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23 Academic Communication and Internet Discussion Groups: What Kinds of Benefits for Whom?

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23.1 Abstract

This paper analyzes the implications of Internet Discussion Groups for informal academic communication. The first part reviews different hypotheses of the benefits of academic mailing lists and newsgroups for individual researchers. Moreover, special attention is given to the various forms of impact on the macro system of informal communication networks. Hypotheses are presented suggesting equalizing effects on the distribution of communication opportunities for researchers. Other studies suggest that mailing lists could contribute to a „Balkanization“ of the academic communication system. The sparse empirical evidence for and against these hypotheses is summarized. The last part concentrates on differences in the use of these communication tools in various academic disciplines. It discusses a number of hypotheses that try to predict which groups of researchers will use mailing lists or newsgroups more often.

23.2 Introduction

There are many speculations about the potential of new information technologies. Predictions are made that the „information superhighway“ will transform the world into a global village, and that the communication revolution will lead to „[t]he death of distance“ (Cairncross, 1997). In the academic education system, there is the virtual university and in the research system, the Internet is seen by some as a communications-technology quantum transition (Pascha, 1995). What is *certain* is that the growth of the Internet has been accompanied by an explosion of predictions of the coming technological utopia, within academic circles as well as in the general public (Kling & Iacono, 1995).

A lively discussion among researchers about the potential of the new communication tools the Internet offers is understandable: formal and informal communication is crucial for the research community (Garvey, 1979; Meadows, 1974). New possibilities for their promotion are thus very important. The potential of the World Wide Web for online publishing is influencing the formal publication system (Peek & Newby, 1996). Academic mailing lists and newsgroups have been adopted as tools for informal communication between researchers.

These Internet Discussion Groups (IDGs), as I will call mailing lists and newsgroups here, can be traced back to electronic conference systems used as early as the 1970s (see e.g. Hiltz, 1984). Despite 20 years of use there are still various hopes for improvement of the communication system as well as concern for the detrimental consequences IDGs may have for informal communication in the research community. The next section shows that questions remain about the effects of IDG usage. A clarification of possible benefits or disadvantages of IDGs for the academic communication system is needed for at least two reasons:

Firstly, the number of academic IDGs increased to cover almost every discipline by the middle of the 1990s (Kovacs & the Directory Team, 1996; Mailbase, 1999a). In some countries, computing services were founded to promote and support the initiation and use of academic mailing lists. These services receive official funds from science foundations (e.g., Mailbase, 1999b; H-Net Webstaff, 1999). Much time, money and effort is invested in IDGs with distinct target groups - not to mention the time individual researchers spend on the maintenance of IDGs as moderators or as readers/contributors.¹ The use of IDGs is no longer restricted to a minority of technically interested academics. Many researchers use them, and many lists noted a growing number of users in the 1990s (Mailbase, 1999c). A careful analysis can show what benefits IDGs really have for the research community, and which expectations are unwarranted. Such an analysis serves as a basis for judging whether increased expenditure in mental and financial resources for the maintenance of IDGs is justified. It prevents the expenditure of resources for certain ends that may not be attainable via these means.

Secondly, the success and failure of communication technologies depends crucially on the social context in which they are used. Unfortunately, little is known about which conditions are favorable for successful adoption of a communication technology. Rather, different tools and pathways of communication exist in the different disciplines within the research community, and tools successful within one field

¹ Conner (1992) mentions that he spends on the average about 10 hours per week for active moderation of an IDG within the humanities. Other listowners or moderators also complain about the required time (Berge & Collins, 1993). Moreover, active mailing lists aggravate the problem of information overload for every user (McCarty, 1992; Whittaker & Sidner, 1997).

are adopted in other research fields under different conditions (Kling & McKim, in press). The costs of such diffusion by trial-and-error could be avoided if we knew more about the interplay between a communication tool and the communication conditions of a discipline. Thus, what is necessary is a better understanding of the actual usage and impact of different communication technologies *under different conditions* (Walsh & Bayma, 1996a). The analysis of the *use of IDGs by researchers in a variety of different disciplines* offers some insights into general effects of IDG usage by researchers in different disciplines *with distinct communication habits and needs*. This makes it possible to compare the same computer-mediated communication tool under different conditions. The analysis of IDGs offers accordingly general insights into the question of which communication needs are fulfilled under what condition. These insights could help to predict some effects of other computer-mediated communication tools.

This paper tries to clarify possible outcomes of the use of IDGs for the informal communication system. The next section reviews some hypotheses of the potential benefits and negative effects of the use of IDGs for researchers and for the informal communication system. The empirical evidence is summarized, and the drawbacks and limitations of existing empirical studies are described. I show what the likely answers are to some questions relating to possible consequences of IDGs, and which questions are still to be answered. The important question of what determines the use of IDGs by researchers is explored. The third section focuses on differences in the adoption of IDGs by researchers in different disciplines. Several hypotheses identifying specific aspects of the spread of IDG use in different disciplines are discussed. The final section draws some conclusions about what kind of research is needed to answer at least a few of the many questions still unanswered.

23.3 Potential Effects of Academic Internet Discussion Groups

As early as the 1970s, first predictions appeared of the opportunities so-called electronic conference systems will offer academic communication (Hiltz & Turoff, 1978). Although similar optimism regarding the potential of IDGs can be found in the 1990s among some academics (Gresham, 1994; Turoff & Hiltz, 1998), some skeptical voices have also been raised expressing doubts about the general relevance of some IDGs (Bainbridge, 1995) or even suggesting that the use of IDGs might have detrimental consequences for the informal communication system (Alstyne & Brynjolfsson, 1996a).

At first glance it is surprising to find optimistic as well as skeptical evaluations of IDG use more than 20 years after its inception (e.g. compare Alstyne & Brynjolfsson, 1996; Bainbridge, 1995; Gresham 1994; Turoff & Hiltz, 1998). The question whether

and how IDGs can serve the objectives of academic research is discussed not only among observers, but also among IDG users, who have different views of how IDGs should work (Conner, 1992; McCarty, 1992). The range of different views makes it more difficult to judge the relevance of IDGs.

However, although there might be different specific consequences for different researchers, not all of them are of importance for the general population of academic users. I would like to concentrate on the claims of many IDG proponents for universal, beneficial IDG effects on academic communication. To simplify the discussion, I will make a distinction between two different general groups of potential effects relevant for the large majority of researchers. I categorize them as either being information effects or contact effects.

23.3.1 Information Production, Information Transmission or Information Overload?

Hiltz & Turoff (1978) brought up many different potential benefits IDGs can have for either individual researchers or for a whole research field.² According to them, IDGs could generate new research *ideas* or *proposals for research* among academics, from which every active and passive user of an IDG could profit.

Moreover, computer conferences could allow *informal exchange of research results or of other helpful information between researchers*. The authors compare such an exchange with informal discussions on the fringe of academic conferences. Many benefits of conferences are not gained through listening to the official presentations of other researchers. Rather, they are gained through discussions within a small group or through bilateral discussions between individual researchers (Menzel, 1962). A problem of such discussions is that researchers have to be willing to provide help and information to colleagues. The help provider does not get something in return for such a provision, reducing his motivation to do so. The information transfer and providing of help within an IDG, however, take place in front of an audience and are usually recorded. Accordingly, Hiltz & Turoff (1978) expect an increase in the motivation to provide help.

The authors are of the opinion that the most important intellectual benefits of IDGs are those that affect the whole research community. It might profit from the enhanced opportunities for discussions: electronic conferences could help *to resolve or develop* theoretical, methodological and ethical *controversies of a research field*.

² The authors themselves analyze „computerized conferencing“ and not mailing lists or newsgroups. However, their ideas can be found in many analyses of IDGs (e.g. Gresham, 1994; Lewenstein, 1995; McCarty, 1992). Turoff & Hiltz (1998) explicitly include newsgroups in their later statements.

This, in turn, might *speed up the development of whole research fields* (Hiltz & Turoff, 1978, p. 210-239).

Many empirical studies of IDGs and electronic conferences have been inspired by the ideas of Hiltz, Turoff and their colleagues. Most of them consist of case studies of single or a few intentionally selected IDGs or electronic conferences. Usually the users were asked to enumerate advantages or disadvantages of IDG use, or to describe benefits they obtained or problems they experienced with IDG use (see e.g., Tombaugh, 1984; Harasim & Winkelmans, 1990; Rojo & Ragdale, 1997a, 1997b). Other empirical evidence is rather anecdotal and consists of descriptions by moderators of what happened in 'their' IDGs (Conner, 1992; McCarty, 1992; Berge & Collins, 1993).

These studies show that *users evaluate positively* the opportunities IDGs offer for the *creation of new ideas and for the provision of research information and other helpful advice*. Such users tell of referral to new literature mentioned by other IDG users. Others were able to get help from people they otherwise had no chance of contacting (Conner, 1992; McCarty, 1992).

On the other hand, many users complained about the *low quality* or the *low amount of discussion* within discussion groups. These complaints can be found among users or moderators of a variety of different IDGs (Conner, 1992; McCarty, 1992; Rooy 1996). Some studies mention explicitly that IDGs are not well suited for the discussion or the solution of intellectual controversies between researchers (Hiltz, 1984; Harasim & Winkelmans, 1990; Lewenstein, 1995; Tombaugh, 1984).

This does not mean discussions do not take place. Rather, if they take place, they are often abandoned before the resolution of a problem. Discussion participants inform each other, and the passive readers of the discussion about their positions and about „the state of the art“. Yet it is not the rule that this leads to a resolution of controversies (e.g., Hiltz, 1984).

Only single studies try to assess how large the amount of discussion in an IDG is in comparison to messages that contain questions, answers, announcements etc. Lewenstein (1995) analyzed how the newsgroup sci.physics.fusion was used between March 1989 and June 1992. On March 23, 1989 two electrochemists from the University of Utah announced that they had discovered a method for creating nuclear fusion at room temperature with simple equipment. Despite the *important role* the newsgroup sci.physics.fusion played in the *distribution of information* about cold fusion, Lewenstein (1995) concludes that it was hardly used by the researchers who were most active in the field. It was most of all used by non-professional observers who wanted to stay informed. The newsgroup was *not used* by researchers *to discuss* or judge colleagues' new findings; this happened at conferences. The author of another study comes to a similar conclusion relating to the amount of discussion within an IDG. Rooy (1996) grouped the e-mail messages of a scientific mailing list

according to whether they contained a) discussion contributions, b) requests for information, reactions to these requests or summaries of already conducted research projects, c) administrative messages or d) announcements. He found that only three percent of the messages were discussion contributions.

I conclude from these findings that the *transmission of already existing knowledge* is much *more common* in IDGs than the *production of new knowledge*. If IDGs have a *general information potential* for academic communication, this potential is grounded most of all in the possibilities for a *transfer of information*. However, even the claim that IDGs are a valuable tool for researchers to get access to information and the knowledge of their colleagues rests on shaky ground.³

The empirical evidence for these claims consists of studies with many drawbacks and limitations.⁴ The evidence often consists of *subjective descriptions of user experiences* within single *deliberately selected IDGs* which can be very untypical for the general population of IDGs used by researchers (e.g. Tombaugh, 1984; Harasim & Winkelmann, 1990). Only Rojo & Ragsdale (1997a, 1997b) studied a larger number of IDGs. Furthermore, few of these studies conduct a *systematic comparison of users with non-users of IDGs*. It is therefore completely unclear whether the use of IDGs really leads to benefits that could not be obtained in a different way. Scholl et al. (1996) use data of a random sample of German university researchers in the social sciences. They compare researchers who are intensive users of e-mail and IDGs with those who do not use IDGs, and who use e-mail less often. Both groups had to assess how far their use of computer-mediated communication (CMC) improved their information gathering and stimulated new ideas for research. The intensive users assessed their improvements significantly higher than the less intensive users (Scholl et al., 1996; Scholl & Pelz, 1997). However, the data did not allow for a distinction between the effects of IDG use and the effects of general e-mail use.

In addition, there were no effective controls for spuriousness of the found effects and their claimed relevance. Intensive users of e-mail and IDGs will differ from non-users in many aspects. Maybe the information benefits are due to other, non-controlled factors and not to the use of IDGs and e-mail. *No study systematically*

³ I leave out a serious negative effect of IDGs, namely, that they aggravate the problem of information overload. This is an obvious effect of IDGs with a high number of messages (McCarty, 1992).

⁴ In the following, I concentrate on the evidence for benefits relating to the transfer of information. I do not consider the evidence for the creation of new ideas through the help of IDGs. The same limitations of the empirical studies are valid for both kinds of evidence. I think it is possible to overcome the drawbacks in studying whether or not IDGs provide information advantages, however, this is hardly possible with regard to the analysis of the creation of new ideas.

controls whether information effects are IDG-induced. This is crucial for evaluating the potential of IDGs.

Another disadvantage of most studies is that the experienced *information benefits are expressed in very abstract ways*. Scholl & Pelz (1997) asked their respondents whether they received „more information“, whether they received information „quicker“ or „easier“ (ibid., 355 - own translation, U.M.). Rojo & Ragsdale (1997, 334) mention as benefits „keep[ing] updated“, „get[ting] materials“ and „get[ting] answers“. But it was *never asked what kind of information IDG users received*. This makes it hard to make any judgments on the specific relevance of the information that is gained from IDGs. Does the information enhance the theoretical knowledge of researchers about their research field or is it advice related to practical problems the researchers have?

Finally, the authors always associate the information benefits with the use of the IDG (e.g., Rojo & Ragsdale, 1997a; 1997b; Scholl et al., 1996) It was asked whether the use of an IDG led to some benefits (e.g., more information): It is never clear whether these benefits were really obtained through the use of IDGs or whether intensive users justified their time consuming use of IDGs for themselves by assuming that it led to benefits. There are *no measures of the effects (benefits) that are independent from the assumed causes (IDG use)*.

As a consequence it is not surprising that since the mid-1990s there are more and more researchers who doubt the general relevance of IDGs for academic communication. Lewenstein (1995) argues that smaller electronic spaces with more limited access than newsgroups might be better for active researchers. This resembles the observation of Bainbridge (1995), who argues that public newsgroups have too high a noise rate. Many researchers would react by leaving these groups and concentrating on more restricted mailing lists.

However, the available data, lacking any systematic evaluation, doesn't allow a judgment of these assessments.

23.3.2 Transformation of Invisible Colleges, Peripherality Effects, or the „Balkanization“ of the Sciences?

Some researchers regard the discussion in IDGs as low quality research more resembling party conversation than serious academic communication and stop using them (Bainbridge, 1995; Conner, 1992). One might counter that this kind of electronic conversation is important for the interactive formulation of new ideas (Conner, 1992). Conversation, however, does more than stimulate the formation of new ideas. Studies of the academic communication system demonstrate that the benefits of informal communication are only to a small extent the intended result of planned action. They are often a by-product of interactions initiated for other reasons (Menzel,

1962, 1966). Such by-products can nevertheless lead to important new *contacts* between researchers.

The discussion within an IDG is sometimes compared to discussions on the fringe of conferences (Gresham, 1994; Hiltz & Turoff, 1978). E-mail communication is a peculiar mixture of textual and conversational elements (McCarty, 1992; Rice, 1997). This suggests that e-mail not only facilitates the transmission of impersonal information on research questions, but also acts as a social medium in which personal information is exchanged. Empirical studies show that e-mail communication makes possible the sending out of social cues about the sender especially during longer-lasting communication processes (e.g., Korenman & Wyatt, 1996; Walther, 1995).

These considerations have become more important since the 1980s because science policy gives clear incentives for collaboration and cooperation between researchers (Ziman, 1994). Empirical indications for an increase in cooperation and networking within the research system exist (Hicks & Katz, 1996). The formation of a collaboration between researchers, however, is dependent on their cognitive backgrounds as well as on social and economic considerations (Traore & Landry, 1997; Luukkonen et al., 1992). Moreover, the frequency of interaction between researchers plays a role (Hagstrom, 1965; Katz & Martin, 1997). Kraut et al. (1987, 1990) argue that frequent communication provides opportunities for an easy assessment of the qualities of a potential cooperation partner. These opportunities for a first preliminary assessment can be given in an active IDG as well.

Accordingly, one of the important possibilities of IDGs is the *creation of new contacts between individual researchers or the intensification of already existing contacts* (Hiltz & Turoff, 1978). Furthermore, many analysts have taken a look at the impact on the *macro level* of the whole communication system.

The possibility of creating new links has particularly attracted their attention. This potential to change the informal communication network of the whole academic system, and not just the networks of single researchers, is sometimes regarded as a remedy for existing problems and disadvantages (e.g., Gresham, 1994). Others look upon it with the skepticism that the use of IDGs might also create new problems, at least if IDGs are used by numerous researchers (Alstynne & Brynjolfsson, 1996a). Both points of view expect that the emergence of new contacts will not take place randomly. Hopeful analysts expect the creation of new links to diminish existing disadvantages in the informal communication structure *within research areas*. The skeptical view concentrates on the possible detrimental consequences for the communication structure *between different research areas*.

Optimistic analysts believe that electronic communication will put an end to some of the negative effects of the so-called „invisible colleges“ which have traditionally characterized the informal academic communication structure. An invisible college consists of a small number of very active researchers who regularly exchange infor-

mation or papers about the newest progress on the research front (Price, 1963; Crane, 1972). Such invisible colleges have been found in a variety of different disciplines within the natural sciences, social sciences and humanities (e.g., Price & Beaver, 1966; Crane, 1969, 1972; Gaston, 1972; Weedman 1993; Zaltman 1974). They mediate large parts of the informal communication within many research fields. As a result of its limited size and restricted access opportunities, the existence of an invisible college leads to a very *unequal distribution of communication possibilities*. There is a status hierarchy that corresponds to the opportunities for access to communication channels. Those few very active researchers in the center of an invisible college have the most possibilities (Price & Beaver, 1966; Price, 1971). The large number of researchers without access to any member of an invisible college has very few communication opportunities (Garvey & Griffith, 1966). This especially affects younger researchers, who are prevented from reaching their full potential, and making the maximum possible contribution to their discipline (Cronin, 1982).

Proponents of IDGs hope that IDGs enhance the information flow between low status and high status researchers and that especially disadvantaged researchers will profit from the opportunities of creating new contacts (Hiltz & Turoff, 1978). IDGs could thereby, it is hoped, counteract the Matthew Effect in science (Merton, 1973), which postulates that those in the research system who are already recognized will cumulatively be more advantaged compared to those who are less recognized. Researchers have different expectations about the extent to which this inequality will be diminished.

Some researchers expect a *peripherality effect* of those computer-mediated communication tools for which there are few access restrictions (Walsh & Bayma, 1996b; Hesse, Sproull, Kiesler & Walsh, 1993).⁵ Peripheral researchers (younger researchers and those in less prestigious institutions) will be more able to participate in the informal communication system of a research field through the use of these CMC tools, and will extend their communication networks (Walsh & Bayma, 1996b). The peripherality hypothesis is often mentioned in connection with the study of Hesse et al. (1993). They found that peripheral researchers in the field of oceanography profited more from the use of CMC tools, including several bulletin boards, than integrated researchers did (see below). The hypothesis does not predict sweeping changes in the significance of a researcher's status for control over access opportunities to communication channels (Walsh & Bayma, 1996b). It also leaves open the question whether there are any substantial effects for well-integrated researchers and whether the differential effects will be large enough to have a *fundamental* impact on the inequality in

⁵ Free access to CMC tools like e-mail and IDGs is practically given for Western European and US researchers.

the distribution of access opportunities in general (ibid.).⁶ However, it suggests an effect that *reduces these inequalities at least to some degree* (Hesse et al., 1993; Walsh, 1998).

A more explicit variant of this hope states that IDGs will extend the contact networks of researchers in general. Gresham (1994) predicts that invisible colleges will increase in size and that their exclusiveness will be overcome through the use of IDGs. Members of an invisible college, as well as other researchers, will make use of mailing lists, newsgroups and other forms of online-conferences. Peripheral researchers will have new possibilities for participating in the flow of ideas, information and unpublished research papers, which usually takes place only between members of an invisible college. They will easily make contacts with experts in their research area. Everyone will profit from these opportunities to a considerable degree. The formerly limited networks of invisible colleges will expand into international networks of enormous size. According to Gresham (1994) the character of invisible colleges will be changed fundamentally through the use of IDGs because their elitism will disappear.

Consequently, the two variants differ relating to the expected scope of the change in the networks. According to the peripherality hypothesis, it is possible that the communication networks of well-established researchers using IDGs are minimally affected whereas those of traditionally disadvantaged researchers benefit from access to more established researchers. Gresham (1994) is much more explicit with regard to the expected effects. However, both versions expect consequences of the use of IDGs that will reduce the traditionally existing inequalities in the distribution of access opportunities.

Alstynne & Brynjolfsson (1996a, 1996b) are more skeptical about the consequences of increased use of mailing lists and the Internet in general. They also expect that the Internet and academic mailing lists will offer opportunities for the creation of new contacts. Their starting point, however, is not the unequal distribution of access opportunities within a research area. Rather, they are concerned with the possible effects on interdisciplinary contact between different research areas. They argue that the increasing possibilities the Internet offers for extending one's network might lead to a „global village“. At the same time, they emphasize that the emergence of a „global village“ is just one possible outcome. An alternate, completely different outcome may be increasing fragmentation among insulated research communities supported

⁶ Furthermore, Walsh & Bayma (1996b, 357) explicitly mention another scenario. They note that top researchers may profit more because they are the targets of those researchers who initiate e-mail-contact in hopes of collaboration. However, the only differential effects found were larger for peripheral researchers (see below). Moreover, Walsh (1998) refers to the peripherality hypothesis as implying peripheral researchers profit disproportionately.

by very narrowly specialized mailing lists (Alstyne & Brynjolfsson, 1996b). In a nutshell, their argument reads as follows:

The Internet and its different tools offer a variety of opportunities for information access and contact with other researchers. The geographical limitations of the past can be overcome by the Internet. However, researchers have a limited amount of time and attention at their disposal. The increase in opportunities of choice demands an increase in selectivity: it becomes necessary to filter out of the most favored information and contacts. Researchers have to focus on those colleagues that interest them most, regardless of their geographical location. Other colleagues have to be excluded (Alstyne & Brynjolfsson, 1996a). Whether fragmentation occurs depends on the nature of the researcher's interest: is it more concentrated in his own field or in the developments of other research fields? *If* the interest is based on *similarity* and *if* the preference for similarity is so *strong* that it leads to more contacts of the same sort than are available locally (e.g., based on the same discipline or on the same research field), the increase in choice opportunities will lead to an increased balkanization of the research system (Alstyne & Brynjolfsson, 1996b). Researchers will then favor depth in their interactions with colleagues at the cost of breadth.

This consequence is not inevitable. If researchers prefer diversity in their contacts, there will be no increase in balkanization. On the other hand, specialization is often beneficial for the individual researcher. Especially in research fields with high pressure for publication there will be less time to cross the borders of one's own specialty (Alstyne & Brynjolfsson, 1996a). The authors view the increasing use of technological filter mechanisms for the selection of information and the retreat of researchers into ever more restricted *mailing lists* as indicators that a balkanization is indeed possible. At the same time, they stress that in the second half of the 1990s these changes are just beginning. The direction of the change, either towards a „global village“ or „balkanized electronic communities“ can still be influenced by the research system. The emergence of a „global village“, however, should not be taken for granted (ibid.).

The *empirical evidence* for contact benefits of IDGs is weaker than the evidence for the information and idea benefits. Lubanski & Matthew (1998) and Ziesemer (1996) give some examples of researchers that created new contacts by using Internet tools (including IDGs). Hiltz (1984) found in her study of four research groups using a computer conference system that intensive system use increased the communication between the researchers. Freeman (1984) studied the use of an electronic conference system by a small number of social network researchers. He found that during the seven months of system use, the mutual awareness and mutual acquaintance between pairs of researchers increased. Rojo & Ragsdale (1997a) found in their study of eleven mailing lists that only a minority of researchers (37 out of 124) had become more aware of other researchers. Lewenstein (1995) reports few possibilities for the creati-

on of new contacts between researchers in one studied physics newsgroup. None of these studies compared users with non-users of IDGs or distinguished peripheral researchers from other ones. Scholl et al. (1996) asked researchers whether e-mail use led to an intensification of contacts to other researchers. They found that those who were intensive e-mail and IDG users attributed a significantly higher value to its usefulness in intensifying contacts.

Hesse et al. (1993) made a distinction between different groups of researchers. They studied the use of computer networks (including IDGs) by 257 researchers within the field of oceanography. In a multivariate analysis, they found positive associations between CMC use and the number of published articles, professional recognition, and the number of oceanographers known by the respondent. The first two effects were stronger for researchers at peripheral research institutes or for less experienced researchers. Other studies of the general use of CMC found positive associations between the use of CMC tools and the amount of collaboration between researchers. However, stronger effects of general CMC use for peripheral researchers were not always found (Walsh, 1998).

I do not know of any study that analyses the possible impact of IDG use on the diversity of researchers' contact networks.

Other studies investigate the effects of general e-mail use on the creation of new contacts between researchers. Carley & Wendt (1991) studied a small group of researchers at geographically dispersed locations. They found that e-mail was used to enhance existing contacts but not to create new ones. Meadows & Buckle (1992) also argue that the use of e-mail for informal communication by British researchers did not reduce social barriers to the circulation of important pieces of information like pre-prints of research papers.

This data does not lead to any firm conclusions. The existing evidence for contact benefits often suffers from the same drawbacks as the evidence for information benefits. It is not clear if IDGs lead to an increase in informal contacts among researchers. Furthermore, it is unclear whether there are differential effects that reduce existing inequalities. Contact benefits even for a limited group of researchers could be important for the research system. However, it remains unclear what benefit these hypothetical new contacts may have and for whom. Are they opportunities for posing single questions, or can they become more regular information channels? Qualitative information about the nature of these new links is minimal. This makes it even more difficult to evaluate whether IDGs can reduce inequalities, or if they narrow the focus of interactions between researchers.

23.4 Disciplinary Differences in the Use of Internet Discussion Groups

The hypotheses that were presented in the previous section have a very broad scope in the sense that they do not make a distinction between researchers in different disciplines. However, different disciplines have distinct communication traditions (Becher, 1989). Many researchers argue that these differences have an influence on how researchers use the Internet (Goodman et al., 1994; Kling & Covi, 1995). This leads to the question: Are there differences in the prevalence of IDGs use among different disciplines? If so, how can these differences be explained?

The common view is to regard researchers in the natural sciences as the most advanced Internet users (Goodman et al., 1994; Scholl et al., 1996). Some even forecast that researchers in other disciplines, after a time lag, will adopt the Internet tools most successful in the natural sciences, and that finally all disciplines will converge to use the same tools in similar ways (Odlyzko, 1996). Other analysts emphasize disciplinary differences in communication habits. They think disciplinary differences in the use of computer-mediated communication tools will continue to exist (Kling & McKim, in press).

Little research has been done on general differences in the use of e-mail, IDGs or computer-mediated communication tools among the different academic disciplines (Harrison & Stephen, 1996). Most analysts adopt ideas from organizational studies or from diffusion of innovation studies (Rogers, 1995). The basic idea of these studies is that not only the potential of a technology, but also the working and communication traditions and the personal interests of its potential users influence the way it will be used.

In a study of researchers in mathematics, physics, chemistry and experimental biology, Walsh & Bayma (1996a) identified a number of conditions which, according to their view, influence how a researcher will make use of a computer-mediated communication tool if he has access to the technology. They argue that a high *degree of interdependency* between the projects of researchers within a research field will facilitate the adoption of computer-mediated communication (CMC). In such fields CMC is a useful tool for informal communication, helping to coordinate and adjust research activities among researchers. Another factor is the strength of the *link to the (commercial) market* within a research field. If this link is strong, much of the information is too valuable for researchers to spread it informally, inhibiting the use of CMC. An additional determinant might be *the size of a research field*. Walsh & Bayma (1996a) think that in large research fields many researchers are unknown to one another, leading to complications in informal communication. This would discourage researchers from communicating informally with each other via CMC. Finally, the *match between routine working traditions and CMC* might be important. If

it is difficult to integrate the CMC tool into the working routine of researchers, its usage would be avoided.⁷

Kling & McKim (in press) argue that *problems of trust* between researchers have a pivotal influence on the use of CMC by researchers. They discuss various conditions related to the usage of CMC tools by researchers in different disciplines, and how they may affect these problems. Two kinds of problems of trust have an impact on the use of CMC in research fields. Firstly, researchers who use CMC tools to receive information in an informal way have to trust the sender that the information is reliable. Reliability is necessary for the information to have some value. Secondly, researchers who use CMC tools to send information informally to others have to be confident that sharing information does not harm their own career advancement. Kling & McKim (in press) regard four conditions of research fields as crucial for these problems of trust that may inhibit the use of CMC tools.

If there is a *high degree of mutual visibility* of research projects, the risk of sharing information will be lower. A higher visibility of the projects in a research field results in the distributed information having a value which is less dependent on its secrecy. Moreover, Kling & McKim (in press) argue that the *degree of concentration of communication channels* is important. If the research results in a field are published in a small number of journals, researchers are much more visible. This visibility, in turn, lowers the risk of sharing information (see above). As a third condition, they consider the *commercial consequences* of research projects as important. Commercial consequences of research results cause researchers to be more conservative about sharing information and data. Finally, according to the authors, *high research project costs* have several effects. They can give incentives to collaborate more often and may make researchers more visible within their research field. At the same time, high costs give rise to stronger internal controls of the reliability of the distributed results of project⁸.

These hypotheses have not been tested explicitly. In principle, they should apply to the use of IDGs among different disciplines. Presently the only way to assess their validity is to examine existing studies that describe disciplinary differences in the use of IDGs.

Harrison & Stephen (1996) conclude from the growth of the number of academic mailing lists in the first half of the 1990s that it is unlikely that there is a discipline that does not make any use of IDGs. However, representative data on the use of e-mail, IDGs, electronic archives or other forms of computer-mediated communication tools in a variety of different disciplines is not available. The study of Scholl et al.

⁷ As an additional remark, Walsh & Bayma (1996a) regard the publication time lag of research journals as an important factor in the use of CMC tools.

⁸ I regard this last effect as ambiguous. It may reduce the problem of trust for the receiver of the information. On the other hand, it can increase it for the sender.

(1996) suggests that German researchers in the natural sciences used e-mail more often than researchers in the social sciences did. Walsh & Bayma (1996a) found in a study among US-researchers that mathematicians and physicists used e-mail more often than experimental biologists or chemists. Mathematicians mentioned the use of mailing lists most often. In another study, Merz (1998) notes that only a few theoretical physicists use mailing lists or newsgroups.

These studies cannot be used to evaluate any of the hypotheses systematically: Many factors are confounded when we look at outcomes compiled from different disciplines. Walsh & Bayma (1996a) comment on their findings that, for instance, mathematicians work in small research fields that have a weak link to commercial markets. One has to compare researchers in different fields to find out whether the small field size or the low amount of commercial consequences is the crucial factor. As another important aspect, these studies suggest that even *within the same discipline different CMC tools can be used completely differently*. Although physicists may use e-mail very often, they may avoid IDGs.

I regard this as a hint to consider very carefully *which communication needs can be fulfilled with which CMC tool*. It might indeed be possible that *problems of trust* inhibit the use of IDGs among researchers within some research fields. Empirical research that looks carefully at the differences between distinct research fields is needed to verify this. However, it might also be that researchers in fields with a large diversity of communication channels (journals) use IDGs because they have special communication needs. They may use IDGs to stay informed e.g. about ongoing conferences, which is more difficult in a field with diverse communication channels. This implies that a diversity of communication channels does not inhibit the use of IDGs. Rather, it gives incentives to use them.

23.5 Summary

This paper reviewed a number of hypotheses with regard to the possible effects of IDGs on the informal academic communication system. It looked at possible benefits for individual researchers and at the possible consequences of the use of IDGs for the structure of the informal communication system.

The individual benefits were categorized as information or contact benefits. Existing studies suggest IDGs may *facilitate the transfer of information*, yet may *not stimulate the production of new knowledge*. The creation of *new contacts* or the *intensification of existing contacts* are often mentioned as potential contact benefits. However, existing studies have not yet succeeded in giving clear evidence that the use of IDGs really results in information or contact advantages.

Different hypotheses were presented that focused on distinct consequences of the use of IDGs for the informal communication networks of researchers. Many analysts expect IDGs will *equalize access to communication channels*: those with fewer opportunities to communicate will profit disproportionately from the use of IDGs. Other analysts look at the effects of intensified Internet and mailing list use on the fragmentation of research fields. They emphasize that the emergence of a global village should not be taken for granted. A *balkanization of the academic communication network* is another possible outcome. Empirical evidence for either scenario is limited.

Finally, differences in the use of IDGs in various disciplines were discussed. Some studies focus on problems of trust between researchers that might inhibit CMC use. The sparse empirical evidence relating to disciplinary differences in the use of IDGs suggests that conditions, which may facilitate the use of one CMC tool, do not necessarily facilitate the use of another tool. One has to take into consideration how the communication needs of researchers in a field relate to a CMC tool. Otherwise it is difficult to generalize predictions for one CMC tool to another one.

Most empirical studies have the disadvantage of only concentrating on restricted parts of the research system. They focus either on single IDGs or on a few groups of researchers. They do not take into account the differences in communication behaviors, communication needs, and research traditions of different disciplines. In summary, one can say that many empirical studies lack theory. Exactly such a *theory-guided comparative view* is required to evaluate the validity of far-reaching claims. Some of our expectations about the effects of the Internet and its communication tools on research have not been met, but many others still exist. It is time to replace speculation with evidence. Data collection, however, should be steered by theory. I hope to have shown that there is a set of related hypotheses empirical studies should take into account. If this paper is to give some direction for future research, it can be considered a first useful step in understanding the effects of the Internet on research practice.

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