member interests and common group interests

The starting point for the theory is that members of online groups have *individual* interests and *common group* interests that motivate them to contribute to online discussions (Matzat 2004a). The two kinds of interest either can be in complete accordance, or fulfillment of the one kind of interest can be disadvantageous for the fulfillment of the other. In the latter case individuals orient their action either more to the one or to the other goal. The goal that attracts the member's attention and structures the decision situation in such a way that other competing goals vanish in the background is called the 'situational frame' (see Lindenberg 1997; 1998 for the details). In online groups frames for members can be more oriented towards fulfilling the member's individual interests, for example in online markets, or more towards fulfilling the common group interests. An example of the latter would be a self-help group that emphasizes the common needs of all group members. In OLCs of practice with strong cooperative norms the frame will emphasize to some extent the common interests of the whole OLC.

The individual interests of the members as well as the common interests of the whole OLC of practice can be divided into two types. We make a distinction between *relational* interests on the one hand and *material* interests on the other hand. Material interests are interests that do not necessarily need social interaction for their fulfillment. The attainment of information is an example of a material interests since information can be found in data bases so that social interaction may be sometimes useful but is not strictly necessary. The development of new contacts or the maintenance of existing contacts are examples of relational interests that members of OLCs of practice may have. For the fulfillment of both goals one needs social interaction. OLCs of practice that have the maintenance of existing relationships between members as one of the common group goals have a peculiarity. It is much more difficult to substitute these OLCs. If the OLC of practice is important for the realization of material interests then it can be easily substituted. For example, data bases are an easy to find alternative for the participation in an OLC of practice if the attainment of information is the most important goal of the member. OLCs of practice with strong relational interests can only be exchanged against other opportunities for social interaction. In extreme cases, they cannot be substituted at all because the maintenance of relationship to specific individuals is one of the important interests that the members have. Stated differently, in OLCs of practice with strong relational interests we expect to find less *problems of membership stability*.

## **Step 2: Relational Signals of Online Behavior in OLCs of Practice**

Another point of the theory is that the member's behavior in the OLCs sends so-called relational signals to others. Three kinds of signals are distinguished. First, in *bilateral interaction* a member's behavior gives information about how he evaluates the bilateral relationship to the other member. For example, his behavior could indicate an interest in the relationship itself, or it could indicate that he regards it only as a means for the short-term fulfillment of his own goals. Second, a member's participation in the activities of the group, as well as his non-participation, gives information to the *whole group* how he regards the common group goals. The extent of his contribution to a common goal or the extent to which he is willing to provide information to other members indicates whether the decision frame of the member is in accordance with the frame of the group. As a third point, especially the *administrator* or manager of an OLC signals through his own behavior what kinds of *behavioral standards* he expects from the members. For example, an administrator who appeals to the members' fairness signals that in the online group members should evaluate the online interaction not only on the basis of maximization of one's own interests. A different relational signal is sent out by communicating with the members in another way. An administrator could automatically collect Log-File data about the posting behavior of the members of the OLC. He could then use the data to publish a ranking of the members that gives higher scores for those members who are more active in online discussions and other common activities for the OLC of practice. He could draw the members' attention to the ranking and emphasize that active participation would lead to higher places in the ranking. In this case the community manager signals that he expects the members to become more involved in activities of the OLC especially when there are extrinsic selfish incentives. The manager provides an opportunity to gain social status in the OLC by becoming active in common activities. The members receive the signal that in the OLC of practice many individuals are active for whom the realization of their *own* interests is of crucial importance. This kind of exercising social control suggests that the common frame of the whole OLC is one that does not leave much room for taking into account something else than the selfish interests of the members. Taking into account the interests of others at least to some extent, however, is a pre-condition for the development of relational interests.

## **Step 3: Different Management Tools for Dealing with Problems of Interaction**

The first kind of tools, so called *frame-stabilizing tools*, work by increasing the salience of the common group goal. They enhance the individual's attention to the frame, thereby bringing it more in the foreground and diminishing the relevance of the maybe conflicting particular interests of the individual. The value of the member's background goals is through this mechanism reduced and thereby also his costs that may result from neglecting them somewhat. If these tools work successfully they increase the salience of the group frame.

Frame stabilizing tools are those tools that make the group easy to identify, that make membership easily recognizable and thereby stress the salience of the common group goal. Examples for frame stabilizing tools are:

- The use of symbols within the group
- Periodic face to face meetings of the group members
- The development of rules and norms that govern the joint efforts to reach the common Goal

- The definition of the group in relation to another group based on some form of functional interdependency

A well-known example of the use of frame stabilizing tools in an online community is the development of the graphical MUD (Multi-User Dungeon) named “The Palace”. Suler (2000) shows how this MUD grew over months. After the group size reached a critical threshold the salience of the common frame decayed. Subgroups were created that partly were characterized by conflicting competitive interests, which weakened the common frame. Although there were some conflicts, the online community management counterbalanced them by stressing the over arching common goals of all sub-groups through periodic meetings and rituals which undermined the relevance of the conflicting interests.

The literature about online communities stresses some of these tools as well. For example Kim (2000) mentions the use of symbols in online communities, too. Our theoretical underpinning of these recommendations, however, allows us to specify on which conditions the effectiveness of such tools for fostering interaction in online communities depends. I will elaborate on this in the fourth step.

The second kind of management tools is called *indirect monitoring tools*. They make use of the formal or informal rules that exist in a group. Such rules coordinate the joint achievement of the common goal. For example, in a professional mailing list there can be the rule that every member is expected to spend a reasonable amount of his time on providing help and information to other mailing list members who have sent questions to the mailing list.

Indirect monitoring tools work through relational signals that indicate the individual's interest in conformity to the rules and thereby indirectly also his conformity to the group frame. For example, exchange outcomes in the group are then evaluated not only with regard to the direct benefit they deliver to the individuals, but also with regard to the individual's willingness to take into account the relevance of the frame for his behavior within the group. Thus, the individual sends signals to his exchange partner, but also to the whole group.

Indirect monitoring tools are those tools that provide opportunities and incentives for the members to send relational signals that indicate accordance to the group frame. The indirect monitoring tools, at least if they work, have the effect that individuals may restrict the fulfillment of the individual short-term goals because they taken into account the relational signal of their behavior and thus the group frame. If the frame is not too individualistic, the individual has thus an incentive to signal to others and to the group his compliance with the frame to avoid informal sanctions. If such situations that allow relational signaling come up routinely and are not too costly for the individual, then it is easier for the individual member to signal his compliance to the group norms and the frame. Group leaders or the management can use these insights strategically by involving minor group crises that give the members an opportunity for relational signaling. For example, the online community manager of the famous WELL used the difficulties the community had with deviating members for a public discussion about the group frame and its related rules of conduct. It was decided that no direct sanctions should be applied to deviating members if the deviation was not extremely severe. At the same time, the management indicated that informal sanctions applied by the members would be adequate (Hafner 1997). This gave the members low cost opportunities to signal their willingness to comply with the group norms and the frame by applying informal social sanctions to the offenders.



The third kind of management tools, so-called *tools of direct control*, work through enhancing the real direct benefits of a group member, and not through influencing the perceived ones like the frame stabilizing tools do. Examples for directly monitoring tools in the realm of online communities are the introduction of direct rewards for active participation in the online community. For example, Shafer (2000) proposes to give discount rates for some products to stimulate active discussion contributions. Schwartz (2000) proposes to give 'points' that can be used during an online auction. Elaborate tools that fall into this category are the introduction of reputation systems based on mutual evaluations by members like the online auction system eBay does it (Kollock 1999b), or credible commitment devices. Such a credible commitment device on the side of the online community management could be to develop legally obligatory self-commitment not to sell information that members provide through the registration process (Hoffman, Novak, and Peralta 1998). The already mentioned use of a public ranking system also is an example of a tool of direct control.

#### **Step4: Social Embeddedness and the Effects of the Management Tools**

Under which condition is what kind of tool more promising? In the literature, it has been proposed to control how often every member of an online community has actively contributed to the group discussion and then to publish the names of the most active ones in a kind of 'hit parade' to give them a reputation in the online community (Kim 2000; Preece 2000) and thereby to stimulate their active participation. Such a tool makes use of a direct control mechanism. On basis of the theory of relational signals, we doubt whether such a procedure is useful for all kinds of OLCs. This may be tolerated within a commercial online community, but not in all professional academic OLCs of practice, especially not in those that intend to develop a climate of understanding and mutual profession of help.

Direct control tools imply the signal that the member is expected not to take into account the interests of others for his behavior. They signal to the members that the group or in this case the online community management expects the member not to have significant relational interests. So, *the larger the importance of relational interests of a group member, the less adequate are direct control tools*. On the other hand, the larger the importance of relational interests, the more adequate are tools that indicate more relational interest. Group members with an individualistic frame do not care what relational signals their behavior may have. A frame-stabilizing tool does not change their behavior. In general the three kinds of tools (frame stabilizing tools, indirect monitoring, direct control) constitute a hierarchy of tools that progressively indicate a lack of relational interests (Lindenberg 1998).

The social embeddedness influences the degree of relational interests in an OLC of practice, and therefore also influences what the outcomes of the use of the management tools are: Members of an embedded online community have pre-existing real life relations that make them *more dependent* on each other. An example is an online community for a group of same field researchers in the same regional area. Its members are already related to each other, for example because they are members of the same association or board or because of other regular meetings. Yet, the pre-existing relationships are not necessarily dependent on the geographical boundedness of the online community. An online community connected to an international professional association whose members meet only once in a year is also an embedded online community.

Common membership in an organization, in a professional association, or in a local organizational unit imposes a task that has to be fulfilled by the whole group. Some division

of labor with different roles and *mutual dependencies* evolved already. There are pre-existing functional interdependencies. The less the functional interdependencies comprise conflicting elements the more often the members send relational signals that indicate relational interests. The mutual dependency gives incentives to prevent anything that could be interpreted as a lack of relational interest because the members know that they are depend on each other. There is thus some degree of relational interest. The higher the degree of embeddedness, the higher is the degree of interdependency between the members of the OLC of practice. In situations of high interdependency it is in everyone's interest to maintain a satisfying relationship with other members. Accordingly, we expect that under the condition of a high degree of embeddedness indirect monitoring tools and frame stabilizing tools have stronger effects on the active participation of members in knowledge sharing activities than under a condition of a low degree of embeddedness. Moreover, direct control tools have stronger effects under a low degree of embeddedness than under a high degree of embeddedness.

In almost all OLCs of practice there exist some rules or norms that prescribe some forms of knowledge sharing activities. Members of OLCs of practice know that they are expected to share their knowledge actively with others. This is why an OLC of practice is founded. So we can conclude that in OLCs of practice with a high degree of embeddedness the rules, as an example of frame stabilizing tools, should have stronger effects on the knowledge sharing activities than in OLCs of practice with a low degree of embeddedness. Stated differently, on average problems of free riding should be lower under a high degree of embeddedness than under a low degree of embeddedness. Finally, under a high degree of social embeddedness members are more interdependent. In bilateral interactions, that include problems of trust the abuse of placed trust would be a clear signal of a lack of relational interest. Therefore under a high degree of embeddedness trust is less likely to be abused. Members in OLCs with a high degree of embeddedness anticipate the higher likelihood of cooperative behavior of the trustee. Therefore it is more likely that they will place trust. Stated differently, under a high degree of embeddedness an OLC of practice will have higher rates of placed trust than under a low degree of embeddedness. That is, under a high degree of embeddedness there are less problems of trust in an OLC of practice than under a low degree of embeddedness.

### **4.3 The Hypotheses to be tested**

The reputation model and the Coleman model on norm emergence lead to the prediction that in OLCs of practice under a high degree of embeddedness less free riding is to be expected than under a low degree of embeddedness. The theory of relational signaling leads to the prediction that under a high degree of embeddedness there will be less membership fluctuation because of a higher degree of relational interests and less problems of trust. Moreover, in OLCs of practice that do not make use of direct forms of control, such as formalized reputation systems etc, the theory of relational signals predicts that under a high degree of embeddedness there will be less free riding than under a low degree of embeddedness. This leads to the following three hypotheses:

*H1: In Online Communities of Practice, under a high degree of embeddedness there will be less free riding than under a low degree of embeddedness.*

*H2: In Online Communities of Practice, under a high degree of embeddedness there will be less problems of trust (or: higher rates of placement of trust) than under a low degree of embeddedness.*

*H3: In Online Communities of Practice, under a high degree of embeddedness there will be less membership fluctuation than under a low degree of embeddedness.*

## **5. Design of the Study and Measurements**

### **5.1 General Background**

The three hypotheses are tested by means of questionnaire data. The data was collected in November 2005 – February 2006 in 33 online communities of practice of a large virtual organization. The organization started founding a number of OLCs of practice for teachers at the end of the 1990s. The study focuses on teachers who make use of the OLCs for secondary education. The communities were built up in a comparable way. They all have the goal to stimulate the exchange of knowledge among teachers so that the teachers learn from each other, which should facilitate their professional development. Teachers have to register to become a member of the OLC. Every OLC has one manager who is responsible for informing the members and for taking care of problems that members have within their OLC. The manager is him- or herself a teacher and is thus acquainted with the problems and difficulties that a teacher has in his or her professional life. The members regularly are informed about new developments of their professional field as well as about changes in the OLCs. All OLCs provide their members the opportunity to send teaching material to the other members of the OLC. Every OLC has a discussion board where members can ask questions and provide answers to questions of their colleagues. On the discussion board, the posting of announcements and general information of professional or educational interest is also possible. Moreover, the managers regularly send an electronic newsletter to all subscribed members. The newsletter gives information about new developments within the teaching subject, about changes in the educational system and about the OLC. Members have the opportunity to contribute to the newsletter by writing short pieces. Some OLCs organize face-to-face meetings where teachers can meet each other. In some OLCs there is an emailing list installed that allows interested teachers to have more intensive discussions with each other. All managers of the OLCs are loosely supervised by another manager who is responsible for keeping the contact with the virtual organization and supporting the OLC managers in case they need technical or other kinds of help.

A random sample of 3533 email addresses of the members was taken. Every member received an email invitation to participate in an online survey. Filling out the questions took about 10-20 minutes. After the removal of email addresses that were double, no longer valid, or belonging to teachers who in the meantime left the OLC, 3402 usable addresses remained. Out of the 3402 members, 1259 returned usable answers, which results in a response rate of 37%. The multivariate data analyses make use of the answers of those respondents without missing values. These are 936 or 74% of all respondents.

### **5.2 The Measurements**

In the following the measurements of the different theoretical concepts are described. The complete questionnaire and some additional details can be found in Appendix 1, which contains the original questionnaire in Dutch.

## The dependent variables

The problems of interaction were measured in three different ways. *First*, the *perceived* intensity of the three problems of interaction was measured through the members' assessments of how serious different problems are for the functioning of the community. *Second*, the intensity of the problems of trust and free riding were measured by the members' self-reported *willingness* to participate in a number of common activities. In the case of the free rider problem the activities differed with respect to the amount of time they asked for. In the case of trust problems the activities included the possibility that, to some extent, they might be self-damaging. The opportunities to take part in these activities were presented as a number of scenarios. Different measures were taken to increase the validity of the members' answers: The virtual organization publishes per year three issues of an electronic journal that is sent to the members. In one of the journal's issues (in 2005) it was explicitly announced that it was the intention to increase the active participation of teachers in the OLCs of practice for secondary education teachers. A shortage of active participation was described as a serious drawback of some the OLCs. Moreover, it was announced that the virtual organization would take measures to increase the active participation. The questionnaire referred to this initiative and stressed once more that in the near future the OLC would make use of willingness of members to contribute to the community. The scenarios were presented in such a way that the members were to assume that the management of the OLCs would use the information in the near future to take some actions (as indeed they might). It was stressed that the member's answers would be of crucial importance for the further development of his/her own community. Additionally, the survey included items that form a 'social desirability scale', so that it is possible to control for a general tendency to answer in socially desirable ways. *Third*, for the problem of free riding, the members' self-reported *behavior* was taken as an indicator. Members were asked questions about their past contribution to a number of collective goods for the whole community. The three measurement procedures are described below.

*First*, the members' assessments (*perceived intensity*) of the extent to which the three problems of interaction form a problem for the OLC of practice were measured in the following way:

"In the following we present a number of potential problems of knowledge exchange in communities on the Internet. To what extent does each problem play a role for the functioning of the whole community?

There are too few *active* members in the community. (problem of free riding)  
The members send too less teaching material to the community. (problem of free riding)  
If there is something to be done for the whole community then the members wait until other members take the initiative before they contribute themselves. (problem of free riding)

Members do not trust each other. (problem of trust)  
The members hesitate to make use of the information that they can find in the community. (problem of trust)  
The members hesitate to write about their problems at work. (problem of trust)  
The members are afraid that the information that they send to the community might be used in some disadvantageous ways. (problem of trust)

There is a fluctuation in the number of members of the community. (problem of membership fluctuation)"

The members had to assess every statement on a seven point Likert rating scale with the labels "not, hardly, to a limited extent, to some extent, to a reasonable extent, to a large extent, to a very large extent". The items intend to measure a characteristic of the whole community,

as it is perceived by the member. Since a valid assessment of the community requires some acquaintance with its rules and habits only the answers of respondents who are subscribed for more than half a year as a member in the OLC were used. We conducted two factor analyses. We conducted a factor analysis on the three items about free riding. Additionally, we conducted a factor analysis on the four items about problems of trust. This led to two usable indicators (see below). Moreover, the one item about the problem of membership fluctuation constitutes the third indicator of the perceived intensity of the problems of interaction.

The factor analysis (principal axis factoring) on the three items that indicate the perceived intensity of the problem of free riding in the OLC led to one factor with an eigenvalue of larger than one. It explains 66% of the variance of the three used items. The Kaiser-Meier-Olkin measure of sampling adequacy is 0.73, Cronbach's alpha for a scale consisting of the three items is 0.86. The factor analysis (principal axis factoring) on the four items that indicate the perceived intensity of the problem of trust led to one factor with an eigenvalue larger than one. It explains 57% of the variance of the four used items. The Kaiser-Meier-Olkin measure of sampling adequacy is 0.76, Cronbach's alpha for a scale consisting of the four items is 0.81. The values indicate that the items form two strong scales.

*Second*, the questionnaire presented members with a number of opportunities to participate in activities that would be beneficial for the OLC as a whole. That is, they measure the *willingness to contribute to collective goods*. The items ask only for information about the respondent him- or herself, and not about information on the whole community. Therefore the answers of all respondents were used. The following scenarios as measurements for the willingness to contribute to collective goods were used.

"In the near future the community will make use much more of the knowledge and capabilities of the members. Therefore we would like to know to what extent the members are willing to commit themselves to for the future development of the community. Your answers to these questions thus are important for the future of your own community.

Would you or would you not be willing to participate in the following activities:

- a the distribution of flyers of your online community during an information evening in a school in your neighborhood
- b giving a short presentation about the content and utility of your online community during an information evening in a school in your neighborhood
- c the mediation of conflicts between members in the community. You do not need special technical skills and your involvement is only necessary in cases of conflicts.
- d participation in a members' committee for advice. The committee would come together once in a year for one evening. You do not need special technical skills and the expected amount of time invest will be about 8 hours per year (4 hours preparation and 4 hours meeting).

The members had to indicate to what extent they were willing to participate in these activities on a five point Likert rating scale with the labels "definitely not, probably not, maybe/maybe not, probably yes, definitely". A factor analysis (principal axis factoring) was conducted on the answers to the questions. It resulted in one factor with an eigenvalue larger than one. This factor explains 53% of the variance of the four used items. The Kaiser-Meier-Olkin measure of sampling adequacy is 0.74, Cronbach's alpha for a scale consisting of the four items is 0.82.

The following scenarios as measurements for the *willingness to place trust* were used.

"A number of software tools are going to be developed for your community. We would like to prevent that new software tools will be offered that no one needs. Therefore we would like to know whether you would make use of the following devices for your community.

Think carefully about your answers. They affect the future development of your own community.

Because nowadays much of the teaching material is prepared in electronic form (PowerPoint Word, PDF etc) it is possible to prepare a discussion forum in such a way that it is very easy for teachers to provide the material to colleagues so that it can be evaluated by others.

a Would you provide your own teaching material with your name on it to colleagues within your community?

b Would you provide your own teaching material to colleagues within your community if it is possible to do so anonymously?

Assume that every month there is a review of the latest teaching material by members of a committee of your online community. This would result in a review of the material and the discussions that lead to the review would be posted so that they are accessible for every member of the community. Assume that you have teaching material in an electronic form.

a Would you be willing to provide your own teaching material with your name on it for a review?

b Would you be willing to provide your own teaching material anonymously for a review?"

The members had to indicate to what extent they would be willing to provide teaching material on a five point Likert rating scale with the labels "definitely not, probably not, maybe/maybe not, probably yes, definitely". A factor analysis (principal axis factoring) was conducted on the answers to these questions. It resulted in one factor with an eigenvalue larger than one. This factor explains 65% of the variance of the four used items. The Kaiser-Meier-Olkin measure of sampling adequacy is 0.67, Cronbach's alpha for a scale consisting of the four items is 0.88.

The two scales of the willingness to contribute to collective goods and the willingness to place trust are coded in such a way that higher scores go with higher willingness. Stated differently, the higher the score is, the lower the problem of free riding or the problem of trust among the members.

*Third*, the questionnaire included two items that asked the respondents whether they "...had ever contributed to the newsletter by writing something for it" and "...had ever sent teaching material to the OLC". The indicator measuring the self-reported behavior (*contribution to collective goods*) scores a 'one' if the respondent agreed to at least one of the items.

### The independent variables

The social embeddedness of the OLC is measured with the help of an unfolding scale analysis (van Schuur & Post 1990) of five six-point Likert-scaled items, which resulted in a Mudfold scale. The idea of an unfolding scale analysis is that a number of items and persons can be ordered unidimensionally with regard to a latent trait (in this case: the perceived degree to which a group constitutes an integrated community that shares many interests and activities in common). The items can be ordered according to the degree of integration they express and the persons can be ordered according to the degree of integration that they perceive. The smaller the distance between the item and the person on the one dimension (perceived respective expressed degree of group integration), the larger the probability of there being a

positive answer to the item from the respondent. The following five items were presented only to those members of the OLC that were subscribed to the community for more than one year. By doing so, it was made sure that only experienced members who are somewhat familiar with details of the community activities had to assess the following items.

"To what extent do you agree with the following statements about your own community?

- a) It is more a group of unconnected individuals than a community.
- b) It is a set of groups and cliques with their own interests and activities, but not much in common as a community.
- c) It is a set of groups and cliques with their own interests and activities, but also some common interests as a community.
- d) It is a moderately integrated community that shares some interests and some activities in common.
- e) It is a well-integrated community that shares many interests and activities in common."

The members were asked to assess the validity of these statements for their own community. They could choose on a six-point Likert rating scale with answers ranging from "totally disagree" to "totally agree". A Mudfold scale analysis was performed on the answers to the questions, excluding those answer patterns that cannot falsify the measurement assumptions. This resulted in a weak Mudfold scale consisting of all five items in the order a-b-c-d-e. The coefficient of scalability was  $H=0.30$  which is regarded as the lower boundary for an acceptable scale (van Schuur & Post 1990). The coefficients of scalability for the five items are .23, .31, .36, .30, and .34. Further scale analyses did not find scales with a higher coefficient of scalability that fulfilled the assumptions of a Mudfold scale in a satisfactory way. We elaborate on the issue of whether or not to use this unfolding scale in some more detail.

The scale analysis found that the items fulfill the assumptions of an unfolding scale in a proper way: The assumptions of a Mudfold scale imply a single-peaked item response curve for every item. The assumptions of the scale can be tested by inspecting the correlation matrix of the items, by analyzing the scalability, and by investigating the so-called conditional adjacency matrix. The correlation matrix (not shown here) reveals the perfect simplex pattern that is typical for data that confirms to an unfolding scale (see van Schuur & Kiers 1994). In such a case, a factor analysis of the same data would have led to two factors with eigenvalues larger than one. In such cases, the use of an unfolding technique is seen as more adequate to reveal a unidimensional bipolar scale instead of erroneously splitting up the data into two factors according to factor analysis (ibid.).

Pearson correlations (n=592):

| item | e | d      | c       | b       | a       |
|------|---|--------|---------|---------|---------|
| e    | 1 | .133** | -.189** | -.212** | -.421** |
| d    |   | 1      | .086*   | -.025   | -.095*  |
| c    |   |        | 1       | .491**  | .188**  |
| b    |   |        |         | 1       |         |
| a    |   |        |         |         | 1       |

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

The results of the analysis of the conditional adjacency matrix (with a cut-off value between 'disagree somewhat' and 'agree somewhat') revealed no serious violation of the assumption of a single-peaked item response curve (only summary statistics shown here, for details about their meaning, see (van Schuur & Post: 39ff)):

|     | A    | B    | C    | D    | E    | scale |
|-----|------|------|------|------|------|-------|
| Iso | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01  |
| Uni | 0.0  | 0.0  | 1.0  | 0.0  | 0.0  | 1.0   |
| Max | 0    | 0    | 0    | 0    | 0    | 0     |

Chapter 6.1.2 shows that the ordering of the OLCs according to the scale scores of embeddedness can be externally validated in a meaningful way. In OLCs that score higher there are more members having contact with each other outside of the community than in OLCs that score lower on the Mudfold scale. As a consequence, the scale is used as a proxy for the degree of embeddedness of the OLC. Since the embeddedness is a characteristic of the whole OLC the arithmetic mean of the members' answers of every OLC is taken as the final indicator of the embeddedness.

#### Other control variables

Since a number of other factors of influence might affect the relationship between embeddedness and the three problems of interaction the data analysis also includes (a limited number of ) other potential factors of influence. The measurements of these control variables are summarized briefly. The reader can reconstruct the measurement procedures with the help of the mentioned references and the items as mentioned in Appendix 1.

*Digital literacy* was measured with a slightly adapted version of as scale that was proposed and validated by Hargittai (2005). A factor analysis of the items 16a-16j (see Appendix 1) resulted in a single factor. *Digital experience* was measured by years of internet use (item 17). The tendency to give answers in a *socially desirable way* is measured with a shortened version of the BIDR 6 scale (see Paulhus 1991 and item series 51). *Trusting disposition* consists of one factor of four items of the scale proposed by Jarvenpaa and Leidner (see Jarvenpaa & Leidner 2000 and item series 49). *Pro-social orientation* is indicated by a score that stems from a shortened version of the so-called "decomposed games method" (see Snijders & Weesie 1999 and item series 50 for the details and further references). Information about the *group size* of the OLCs was gained by information from the managers of the OLCs. For nine OLCs the information was not available from the mangers and information from the web pages of the OLCS was taken instead. Finally, *age*, *gender*, and the *percentage of having a full-time job as a teacher* are included in the analyses.

## **6. Empirical Findings**

The 1259 respondents constitute a mixture of new and more experienced members of the OLCs. The "average member" is subscribed between 7-12 months in his community, as Table 1 shows. He or she uses the community one day in the week, and is not that active in the community (a score of 2 on a scale from 1 to 7). Most of the members are not new to the internet. Table 2 makes clear that about half of the respondents have been using the internet since more than 7 years. Only 8% use it less than 4 years. A minority of 9% of the respondents has a very high degree of digital literacy, as Picture 1 indicates. They reach the maximum score on the scale, although the scale was adapted to take into account newer developments on the internet. The other 91% of the respondents have a digital literacy that is distributed over the rest of the scale. A minority is very inexperienced with the internet: 3% of the respondents have a score of less than two standard deviations below the arithmetic mean of zero. Scale scores range from -2.3 to 1.4 with a standard deviation of 1. The median category is 0.1 (see Picture 1).



Table 1: How many months are you subscribed as a member?

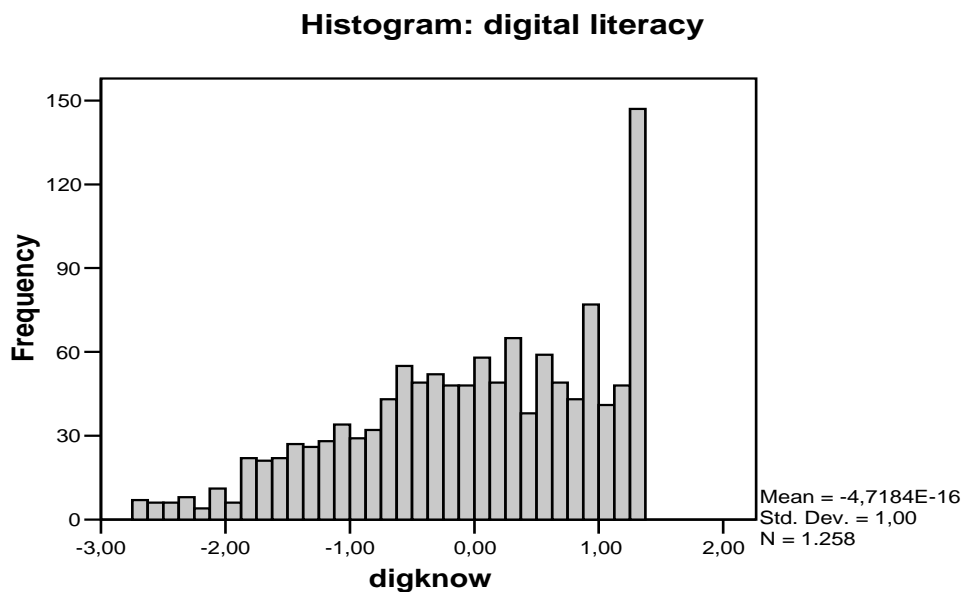
|         |                      | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|----------------------|-----------|---------|---------------|--------------------|
| Valid   | 1 less than 2 months | 101       | 8,0     | 8,0           | 8,0                |
|         | 2 2-6 months         | 348       | 27,6    | 27,7          | 35,7               |
|         | 3 7-12 months        | 217       | 17,2    | 17,2          | 52,9               |
|         | 4 13-24 months       | 234       | 18,6    | 18,6          | 71,5               |
|         | 5 more than 2 years  | 358       | 28,4    | 28,5          | 100,0              |
|         | Total                | 1258      | 99,9    | 100,0         |                    |
| Missing |                      | 1         | ,1      |               |                    |
| Total   |                      | 1259      | 100,0   |               |                    |

About 6% of the respondents have contributed to the electronic newsletter by writing a short article at least once. About 15% of the respondents reported to have sent some teaching material to the OLC. About 10% of the respondents did take place at at least one meeting of the members of the OLC that was organized by the management of the community. Given our sample size and assuming no selection bias, 95% confidence intervals around these percentages run from the percentage plus or minus 2.8 percentage points.

Table 2: Since how many years do you use the internet?

|         |                     | Frequency | Percent | Valid Percent | Cum. Percent |
|---------|---------------------|-----------|---------|---------------|--------------|
| Valid   | 0 less than 1 year  | 6         | ,5      | ,5            | ,5           |
|         | 1 less than 2years  | 7         | ,6      | ,6            | 1,0          |
|         | 2 2                 | 29        | 2,3     | 2,3           | 3,3          |
|         | 3 3                 | 60        | 4,8     | 4,8           | 8,1          |
|         | 4 4                 | 102       | 8,1     | 8,1           | 16,2         |
|         | 5 5                 | 188       | 14,9    | 14,9          | 31,2         |
|         | 6 6                 | 125       | 9,9     | 9,9           | 41,1         |
|         | 7 7                 | 98        | 7,8     | 7,8           | 48,9         |
|         | 8 more than 7 years | 643       | 51,1    | 51,1          | 100,0        |
| Total   | 1258                | 99,9      | 100,0   |               |              |
| Missing | System              | 1         | ,1      |               |              |
| Total   |                     | 1259      | 100,0   |               |              |

Picture 1: Frequency distribution of the scores on digital knowledge



The multivariate tests of the hypotheses can use the data of 936 respondents without missing values. Among these are 55% women and 45% men. The median age category is 46 years. Ages range from 20 to 68. From all respondents, 88% are Dutch, 6.5% are Belgian, 1.8% are German and 1% is American. The other 2% are mainly Turkish, Chinese, or Albanian. About 18% are singles, 30% have no children.

Further analyses show that a substantial number of respondents in fact do not have a position as a teacher. About 7% indicated that they do not have a teaching position. Some of them are students, some indicated that they became a member of the OLC for some other professional reasons. An additional 5% work as a teacher for not more than one day a week. The hypotheses, however, can only be tested using the data on the behavior of teachers. The measurements of the dependent variables presuppose that a respondent has a position as a teacher. Therefore the data analyses include only those respondents who reported having a teaching position of more than one day a week. This resulted in the exclusion of 12% of the respondents. Additional data cleaning showed that 6% of the respondents gave inconsistent answers to the questions on social orientation, a percentage that is not uncommon. In four small OLCs there were no respondents who were able to answer the questions on the social embeddedness. The sample size that is adequate for the tests of the three hypotheses consists thus of 726 respondents in 29 different OLCs of practice.

### 6.1.1. Descriptive Findings: An Inventory of interaction Problems in OLCs of Practice

In the following we describe the distributions of the 6 dependent. We explicitly focus on the three problems of interaction that are prevalent and whether there are differences between the 29 OLCs. First, the reported *actual contribution* to collective goods is examined. On average, 20% reports to have either sent teaching material or written something for the electronic newsletter (see Table 3). The proportion of contributors differs remarkably between the 29 OLCs.

Table 3: proportion of contributors per OLC

|                |       |
|----------------|-------|
| Number of OLCs | 29    |
| Mean           | ,2071 |
| Median         | ,1667 |
| Minimum        | ,00   |
| Maximum        | ,60   |
| 10             | ,0000 |
| 20             | ,0625 |
| 30             | ,0864 |
| 40             | ,1277 |
| Percentiles 50 | ,1667 |
| 60             | ,2000 |
| 70             | ,3023 |
| 80             | ,3846 |
| 90             | ,5000 |

In 5 OLCs the proportion of contributors is 0%. In 30% or nine of the OLCs the proportion is not larger than 6%. On the other hand, 7 OLCs have proportions of contributors that are higher than 33%. Across all 29 OLCs the proportion of contributors varies between 0%-60%. The differences between OLCs in the proportion of contributors are statistically significant ( $\chi^2=81.93$ ,  $df=28$ ,  $p<.01$ ).

Next, the willingness to contribute to common activities that create collective goods is investigated. The activities include the distribution of flyers, giving a presentation, mediation of conflicts between members, and participation in an advisory board. Table 4 shows the proportion of members per OLC who reported to be unwilling (definitely or likely) to participate in such activities. The arithmetic mean of the proportion of unwilling members is 54%, 70%, 75%, and 70% for the four activities. The activity with the smallest investment in time, the distribution of flyers, had the lowest proportion of unwilling members. The range in the proportion of unwilling members for the four activities is 17%-100%, 42-100%, 42-100%, and 25-100%.

Table 4: contribution to collective goods: proportion of members per OLC who answered "definitely not" or "likely not"

|                | board  | mediation | presentation | flyers |
|----------------|--------|-----------|--------------|--------|
| Number of OLCs | 29     | 29        | 29           | 29     |
| Mean           | ,70457 | ,75060    | ,70045       | ,53850 |
| Median         | ,70213 | ,74074    | ,67901       | ,50000 |
| Minimum        | ,250   | ,417      | ,417         | ,167   |
| Maximum        | 1,000  | 1,000     | 1,000        | 1,000  |
| Percentiles    |        |           |              |        |
| 20             | ,53846 | ,67442    | ,58242       | ,38462 |
| 40             | ,66667 | ,73333    | ,63636       | ,48936 |
| 60             | ,72727 | ,75000    | ,73913       | ,52381 |
| 80             | ,81250 | ,83333    | ,83333       | ,66667 |

An analysis of variance of the factor score shows that the differences between the four OLCs in the willingness to contribute to common activities that produce collective goods are only marginally significant ( $F=1.48$ ,  $df_1=28$ ,  $df_2=697$ ,  $p=.053$ ).

The willingness to place trust is indicated by the willingness to participate in four activities: sending of own teaching material, anonymous sending of own teaching material, letting own teaching material be reviewed, and letting own teaching material be reviewed anonymously. Table 5 presents the proportion of members per OLC who reported to be unwilling (either definitely or unlikely) to place trust in these four activities.

Table 5: placement of trust: proportion of members per OLC who answered "definitely not" or "likely not"

|                | being anonymously reviewed | being reviewed | anonymous sending | sending |
|----------------|----------------------------|----------------|-------------------|---------|
| Number of OLCs | 29                         | 29             | 29                | 29      |
| Mean           | ,14645                     | ,23673         | ,11786            | ,12410  |
| Median         | ,13433                     | ,19753         | ,09091            | ,08333  |
| Minimum        | ,000                       | ,000           | ,000              | ,000    |
| Maximum        | ,500                       | 1,000          | ,500              | ,500    |
| Percentiles    |                            |                |                   |         |
| 20             | ,06667                     | ,08333         | ,00000            | ,02564  |
| 40             | ,09890                     | ,17910         | ,07463            | ,06977  |
| 60             | ,13889                     | ,23077         | ,12088            | ,11111  |
| 80             | ,18182                     | ,27273         | ,17391            | ,18182  |

The average proportion of members per OLC who are not willing to place trust for the four activities is 12%, 12%, 24%, and 15%. We see that the proportion of members who are

unwilling to engage in trusting activities is lower than the proportion of members who are unwilling to participate in the contribution of collective goods. The range in the proportion of unwilling members per OLC for the four trusting activities is 0-50%, 0-50%, 0-100%, and 0-50%. The values of the 80% percentiles imply the following. For three trusting activities (sending, anonymous sending, being anonymously reviewed) in most OLCs (23 out of 29) the proportion of unwilling members is not higher than 18%. In the other six OLCs the proportion rises up to 50%. The unwillingness to send teaching material for a public review is higher than the unwillingness for the other three trusting activities. It reaches a proportion of more than 27% among the members in six of the 29 OLCs. The differences between the OLCs in the willingness to place trust are limited. An analysis of variance of the factor score to place trust shows that the difference is not significant ( $F=1.28$ ,  $df_1=28$ ,  $df_2=697$ ,  $p=.15$ ).

Finally, we examine the *perceived intensity of the three problems of interaction* in the OLCs. We look at the extent to which free riding, mutual trust, and membership fluctuations, are considered problematic for the whole OLC by the members. A reasonable assessment of the prevalence of these problems necessitates some acquaintance with the OLC as a whole: we assume that these questions could only be answered by members who are subscribed to the OLC for more than half a year. Out of the 726 respondents we have 512 respondents in 28 OLCs. In one OLC none of the respondents was longer than half a year subscribed.

Table 6 gives information about the perceived intensity of the problem of *free riding* and about the variance of the problem intensity between the 28 OLCs. The table shows the proportion of members who answered that the problem is prevalent to "some extent", "to a reasonable extent", "to a large extent", or "to a very large extent".

Table 6: proportion of members per OLC reporting that the problem of free riding is prevalent at least "to some extent"

|                | too few active members | members wait until others contribute | too less sending of teaching material |
|----------------|------------------------|--------------------------------------|---------------------------------------|
| Number of OLCs | 28                     | 28                                   | 28                                    |
| Mean           | ,47763                 | ,38297                               | ,46032                                |
| Median         | ,50000                 | ,43108                               | ,48529                                |
| Minimum        | ,000                   | ,000                                 | ,000                                  |
| Maximum        | 1,000                  | ,667                                 | 1,000                                 |
| Percentiles    |                        |                                      |                                       |
| 20             | ,25870                 | ,16667                               | ,31921                                |
| 40             | ,44119                 | ,36010                               | ,39000                                |
| 60             | ,56417                 | ,50000                               | ,50952                                |
| 80             | ,67879                 | ,53576                               | ,64242                                |

The arithmetic mean of the proportion of members who evaluate that the problem is prevalent at least to some extent is 46%, 38%, and 48% for the three activities. The proportion in the OLCs ranges from 0%-100% for the problem of too less sending of teaching material and the problem of too few active members. It ranges from 0-67% for the problem that members wait to contribute until others do so. The intensity of the problem of free riding varies significantly between the 28 OLCs ( $F=2.11$ ,  $df_1=27$ ,  $df_2=484$ ,  $p<.01$ ).

The prevalence of the problem of *trust* is measured by four items. Table 7 shows the proportion of members per OLC who answered that the problem of trust is prevalent to "some extent", "to a reasonable extent", "to a large extent", or "to a very large extent". The arithmetic mean of the proportion of members who evaluate that the problem is prevalent at least to

some extent is 3%, 11%, 29%, and 11% for the four indicators. These numbers are smaller than the numbers for the mentioned problems of free riding (compare Table 7 and Table 6). The proportions of members who argue that the mentioned problems of trust are prevalent in the OLCs range from 0%-17%, 0-50%, 0-100%, and 0-28% for the four indicators. The intensity of the problem of trust (factor score) varies significantly between the 28 OLCs ( $F=1.64, df_1=27, df_2=484, p<.05$ ).

Table 7: proportion of members per OLC reporting that the problem of trust is prevalent at least "to some extent"

|                | Members are afraid that sent information is misused | Members hesitate to write out problems at work | Members hesitate to use the information | Members do not trust each other |
|----------------|---|--|---|---------------------------------|
| Number of OLCs | 28  | 28   | 28                                      | 28                              |
| Mean           | ,10693  | ,28797   | ,10734                                  | ,03075                          |
| Median         | ,11012  | ,25000   | ,06158                                  | ,00000                          |
| Minimum        | ,000  | ,000   | ,000                                    | ,000                            |
| Maximum        | ,273  | 1,000  | ,500                                    | ,167                            |
| Percentiles    |   |  |   |                                 |
| 20             | ,00000  | ,16667   | ,00000                                  | ,00000                          |
| 40             | ,07143  | ,22857   | ,03894                                  | ,00000                          |
| 60             | ,12959  | ,29647   | ,09806                                  | ,01749                          |
| 80             | ,16667  | ,45455   | ,25000                                  | ,06667                          |

The prevalence of the problem of membership fluctuation is measured by one item. Table 8 shows the proportion of members per OLC who answered that the problem of membership fluctuation is prevalent to "some extent", "to a reasonable extent", "to a large extent", or "to a very large extent" in the OLC. It shows that only few members argue that the problem of membership fluctuation is prevalent to at least some extent. In 19 of the 28 OLCs (68%) no member argues that there is a problem of membership fluctuation at hand. Only in a minority of OLCs the problem is prevalent. In 9 of the 28 OLCs the proportion of members who argue that membership fluctuation is a problem ranges from 1.4%-12.5%.

Table 8: proportion of members per OLC reporting that the problem of membership fluctuation is prevalent at least "to some extent"

|                |        |
|----------------|--------|
| Number of OLCs | 28     |
| Mean           | ,01826 |
| Median         | ,00000 |
| Minimum        | ,000   |
| Maximum        | ,125   |
| Percentiles    |        |
| 20             | ,00000 |
| 40             | ,00000 |
| 60             | ,00000 |
| 80             | ,03473 |

Although membership fluctuation seems to be less of a problem than free riding and (a lack of) mutual trust, there are nevertheless significant differences between the OLCs in this respect ( $F=1.86, df_1=27, df_2=484, p<.01$ ).

The descriptive analyses presented in the tables provide an inventory of the three problems of interaction in the OLCs. They show the following. The reported behavior of the respondents

makes clear that only a minority contributes to activities that produce collective goods for the whole community. The degree of reported activity varies strongly between the OLCs (see Table 3). The willingness to participate in future activities that contribute to collective goods is only moderate. There are some differences between the OLCs with respect to the average willingness to contribute. Stated differently, the results suggest that the problem of free riding is a crucial problem in the OLCs. The numbers suggest that some OLCs might be more successful in alleviating the problem than others (Table 4). Our data also show that members indeed perceive that the problem is prevalent in the OLCs. They also perceive that some OLCs are more successful in solving the problem of free riding than others (see Table 6).

The problem of (a lack of) trust is also prevalent in the OLCs. However, Table 5 suggests that this issue is less of a problem compared to free riding. On the average, a minority of respondents, although not a small one, reported that they likely would not be willing to place trust. There is only limited variation in this reported willingness to place trust between the OLCs. The distribution of the perceived intensity of the problem of trust by the members differs from the distribution of the reported willingness to place trust. There is significant variation between the OLCs in the perceived intensity of the problem of trust. According to the members, some OLCs are more successful than others in diminishing problems of trust (Table 7).

From the point of view of the members, membership fluctuation is a problem of only limited intensity. In all OLCs only a small proportion of the members regard the problem as significant. Nevertheless there is some variation between the OLCs in the perceived intensity of the problem (see Table 8).

**6.1.2 The Social Embeddedness**

In the following the 29 OLCs are characterized by their degree of embeddedness. Table 9 shows that the embeddedness scores range form 14-34.5. As these are scores of a Mudfold scale, the numbers themselves do not have a substantial meaning. They just show that the OLCs can be ordered according to their degree of embeddedness. Moreover, they show that the distribution of the embeddedness scores roughly is symmetrical around the midpoint.

Table 9: distribution of embeddedness

|                |         |
|----------------|---------|
| Number of OLCs | 29      |
| Mean           | 26,4202 |
| Median         | 26,5000 |
| Minimum        | 14,00   |
| Maximum        | 34,50   |
| Percentiles    |         |
| 10             | 21,0000 |
| 20             | 23,7917 |
| 30             | 25,0000 |
| 40             | 25,8571 |
| 50             | 26,5000 |
| 60             | 27,7083 |
| 70             | 28,5814 |
| 80             | 29,6667 |
| 90             | 31,8571 |

Picture 2: embeddedness scores

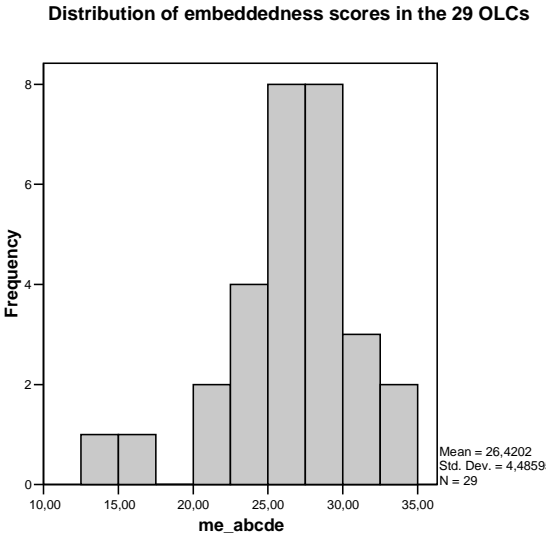


Table 10 shows the results of an analysis of variance of the original scores of the 792 respondents who answered the questions about the degree of embeddedness (see Chapter 5.2.). It reveals that the differences between the OLCs are statistically significant ( $p=0.002$ ).

Table 10: analysis of variance of perceived degree of embeddedness

|                | Sum of Squares | df  | Mean Square | F     | Sig. |
|----------------|----------------|-----|-------------|-------|------|
| Between Groups | 3759,177       | 26  | 144,584     | 2,095 | ,002 |
| Within Groups  | 25118,802      | 364 | 69,008      |       |      |
| Total          | 28877,980      | 390 |             |       |      |

The numbers show that it is justified to distinguish between highly embedded and weakly embedded OLCs of practice. What this implies in substantial terms can be illustrated as follows. We asked the respondents to agree or disagree to the following item: "In our community there are groups of members who are in regular contact with each other outside of the community." In the 20% of the OLCs that score lowest on the embeddedness scale only 23% of the respondents agreed to this item. This proportion rises to 46% in the 20% of the OLCs that score highest on the embeddedness scale.

## 6.2 Tests of the Hypotheses

We now present the results of the tests of the three hypotheses. The hypotheses predict that OLCs of practice that have a higher degree of embeddedness tend to be more successful in diminishing the three problems of interaction. We analyze whether there is a significant association between the degree of embeddedness and the reported contribution behavior, the reported willingness to place trust or to contribute to collective goods, and the perceived intensity of the problems of trust, free riding and membership fluctuation. So we have 6 dependent variables and the data are clustered in 29 groups so that a (multilevel) analysis is needed that takes this kind of clustering into account (Snijders & Bosker 1999). The presentation of the results focuses on 2-level multiple linear or logistic regression analysis. (Additionally, for the linear regression analyses we first present the simple bivariate association between the embeddedness and the chosen indicator of problem intensity.) The multilevel analysis controls for a number of factors that potentially affect the problem intensity. For the linear regression analyses we first present the so-called "empty model" that estimates how large the variance between the OLCs is. For the linear and the logistic regression analyses we then present the net effect of embeddedness after the effects of nine other factors are removed. The analyses should not be interpreted to provide a test of the causal mechanisms that are hypothesized to affect the intensity of the three problems. They do test, however, whether there is empirical evidence for the hypothesis that highly embedded OLCs of practice are more successful than virtual ones.

We start with the multilevel logistic regression analysis of the actual contribution behavior. Here it does not make sense to split the variance into the two levels so that no "empty model" is presented. Instead, we present a model that includes only the effect of embeddedness. Table 11 shows that the embeddedness has a positive and significant effect on the likelihood that a member contributed by either sending teaching material or writing an article for the electronic newsletter. There is a significant bivariate association between embeddedness and the contributing behavior. Moreover, the effect remains statistically significant after a number of potentially intervening factors are included. We see that the likelihood of a contribution increases with the digital literacy, with the internet experience and with the degree of trustfulness of the respondent. Those who are more pro-social do not report to have

contributed more often. Neither do those who score higher on the social desirability scale. Age, gender, and the percentage of a full-time job also do not affect the likelihood.

Table 11: Two-level logistic regression analysis of actual contribution behavior

| Variable                                 | Model 1                             | Model 2                             |                            |
|--|-------------------------------------|-------------------------------------|----------------------------|
|  | Estimated value<br>(standard error) | Estimated value<br>(standard error) |                            |
| <b>Group level effect:</b>               |                                     |                                     |                            |
| social embeddedness                      | .123* (.054)                        | .148*                               | (.066)                     |
| group size                               |                                     | .000                                | (.003)                     |
| <b>Individual level effects:</b>         |                                     |                                     |                            |
| digital literacy                         |                                     | .455**                              | (.121)                     |
| digital experience                       |                                     | .141*                               | (.067)                     |
| trusting disposition                     |                                     | .238*                               | (.112)                     |
| Pro-social orientation                   |                                     | .290                                | (.492)                     |
| social desirability                      |                                     | .003                                | (.111)                     |
| gender (1=female)                        |                                     | .236                                | (.235)                     |
| Age                                      |                                     | .013                                | (.010)                     |
| percentage of full-time job as a teacher |                                     | .006                                | (.005)                     |
| *: $p \leq .05$                          |                                     | **: $p \leq .01$ (one sided)        |                            |
| $N=726$ $n=29$                           |                                     | $\tau_0^2 = 0.411$ (0.202)          | $\tau_0^2 = 0.481$ (0.229) |

$N$ : level 1 sample size (number of individuals);  $n$ : level 2 sample size (number of groups);  $\tau_0^2$ : level 2 variance of the intercept

Next, we analyze whether the willingness to contribute to collective goods in the future is affected by the degree of embeddedness. When we do not take into account the clustering of the data then we find that Pearson's  $r$  for the two variables equals 0.09. The empty model of Table 12 shows that only 1% of the variance is between the groups. Model 2 shows that a number of variables have significant effects. Those with more digital literacy, those who are more trustful and those who have a stronger pro-social orientation are more willing to participate in the contribution of collective goods. Additionally, the effect of embeddedness is significant and positive. Highly embedded OLCs are more successful than solely virtual ones in the sense that they have more members who report to be willing to contribute.

To what extent does embeddedness increase the willingness score? The difference in the average willingness scores between a member in a weakly embedded OLC (20% percentile value) and a member in a highly embedded OLC (80% percentile value) is 0.265. This is 29% of the standard deviation of the scores in the sample of 726 respondents. The difference in the average willingness score between a member with a somewhat low digital literacy (20% percentile value) and a somewhat high digital literacy (80% percentile value) is 0.244. This is 27% of the standard deviation of the willingness scores.



Table 12: Two-level linear regression analysis of willingness to contribute

| Variable   | Model 1                             | Model 2                             |
|--|-------------------------------------|-------------------------------------|
|  | (empty model)                       |                                     |
|  | Estimated value<br>(standard error) | Estimated value<br>(standard error) |
| <b>Group level effect:</b>   |                                     |                                     |
| social embeddedness  |                                     | .045** (.013)                       |
| group size   |                                     | -.001 (.001)                        |
| <b>Individual level effects:</b>   |                                     |                                     |
| digital literacy   |                                     | .122** (.036)                       |
| digital experience   |                                     | .024 (.020)                         |
| trusting disposition   |                                     | .066* (.036)                        |
| Pro-social orientation   |                                     | .546** (.158)                       |
| social desirability  |                                     | -.016 (.037)                        |
| gender (1=female)  |                                     | -.039 (.071)                        |
| Age  |                                     | -.001 (.003)                        |
| percentage of full-time job as a teacher   |                                     | .001 (.002)                         |
| *: $p < .05$ **: $p < .01$ (one sided) $\sigma^2 = 0.807$ (0.043) $\sigma^2 = 0.777$ (0.041) |                                     |                                     |
| $N = 726$ $n = 29$ $\tau_0^2 = 0.008$ (0.010) $\tau_0^2 = 0$ (-)                             |                                     |                                     |

$N$ : level 1 sample size (number of individuals);  $n$ : level 2 sample size (number of groups);  $\tau_0^2$ : level 2 variance of the intercept,  $\sigma^2$ : level-1-variance

The results of the first model of Table 13 show that only 1% of the total variance is between the OLCs. Model 2 shows that those who have a higher digital literacy, more digital experience, and those who are more trustful are more willing to place trust by sending their teaching material. The most important point is that the effect of embeddedness is positive and significant. This is in accordance with the prediction of hypothesis 2. In OLCs with a higher degree of embeddedness members tend to be more willing to place trust than in solely virtual OLCs. The results suggest that there is a positive effect of embeddedness on the willingness to place trust.

Next we analyze the perceived intensity of the three problems of interaction. The three hypotheses imply that we should find a negative effect of the embeddedness on the perceived intensity of the three problems (free riding, lack of trust, and membership fluctuation). In Table 14 we start with the problem of free riding. The analysis tests whether in embedded OLCs the members perceive a larger intensity of free riding than the members in virtual OLCs of practice. The bivariate association between embeddedness and the perceived problem intensity of free riding equals  $-0.14$ . Pearson's  $r$ , however, does not take into account the clustering of the data. Table 14 presents the results of a 2-level multiple linear regression analysis that does take the clustering into account.

Table 13: Two-level linear regression analysis of willingness to place trust

| Variable   | Model 1                             | Model 2                             |
|--|-------------------------------------|-------------------------------------|
|  | (empty model)                       |                                     |
|  | Estimated value<br>(standard error) | Estimated value<br>(standard error) |
| <b>Group level effect:</b>   |                                     |                                     |
| social embeddedness  |                                     | .040** (.012)                       |
| group size   |                                     | -.001 (.001)                        |
| <b>Individual level effects:</b>   |                                     |                                     |
| digital literacy   |                                     | .068* (.037)                        |
| digital experience   |                                     | .041* (.020)                        |
| trusting disposition   |                                     | .164** (.037)                       |
| Pro-social orientation   |                                     | .360* (.162)                        |
| social desirability  |                                     | -.036 (.037)                        |
| gender (1=female)  |                                     | .110 (.073)                         |
| Age  |                                     | -.010* (.003)                       |
| percentage of full-time job as a teacher   |                                     | .002 (.002)                         |
| *: $p < .05$ **: $p < .01$ (one sided) $\sigma^2 = 0.869$ (0.046) $\sigma^2 = 0.818$ (0.043) |                                     |                                     |
| $N = 726$ $n = 29$ $\tau_0^2 = 0.007$ (0.01) $\tau_0^2 = 0$ (-)                              |                                     |                                     |

$N$ : level 1 sample size (number of individuals);  $n$ : level 2 sample size (number of groups);  $\tau_0^2$ : level 2 variance of the intercept,  $\sigma^2$ : level-1-variance

6% of the variance of the perceived intensity of the free rider problem is between the OLCs (Model 1 of Table 14). The variance between the OLCs reduces to zero after the inclusion of the individual characteristics and the group characteristics (see Model 2 of Table 14). A model that includes a level-2 residual variance does not fit better with the data ( $\chi^2 = 2.066$ ,  $df = 1$ ,  $p = .151$ ). The results imply that those who have a stronger pro-social orientation, women, and those who score higher on the social desirability scale report to perceive less problems of free riding. Most important, embeddedness has the expected negative and statistically significant effect. In embedded OLCs the perceived intensity of the problem of free riding tends to be lower than in virtual ones. This is in accordance with hypothesis 1.

Table 15 present the results of the analysis of the perceived degree of trust problems between members. The bivariate association between embeddedness and the perceived problem intensity of free riding equals  $-0.13$ . Again, in Table 15 we now take the clustering within OLCs into account. Only 3% of the variance of the perceived intensity of the problem of trust is between the OLCs (Model 1 of Table 15). After the inclusion of the variables in Model 2 of Table 15 the variance between the OLCs is insignificant ( $\chi^2 = 0.1$ ,  $df = 1$ ,  $p = .75$ ). We see that those who have a stronger pro-social orientation and those who have less digital literacy perceive a higher intensity of the problem of trust. Most importantly, the effect of embeddedness is negative and statistically significant, as hypothesized. Embedded OLCs tend to have less problems of trust in the eye of their members than virtual ones.

Table 14: Two-level linear regression analysis of perceived free rider problem

| Variable   | Model 1                             | Model 2                             |
|--|-------------------------------------|-------------------------------------|
|  | (empty model)                       |                                     |
|  | Estimated value<br>(standard error) | Estimated value<br>(standard error) |
| <b>Group level effect:</b>   |                                     |                                     |
| social embeddedness  |                                     | -.034* (.016)                       |
| group size   |                                     | -.001 (.000)                        |
| <b>Individual level effects:</b>   |                                     |                                     |
| digital literacy   |                                     | .039 (.045)                         |
| digital experience   |                                     | -.019 (.025)                        |
| trusting disposition   |                                     | .006 (.043)                         |
| Pro-social orientation   |                                     | .381* (.182)                        |
| social desirability  |                                     | -.095* (.044)                       |
| gender (1=female)  |                                     | -.150* (.089)                       |
| Age  |                                     | .001 (.004)                         |
| percentage of full-time job as a teacher   |                                     | .002 (.002)                         |
| *: $p < .05$ **: $p < .01$ (one sided) $\sigma^2 = 0.761$ (0.049) $\sigma^2 = 0.772$ (0.049) |                                     |                                     |
| $N = 512$ $n = 28$ $\tau_0^2 = 0.052$ (0.028) $\tau_0^2 = 0$ (-)                             |                                     |                                     |

$N$ : level 1 sample size (number of individuals);  $n$ : level 2 sample size (number of groups);  
 $\tau_0^2$ : level 2 variance of the intercept,  $\sigma^2$ : level-1-variance

Table 15: Two-level linear regression analysis of perceived problems of trust

| Variable   | Model 1                             | Model 2                             |
|--|-------------------------------------|-------------------------------------|
|  | (empty model)                       |                                     |
|  | Estimated value<br>(standard error) | Estimated value<br>(standard error) |
| <b>Group level effect:</b>   |                                     |                                     |
| social embeddedness  |                                     | -.038* (.015)                       |
| group size   |                                     | -.001 (.001)                        |
| <b>Individual level effects:</b>   |                                     |                                     |
| digital literacy   |                                     | -.096* (.044)                       |
| digital experience   |                                     | -.016 (.025)                        |
| trusting disposition   |                                     | -.070 (.043)                        |
| Pro-social orientation   |                                     | .312* (.180)                        |
| social desirability  |                                     | -.052 (.043)                        |
| gender (1=female)  |                                     | -.132 (.083)                        |
| Age  |                                     | -.006 (.004)                        |
| percentage of full-time job as a teacher   |                                     | .002 (.002)                         |
| *: $p < .05$ **: $p < .01$ (one sided) $\sigma^2 = 0.768$ (0.050) $\sigma^2 = 0.743$ (0.046) |                                     |                                     |
| $N = 512$ $n = 28$ $\tau_0^2 = 0.026$ (0.019) $\tau_0^2 = 0$ (-)                             |                                     |                                     |

$N$ : level 1 sample size (number of individuals);  $n$ : level 2 sample size (number of groups);  
 $\tau_0^2$ : level 2 variance of the intercept,  $\sigma^2$ : level-1-variance

Table 16 analyzes the problem of membership fluctuation. The bivariate association between embeddedness and the perceived problem intensity of free riding is only  $-0.03$ . Table 16 presents the results of a 2-level multiple linear regression analysis that takes the clustering into account. We see that 4% of the variance of the perceived intensity of the problem of membership fluctuation is between the OLCs. Only gender has a significant effect on the perceived problem of membership fluctuation. Women regard the problem of membership fluctuation as less intensive. Most important, the embeddedness does *not* show an effect on the perceived intensity of the problem of membership fluctuation. In general, differences in the perceived problem of membership fluctuation cannot be explained very well by the model. Only one out of nine variables shows a significant effect.

Table 16: Two-level linear regression analysis of problem of perceived membership fluctuation

| Variable   | Model 1                             | Model 2                             |
|--|-------------------------------------|-------------------------------------|
|  | (empty model)                       |                                     |
|  | Estimated value<br>(standard error) | Estimated value<br>(standard error) |
| <b>Group level effect:</b>   |                                     |                                     |
| social embeddedness  |                                     | .015 (.029)                         |
| group size   |                                     | -.001 (.001)                        |
| <b>Individual level effects:</b>   |                                     |                                     |
| digital literacy   |                                     | -.013 (.056)                        |
| digital experience   |                                     | -.052 (.031)                        |
| trusting disposition   |                                     | -.044 (.055)                        |
| Pro-social orientation   |                                     | .160 (.230)                         |
| social desirability  |                                     | -.026 (.055)                        |
| gender (1=female)  |                                     | -.279* (.113)                       |
| Age  |                                     | -.005 (.005)                        |
| percentage of full-time job as a teacher   |                                     | .001 (.002)                         |
| *: $p < .05$ **: $p < .01$ (one sided) $\sigma^2 = 1.196$ (0.076) $\sigma^2 = 1.181$ (0.076) |                                     |                                     |
| $N = 512$ $n = 28$ $\tau_0^2 = 0.055$ (0.034) $\tau_0^2 = 0.081$ (0.043)                     |                                     |                                     |

$N$ : level 1 sample size (number of individuals);  $n$ : level 2 sample size (number of groups);  $\tau_0^2$ : level 2 variance of the intercept,  $\sigma^2$ : level-1-variance

### Summary of the data analyses

The results of the data analysis can be summarized as follows. In Chapter 6 we analyzed six indicators of the problems of (lack of) trust, free riding, and membership fluctuation. A small proportion of members report having contributed to the production of collective goods. On the average, about 17% of the members of an OLC reports to do so. The proportion of contributing members varies significantly between the OLCs. Moreover, on the average about 50-74%, depending on the type of activity, of the members of an OLC report not being willing to participate in future common activities. The willingness to participate varies only to a limited extent between the groups. On average, about 43%, 48%, and 50% perceive three different problems of free riding as prevalent in their OLC. The perceived intensity of the

problems of free riding varied significantly between the OLCs. We regard the findings as support for the hypothesis that problems of free riding are a significant type of problem in OLCs of practice. Moreover, the data suggest that some OLCs are more successful than others in diminishing the intensity of the problem.

The majority of members report to be willing to place trust in other members by participating in the sending of teaching material. The proportion of unwilling members in an OLC ranges, on the average, from 8-20% for four different types of activities. The average willingness varied hardly between the OLCs. Depending on the indicator of a trust problem, on the average between 0-25% of members of an OLC perceive problems of trust as being prevalent. The perceived intensity of problems of trust varies significantly between the OLCs. We regard the findings as supportive for the hypothesis that problems of trust are prevalent at a moderate intensity. In some OLCs problems of trust play a significant role.

Problems of membership fluctuation play only for a minority of members a role. Nevertheless the perceived problem intensity varied significantly between the OLCs. While in most OLCs only a very small minority regards membership fluctuation as a serious problem, in a few OLCs the minority reaches a somewhat larger threshold. We regard the findings as supportive for the hypothesis that problems of membership fluctuation in general do not play a role in the OLCs. Only in a few OLCs membership fluctuation is a problem of moderate relevance.

The tests of the three hypotheses showed that differences in the perceived intensity of the problem of membership fluctuation cannot be explained by social embeddedness. *No empirical evidence for hypothesis 3* can be found. Differences in the reported contribution behavior, the willingness to participate in future contributing activities, as well as in the perceived intensity of problems of free riding *can* be explained by differences in the degree of social embeddedness. We regard these findings as *supporting hypothesis 1*. Differences in the willingness to place trust and differences in the perceived intensity of trust problems can be explained by differences in the degree of embeddedness. We regard the findings as *supportive for hypothesis 2* claiming that in embedded OLCs of practice there are less problems of trust than in virtual ones.

The findings suggest that the social embeddedness of OLCs of practice could be a factor of influence that affects their success. We intend to analyze the data in more detail to get a better understanding of the underlying causal mechanism (cf. Chapter 4). Managers of OLCs can take into account the degree of embeddedness during their management activities if they think that in their OLC problems of trust or free riding limit the values of the OLC for the members, or could consider to actively promote embeddedness outside the virtual community.

## **7. Summary and Conclusions: The Design of Online Communities of Practice**

This paper analyzes the question whether embedded online communities of practice are more successful than exclusively virtual ones. Interaction in groups on the internet often does not run smoothly because typical problems of group interaction can limit the value of the online community for the member. In the literature on online communities of practice a distinction is made between three typical problems of interaction, namely problems of free riding, problems of trust, and the problem of membership fluctuation. It is argued that the problems diminish the motivation to share knowledge in online groups so that members of knowledge sharing communities profit less from each other. Empirical research suggests that a remarkable number of online communities suffer from these problems (see Chapter 2). Social psychological theories are only of limited value to generate insights about the social

conditions that influence the emergence and the diminishment of the problems (Chapter 3). Consequently, another perspective for the analysis of the problems is proposed here. Starting point of this alternative perspective is the insight that interaction on the internet is in many cases not limited to the internet, but is combined with some degree of offline interaction. This is often called the “social embeddedness of online interaction”. A higher degree of embeddedness implies a higher density of the network in the offline world. A high degree of embeddedness need not imply that all members know each other or interact with each other. The point is that a high degree of embeddedness can change the situation even for those members who do not interact with other members in the offline world. Empirical studies of online communities often point to the fact that in the communities some members build up relationships and they transfer some of their online relations into the offline world (see Chapter 4.1). We propose three different theories that provide insight into the effects of a high degree of social embeddedness. All three theories claim that a high density of the network of relations in the offline world has important consequences for the interaction in online communities of practice. According to the reputation model a high degree of embeddedness provides incentives to the members to become active in knowledge sharing activities because this is a way of gaining reputation and status in the online community. An alternative theory is Coleman’s (1990) model of norm emergence. The main argument is that a high degree of embeddedness facilitates the emergence of a cooperative norm. Such a norm prescribes members to share their knowledge with others. Finally, the theory of relational signals argues that a member’s interaction behavior sends signals to other members. The signals are interpreted as revealing information about the intentions of the members. For example, a lack of participation in common activities can be understood by others as a general disinterest to develop a relationship. A high degree of embeddedness, however, makes the members more interdependent. The more they are dependent on each other, the more they are interested in maintaining a satisfying relationship with others. Consequently, under a high degree of embeddedness they have an incentive to avoid anything that signals a lack of interest (see Chapter 4.2). Three hypotheses about the effects of a high degree of social embeddedness were derived. In online communities of practice, under a high degree of embeddedness there will be 1. less free riding 2. less problems of trust, and 3. less membership fluctuation than under a low degree of embeddedness.

The three hypotheses are tested by means of questionnaire data. A random sample of members of 33 online communities of practice for secondary teachers answered a number of questions about the social embeddedness and the problems of interaction in their communities. The response rate is 37%. Three different types of indicators of the problems of interaction are used. First, the respondents report about their contributing *behavior* to collective goods, such as the writing of a short article for an electronic newsletter that is sent to the whole community. Second, the respondents describe their reaction in a number of realistic scenarios. In the scenarios they have to decide whether they are willing to place trust in other members, for example by sending their teaching material for a review by other members. Moreover, they have to decide whether they would be willing to contribute to activities that produce collective goods for the online community, such as mediating conflicts between members or participating in an advisory board of the online community. These items are indicators of the members’ *willingness* to place trust and to contribute to collective goods. Third, the *perceived intensity* of the problems of trust, free riding, and membership fluctuation in the online community are assessed by respondents who are somewhat longer subscribed as a member. This makes sure that the respondents are acquainted enough with the community so that they are able to provide a more valid picture of the intensity of the three problems (see Chapter 5).

The descriptive results showed that the problem of membership fluctuation plays a role only in a small number of online communities. Problems of trust and especially problems of free riding are much more significant problems. The hypotheses were tested with the help of multilevel (linear or logistic) regression analyses that include a number of other possibly intervening factors, such as group size, pro-social orientation, digital literacy etc. The results of the tests of the three hypotheses provide evidence for the first and second hypotheses, but not for the third hypothesis about membership fluctuation. The effects of embeddedness on the problems of free riding and trust were in the right direction and were significant across the different analyses. The embedded online communities of practice had less problems of trust and less problems of free riding than virtual ones. They did not suffer more or less from the problem of membership fluctuation (see Chapter 6).

The failure to find support for the hypothesis on membership fluctuation can have different reasons. It could be that the online communities of teachers have the special characteristic that they are more stable than other online communities of practice because many of their members have a long-term professional interest in the community. It could also be that the used indicator, which consisted of only a single item in this case, is not an adequate one. Moreover, it could also be that the beneficial effects of the social embeddedness are of such a limited size that they do not affect a member's decision about staying in the community or leaving it. The extremely low proportion of members who report that membership fluctuation would be a problem supports the first explanation. Future research has to shed more light on this question.

The data analyses provide evidence for the hypothesis that the embedded online communities are more successful than the virtual ones with regard to problems of trust and free riding. This is promising for the management of online communities and for future research on interaction in online communities. This is different from claiming that the analyses provide evidence for a *causal* relationship. For some of the indicators, the causal relationship might be the other way around. Moreover, the data analysis models could be extended in different ways. It could be that some of the control factors interact with each other or that they interact with the embeddedness. Also, it could be that other group characteristics of the OLCs play a role, such as the average degree of digital literacy in the group etc. A thorough causal analysis, however, is beyond the scope of this paper.

The findings have interesting implications for the social design and for the management of online communities in general, not only for online communities for teachers. The degree of social embeddedness can be influenced in a number of ways. When a *new* online community is founded, one can think about the target group of the community. The target group either can be very large. This often implies a more heterogeneous group of members. It is to be expected that in such a community only for smaller subgroups of members some degree of offline interaction is interesting. In the whole community the overlap of interests is limited. The consequence is that although a very broad target group may lead to a larger online community, it will in all likelihood also lead to a limited amount of social embeddedness. The community founders already in an early phase can decide whether they want to accept a higher degree of problems of free riding and trust in such a large community. They may prefer to have a community of limited size with less problems of interaction. Moreover, in an already *existing* online community the degree of embeddedness can be influenced in different ways. For example, the administrator can decide to focus his or her marketing activities for new members not on isolated individuals. Rather, he can focus on clusters of individuals who are already in contact with each other. If a complete cluster of related individuals subscribes to the community then the members 'import' their embeddedness to the online community.

Another strategy to increase the embeddedness is to organize or to support offline meetings. The virtual organization of this study followed such a strategy. We would like to add that not only the *organization* of member meetings can be a good strategy. An interesting aspect is that it can already be beneficial to the group when the fact that offline meetings took place (or will take place) is *made public* to the members. The members' attention can be drawn to the fact that a number of offline activities take place and that many members know each other and have pleasant relationships to each other. Through such efforts both the actual and the *perceived* degree of embeddedness increases, which is likely to have some beneficial effects.

The findings not only have practical implications. They also have implications for future research. They support the hypothesis that embedded online communities tend to be more successful than purely virtual ones. However, they leave open what the underlying mechanisms are and whether it is justified to speak of causal effects. A better understanding of *why* a high degree of embeddedness affects the outcomes of online knowledge sharing is of crucial importance. Chapter 4.3 argues that there are different forms of social control that can be applied within online communities. The embeddedness affects which type of social control is more adequate. So an efficient use of the potential of a high degree of embeddedness requires a better understanding of the behavioral mechanisms and regularities of online interaction in groups. Chapter 4 showed that such an understanding leads to corrections and refinements of sometimes misleading recommendations about the design of online communities that can be found in the consultancy literature. Future research should focus more on theory guided empirical studies that provide insights about the behavioral effects of group characteristics that influence the outcomes of online interaction. Such research can provide evidence not only for the existence of beneficial effects of embeddedness on the success of online interaction. It can also provide evidence for hypotheses that make clear why they exist. Such knowledge is crucial for the design and the management of online communities.



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## Appendix I: The Questionnaire

### A: Eerst willen wij graag wat meer informatie over uw gebruik van de vakcommunity.

1. Welke vakcommunity gebruikt u?
2. Hoveel maanden bent u al lid van deze vakcommunity?
3. Denkt u nu aan de **afgelopen 4 weken**. Hoveel dagen per week hebt u gemiddeld gebruik gemaakt van uw vakcommunity? Hieronder valt bijvoorbeeld het lezen van informatie op één van de vakcommunity sites, het versturen van emails naar een Emailing lijst van de vakcommunity, het posten van bijdragen in een forum of het lezen van emails/posts van een Emailinglijst/forum van uw vakcommunity.
4. Hoveel minuten per dag hebt u tijdens de afgelopen 4 weken gemiddeld gebruik gemaakt van uw vakcommunity? Probeer een zo nauwkeurig mogelijke schatting te geven
5. Geeft u s.v.p aan **hoe actief** u in het algemeen, dus niet alleen de afgelopen 4 weken, gebruik maakt van uw vakcommunity. Met activiteit is b.v.b. het versturen van emails of van posts naar de Emailinglijst of het forum van uw vakcommunity bedoelt. Maar ook het versturen van informatie, nieuws of lesmateriaal dat op de website of in de newsletter gepost wordt valt hieronder.

6. Bent u ingeschreven in een Emailinglijst van uw vakcommunity?

Indien 6=ja dan:

[

Denkt u bij de volgende vragen aan de **afgelopen 12 maanden**. Indien u minder dan 12 maanden lid bent dan denkt u aan uw tot nu toe beleefde lidmaatschap.

7. Hoveel emails van de Emailinglijst van uw vakcommunity ontvangt u gemiddeld per maand?
8. Hoveel emails van de Emailinglijst van uw vakcommunity leest u gemiddeld per maand?
9. Hoveel emails stuurt u gemiddeld per maand naar de Emailinglijst van uw vakcommunity?

]

10. Maakt u gebruik (lezen of posten) van een discussieforum van uw vakcommunity?

Indien 10=ja dan:

[

Denkt u bij de volgende vragen aan de **afgelopen 12 maanden**. Indien u minder dan 12 maanden lid bent dan denkt u aan uw tot nu toe beleefde lidmaatschap.

11. Hoveel posts van het forum leest u gemiddeld per maand?
12. Hoveel posts stuurt u gemiddeld per maand naar het forum van uw vakcommunity?

]

13. Hebt u ooit een bijdrage aan een newsletter van uw vakcommunity geschreven?

14. Hebt u ooit lesmateriaal naar uw vakcommunity gestuurd?

21. Aan hoeveel vergaderingen van de leden van de vakcommunity hebt u ooit deel genomen? (Kiest u s.v.p. 0 indien u nog nooit aan een vergadering van de leden deel genomen hebt.)

15. Bent u ooit op een andere manier als de boven genoemde voor uw vakcommunity actief geweest? Daarmee zijn zowel online acties, maar ook acties buiten het internet in het gewone leven (facet-to-face) bedoelt.



**B: Nu willen we graag iets meer weten over uw internetgebruik in het algemeen.**

16. Hoe bekend bent u met de volgende Internet-gerelateerde verschijnselen? Kies een nummer van "1" tot en met "5" waarbij "1" betekent dat u er nog nooit van heeft gehoord en "5" betekent dat u zeer goed bekend bent met het betreffende verschijnsel.

- A Downloads
- B Advanced search (Geavanceerd zoeken)
- C Preference Settings (Voorkeuren bepalen)
- D Newsgroups
- E PDF-documenten
- F Refresh/Reload
- G MP3-bestanden
- H WebLogs/Blogs
- I EMailingslijsten
- J Spamfilters

17. Hoeveel jaar maakt u al gebruik van het internet?

If antwoord 2 > 6 maanden dan:

[

**In dit gedeelte van de vragenlijst willen we graag meer te weten komen over wat voor activiteiten binnen en buiten de vakcommunity tussen de leden plaatsvinden.**

21. In welke mate gaan de volgende uitspraken op voor uw vakcommunity?

- Het is meer een verzameling van *losse individuen* dan een gemeenschap.
- Het is een verzameling van groepen en *kliedjes* met ieder hun eigen interesses en activiteiten, maar *niet veel gezamenlijk* als een gemeenschap.
- Het is een verzameling van groepen en *kliedjes* met ieder hun eigen interesses en activiteiten, maar ook met een *aantal gemeenschappelijke interesses*.
- Het is een *enigszins geïntegreerde gemeenschap* die een beperkt aantal *interesses en activiteiten deelt*.
- Het is een *hecht geïntegreerde gemeenschap* die *veel interesses en activiteiten deelt*.

22. Bent u het eens of oneens met de volgende stellingen?

In onze vakcommunity zijn groepen leden,...

....die ook buiten de vakcommunity regelmatige contacten met elkaar hebben.

....die elkaar regelmatig tijdens off-line bijeenkomsten van de community ontmoeten.

...die vaak met elkaar telefoneren.

...die ook privé regelmatig gemeenschappelijke activiteiten ondernemen.

**De vakcommunity leeft van bijdragen van de leden zoals het posten binnen een forum, het schrijven van eigen of beantwoorden van andere emails, het aanleveren van (les)materiaal of het meedoen bij bijeenkomsten en activiteiten buiten het internet. Het kost tijd om een bijdrage aan de vakcommunity te leveren en de leden verschillen wat betreft de tijd die ze aan de community besteden. De volgende uitspraken beschrijven hoe een groep met deze verschillen omgaat.**

23. Beoordeelt u in welke mate de volgende uitspraken op uw vakcommunity van toepassing zijn.

In deze vakcommunity moedigen leden elkaar aan om een bijdrage aan de vakcommunity te leveren.

In deze vakcommunity kunnen leden populair worden door regelmatige nuttige bijdragen aan de vakcommunity te leveren.

In deze vakcommunity wordt van competente leden verwacht dat ze zo nu en dan een bijdrage aan de vakcommunity leveren.

In deze vakcommunity wordt van competente leden verwacht dat ze *regelmatig* hun tijd aan de ontwikkeling van de vakcommunity besteden.

In deze vakcommunity wordt enigszins op leden neergekeken die niet vaak genoeg een bijdrage aan de vakcommunity op leveren.

]

**C: Een vakcommunity hoeft niet alleen voor informatievergaring gebruikt te worden, ook het dienen van sociale doeleinden is een mogelijkheid. We willen graag weten hoe belangrijk u het vindt uw vakcommunity mede voor sociale doeleinden te gebruiken.**

24. Bent u het eens of oneens met de volgende stellingen?

Ik vind het belangrijk een goede relatie met de collega's binnen mijn vakcommunity te hebben.

Ik vind het belangrijk nieuwe contacten te maken met collega's binnen mijn vakcommunity.

Er is een groep leden waarvan ik het belangrijk vind dat ze mij aardig vinden.

Ik vind het belangrijk dat de andere leden van mijn vakcommunity mij betrouwbaar vinden.

Ik zou het vervelend vinden als ik in mijn vakcommunity niet goed aangeschreven zou staan.

Ik vind het leuk om de aandacht van andere leden van mijn vakcommunity te hebben.

Ik zou het vervelend vinden als ik zelf helemaal geen nuttige bijdrage zou leveren aan mijn vakcommunity

Ik vind het prettig als ik in mijn vakcommunity populair ben.

D: We willen graag weten hoe u uw vakcommunity op verschillende aspecten beoordeelt.

42a. Wat is in het algemeen uw tevredenheid met de kwantiteit van door de leden aangeboden vakinformatie en het lesmateriaal?

42b. Wat is uw tevredenheid met de kwaliteit van door de leden aangeboden vakinformatie en het lesmateriaal?

42c. Hoe beoordeelt u het aantal bijdragen van de leden dat voor uzelf professioneel relevante vakinformatie bevat?

De volgende uitspraken beschrijven hoe nuttig de informatie van de vakcommunity voor uw werk is. Geeft u s.v.p. aan in welke mate u het met de uitspraken eens of oneens bent.

43a. Voor het uitvoeren van mijn werk kan ik informatie uit de vakcommunity goed gebruiken.

43b. De informatie uit de vakcommunity bevordert mijn leer- of lesvaardigheden soms behoorlijk.

43c. Om mijn werk goed uit te kunnen voeren ben ik soms afhankelijk van de informatie uit de vakcommunity.

De volgende uitspraken beschrijven o.a. de "sociale meerwaarde" van uw vakcommunity voor u. Geeft u s.v.p. aan in welke mate u het met de volgende uitspraken eens of oneens bent.

44. Hoe vaak heeft u het gevoel dat.....

.....de leden van uw vakcommunity begaan zijn met uw lot?

.....u de aandacht van de leden van uw vakcommunity hebt?

.....u binnen de vakcommunity echt populair bent?

.....u bekend bent om uw prestaties in uw vakcommunity?

.....de andere leden uw inbreng waarderen?

.....de andere leden u laten merken dat u iets goed voor u vakcommunity gedaan hebt?

.....de bezigheden in de vakcommunity een uitdaging zijn?

.....u veel plezier in uw vakcommunity hebt?

.....u nieuwe contacten binnen de vakcommunity kunt maken?

.....u goede relaties met collega's binnen de vakcommunity kunt onderhouden?

.....u nuttige informatie over nieuwe werkmogelijkheden door de vakcommunity ontvangt?

.....u nuttige informatie over nieuwe ontwikkelingen rondom uw vak ontvangt?

.....u uw leervaardigheden verder ontwikkeld door de vakcommunity?

.....u uw vakkennis verder ontwikkeld door de vakcommunity?

45. Hoe goed kunt u metu collegas opschieten?

Ik communiceer met veel mensen uit de vakcommunity over persoonlijke dingen.

Ik heb met veel mensen uit de vakcommunity een goede persoonlijke relatie.

Ik wissel met veel mensen uit de vakcommunity informatie uit.

Ik vind in de vakcommunity vaak oplossingen voor problemen als vakdocent.

Ik onderneem met mensen uit de vakcommunity regelmatig activiteiten binnen en buiten het werk.

Ik heb veel vrienden binnen de vakcommunity.

In deze vakcommunity helpen wij elkaar regelmatig.

Er is geen gemeenschapsgevoel in de vakcommunity.

[RANDOMIZATION: yes or no, p=0.5, If YES then "frame stabilization" else go immediately to "social identity scale".]

[Frame Stabilization:]

**Hieronder vindt u een aantal regels die voor de kennisuitwisseling binnen uw eigen vakcommunity belangrijk zouden kunnen zijn. Lees s.v.p. eerst alle volgende regels één keer rustig en grondig door voordat u verder gaat met het beantwoorden van de vragen.**

---

### Gedragscode voor onze vakcommunity

1. In onze vakcommunity is het belangrijke doel dat wij elkaar helpen.
2. Iedereen met belangstelling voor ons vak is van harte welkom om in de vakcommunity mee te doen.
3. We werken in de vakcommunity allemaal aan hetzelfde doel. We gebruiken andermans informatie, maar dragen ook ons steentje bij.
4. De inzet van de leden voor het gemeenschappelijke doel is voor onze vakcommunity heel waardevol.
5. We zetten ons allemaal voor de vakcommunity in en er wordt iedereen beter van.
6. Leden laten andere leden profiteren van hun ervaring.



Day In, Day Out  
Mark Kostabi 1991 ©Kostabi World



Organic Persuasion  
Mark Kostabi 1992 ©Kostabi World

### Button: Ik heb de 6 regels grondig gelezen.

32. Geef nadat u deze uitspraken hebt doorgelezen voor iedere regel aan in welke mate deze uitspraken op het typische lid van uw vakcommunity van toepassing zijn.

Regel 1: In onze vakcommunity is het belangrijke doel dat wij elkaar helpen.

Regel 2: Iedereen met belangstelling voor ons vak is van harte welkom om in de vakcommunity mee te doen.

Regel 3: We werken in de vakcommunity allemaal aan hetzelfde doel. We gebruiken andermans informatie, maar dragen ook ons steentje bij.

Regel 4: De inzet van de leden voor het gemeenschappelijke doel is voor onze vakcommunity heel waardevol.

Regel 5. We zetten ons allemaal voor de vakcommunity in en er wordt iedereen beter van.

Regel 6. Leden laten andere leden profiteren van hun ervaring.

33. Heeft u zelf nog andere uitspraken waarvan u vindt dat deze goed of zelfs beter in de gedragscode van uw vakcommunity zouden passen?

Regel 7: [text field]

Regel 8: [text field]

[IF RAND = YES THEN GRAPHIC + RULE 4, ELSE NO GRAPHIC AND NO RULE]

[social identity scale]

**34. Geeft u s.v.p aan hoe betrokken u zich bij de vakcommunity voelt.**

Ik identificeer mij sterk met deze vakcommunity.

Ik vind het niet prettig om lid van deze vakcommunity te zijn.

Ik voel mij sterk verbonden met deze vakcommunity.

Ik zou ook in de toekomst graag met deze vakcommunity samenwerken.

Ik zou liever met een andere groep samenwerken.

Ik ben blij lid van deze vakcommunity te zijn.

[IF RAND = YES THEN GRAPHIC + RULE 4 ELSE NO GRAPHIC AND NO RULE]

**E: De inzet van de leden**

**Voor de toekomst wordt verwacht dat meer gebruik gemaakt zal worden van de kennis en vaardigheden van de leden. We willen om die reden graag weten hoe sterk de leden geneigd zijn om zich persoonlijk voor de ontwikkeling van de community in te zetten.**

Uw antwoorden op deze vragen zijn dus belangrijk voor de verdere toekomst van de vakcommunity.

35. Zou u bereid zijn om aan de volgende activiteiten mee te doen of niet?

a. Het eenmalig verspreiden van folders met informatie over de vakcommunity op een informatieavond van een school bij u in de buurt.

b. Het geven van een korte presentatie over inhoud en nut van de vakcommunity op een informatieavond van een school bij u in de buurt.

c. Het bemiddelen bij conflicten tussen leden. De vereiste technische kennis is gering, en uw inzet zou alleen nodig zijn indien er conflicten zijn.

d. Meedoen aan een Leden-Advies Raad, die 1 keer per jaar op een avond samenkomt. De vereiste technische kennis is gering, en het kost u zo'n 8 uur per jaar (4 uur bijeenkomst + 4 uur voorbereiding).

e. Het beheren van de adreslijst van de leden en het checken van email- en huisadressen. De technisch vereiste kennis is gering, en het kost u zo'n 15 minuten per week.

f. Het controleren en aanpassen van zogenaamde "dode links" op de website van de vakcommunity. De technisch vereiste kennis is gering, en het kost u zo'n 30 minuten per week.

g. Ondersteunen van het Dagelijks Bestuur. De technisch vereiste kennis is gering, en het kost u zo'n 45 minuten per week.

h. Het met de community manager beheren van een mailinglijst en een forum van de vakcommunity. De technisch vereiste kennis is gering, en het kost u ongeveer een uur per week.

[IF RAND = YES THEN GRAPHIC + RULE 4 ELSE NO GRAPHIC AND NO RULE]

**Voor gebruik in vakcommunities worden nu en dan nieuwe tools ontworpen. Om te voorkomen dat tools worden aangeboden waar niemand belangstelling voor heeft, willen we graag weten of u van de volgende tools binnen uw vakcommunity gebruik zou maken.**

Denkt u rustig over de volgende vragen na. Uw antwoorden zijn belangrijk voor de verder ontwikkeling van de vakcommunity.

Stelt u zich voor dat in uw vakcommunity een apart forum is waar leden de mogelijkheid hebben om over hun problemen met scholieren berichten uit te wisselen.

36a. Zou u in een dergelijk forum over een probleem van uzelf iets vertellen indien uw naam daarbij zichtbaar in beeld is?

36b. Zou u in een dergelijk forum over een probleem van uzelf iets vertellen indien de mogelijkheid bestond om de berichten in dit forum anoniem te plaatsen?

Doordat veel lesmateriaal tegenwoordig in elektronische vorm wordt gemaakt (als pdf-bestand, Powerpoint, Word, of nog anders), is het mogelijk een forum binnen een community zo op te zetten dat het eenvoudig wordt om lesmateriaal aan collega's beschikbaar te stellen en door anderen te laten beoordelen.

37a. Zou u uw eigen lesmateriaal met uw naam er op binnen de vakcommunity ter beschikking stellen voor andere leden?

37b. Zou u uw lesmateriaal ter beschikking stellen voor andere leden indien het mogelijk zou zijn het lesmateriaal anoniem ter beschikking te stellen?

Stelt u zich voor dat de webmaster iedere maand een bespreking van lesmateriaal door een commissie van forumleden organiseert. Hieruit komt een soort beoordeling ('review') van het lesmateriaal dat door leden wordt aangeboden voort, en de bespreking ervan wordt openbaar gepost op de vakcommunity. Veronderstel dat u daadwerkelijk eigen lesmateriaal in elektronische vorm heeft.

38a. Zou u uw eigen lesmateriaal met uw naam erop binnen de vakcommunity ter beschikking stellen ter beoordeling?

38b. Zou u uw lesmateriaal ter beschikking stellen ter beoordeling indien het mogelijk zou zijn het lesmateriaal anoniem ter beschikking te stellen?

#### **F: Nu volgen een aantal mogelijke problemen bij de kennisuitwisseling in communities op internet.**

47a. In welke mate speelt elk probleem volgens u een rol voor het functioneren van uw vakcommunity?

- Er zijn te weinig leden in de vakcommunity.  
Er zijn te weinig *actieve* leden in de vakcommunity.
- Er zijn te veel leden in de vakcommunity
- Er is een fluctuatie van het ledental in de vakcommunity.
- Bij taken voor de hele community wachten leden af tot andere leden actief worden voordat ze zelf een bijdrage inleveren
- Leden sturen weinig lesmateriaal naar de vakcommunity.  
Leden posten zelden in het forum [hidden if v10=nee]

#### **Nu volgen nog een aantal andere mogelijke problemen bij de kennisuitwisseling in communities op internet.**

47b. In welke mate speelt elk probleem volgens u een rol voor het functioneren van uw vakcommunity?

- Er is een overdosis aan informatie.
- Leden vertrouwen elkaar niet.
- Leden aarzelen om gebruik te maken van de aangeboden informatie.
- Leden aarzelen om over hun problemen op hun werk te schrijven.
- Leden zijn bang dat de informatie die ze naar de vakcommunity sturen op een voor hen zelf onvoordelige manier kan worden gebruikt.
- Leden zijn in de mailinglijst te passief [hidden if v6=nee].

**G: Uiteindelijk willen we graag nog wat informatie over u uzelf .**

48. goed beschrijven de volgende uitspraken uw persoonlijkheid?

Ik beschouw mij als iemand die...

- ...terughoudend is.
- ...gelooft in andere mensen.
- ...vaak fouten van andere mensen vindt.
- ...open en sociaal is.

49. Wat is uw mening over andere mensen in het algemeen?

Je kunt van de meeste mensen wel aannemen dat zij doen wat zij zeggen te zullen doen.  
De meeste mensen vertellen de waarheid als zij hun ervaringen en vaardigheden beschrijven.  
De meeste mensen beantwoorden een eerlijke vraag met een eerlijk antwoord.  
Als het enigszins kan, moet je proberen te voorkomen dat je met onbekende mensen moet samenwerken.

50. Stel u het volgende voor. Er wordt geld gegeven aan u en aan een andere deelnemer aan deze enquête die u niet kent. Er zijn vier mogelijkheden, die onderling verschillen naar hoeveel u en deze andere persoon krijgt, zoals hieronder in de tabel aangegeven (zie tabel).

|                     | u krijgt | ander krijgt | uw voorkeur |
|---------------------|----------|--------------|-------------|
| eerste mogelijkheid | 110,-    | 38,-         | ___         |
| tweede mogelijkheid | 98,-     | 88,-         | ___         |
| derde mogelijkheid  | 125,-    | 21,-         | ___         |
| vierde mogelijkheid | 102,-    | 54,-         | ___         |

Zet nu in de kolom "uw voorkeur" eerst een 1 achter de mogelijkheid die u het aantrekkelijkst vindt. Zet een 4 achter de mogelijkheid die u het minst aantrekkelijk vindt. Zet vervolgens een 2 achter degene van de twee overgebleven mogelijkheden die u het aantrekkelijkst vindt. Zet bij de overgebleven mogelijkheid een 3.

51. Hier vindt u een aantal uitspraken over attitudes en persoonlijke kenmerken. Leest u s.v.p. iedere uitspraak rustig door en geeft u dan voor iedere uitspraak aan of deze voor uzelf van toepassing is of niet.

- Mijn eerste indruk van mensen klopt bijna altijd.
- Het zou voor mij heel moeilijk zijn om een van mijn slechte gewoontes te veranderen.
- Ik weet altijd waarom ik bepaalde dingen leuk vind.
- Ik lieg soms als het nodig is.
- Als ik hoor dat mensen gespreken over persoonlijke onderwerpen hebben, dan vermijd ik ernaar te luisteren.
- Ik roddel niet over andere mensen.

**H: Aan het eind van de vragenlijst vragen we u nog wat achtergrondinformatie over uzelf.**

- 52. Bij wat voor soort school bent u docent?
- 53. Hoeveel procent van een full-time baan hebt u als docent?
- 54. Hebt u nog andere banen?
- 55. Wat zijn de 2 vakken waarin uzelf het vaakst les geeft?
- 56. Bent u man of vrouw?
- 57. Wat is uw geboortjaar?
- 58. Welke nationaliteit hebt u?
- 59. Leeft u alleen of in partnerschap?
- 60. Hoeveel kinderen heeft u?

**We zijn nu aan het eind van de vragenlijst aangekomen. Hartelijk bedankt voor uw medewerking!**

- 59. Hebt u nog opmerkingen?
  - 60. Wilt u een korte samenvatting van de resultaten van deze enquête ontvangen
  - 61. Zo ja, wat is uw email adres? [text field] (De informatie over uw email adres wordt apart opgeslagen, maar hebben we vanzelfsprekend nodig om u deze informatie te sturen.)
- Indien u alle vragen ingevuld hebt, kunt u nu de antwoorden versturen.

## **Appendix 2: Overview of Scientific Output of the Project: Articles and Conference presentations**

### **Articles:**

- Matzat, U. (2004). "Cooperation and Community on the Internet: Past Issues and Present Perspectives for theoretical-empirical Internet Research" in: *Analyse & Kritik*, 26, 1: 63-90.
- Matzat, U. (2005). " Die Einbettung der Online-Interaktion in soziale Netzwerke der Offline-Welt: Möglichkeiten der sozialen Gestaltung von Online-Gruppen" (The Embeddedness of Online Interaction in Social Networks of the Offline World: Opportunities for the Social Design of Online Groups.) in: Jäckel, Michael; Mai, Manfred (Hg.): *Online-Vergesellschaftung? Mediensoziologische Perspektiven auf neue Kommunikationstechnologien*. Verlag für Sozialwissenschaften, Wiesbaden: 175-199.
- Matzat, U. (2005). " Kennisdeling in Online Groepen: de Sociale Inbedding van Online Interactie in Offline Relaties" (Knowledge Sharing in Online Groups: The Social Embeddedness of Online Interaction in Offline Relations). in: De Haan, Jos & Van der Laan, Lambert: *Jaarboek ICT en Samenleving 2005. Kennis in Netwerken*. Boom, Amsterdam: 97-111.

### **Conference presentations:**

- Matzat, U. (2004). *Problems of Interaction in different types of online groups*, presentation at the 32nd bi-annual meeting of the German Sociological Society (Deutsche Gesellschaft fuer Soziologie), University of Munich, Germany. 6 October 2004
- Matzat, U. (2004). *Knowledge Sharing in Online Groups*, Presentation at the Meeting of the 'Yearbook ICT & Society 2005' Group, Utrecht, The Netherlands. 13 October 2004
- Matzat, U. (2005). *A theory of relational signals in online groups*, presentation at the conference General Online Research, GOR05, University of Zurich, Switzerland. 22 March 2005.
- Matzat, U. (2005). *The Management of Online Communities. Social Control and Relational Signals in Online Groups* , invited talk at the COSMOS conference, Technical University of Munich, Germany. 6 May 2005.



- Matzat, U. (2005). *The social embeddedness of online communities of practice* . presentation at the conference ICT, the Knowledge Society and Changes in Work, Den Hague, The Netherlands. 10 June 2005.
- Matzat, U. (2005). *A theory of relational signals in online groups*, presentation at the 100<sup>th</sup> Annual Meeting of the American Sociological Association, Philadelphia, USA, August 13-16, 2005. Session: Theory as Wayfinding in Communication and Information Technology Research. Section on Communication and Information Technologies. 13 August 2005.