Part I:
The Setting of the Study
Chapter 1

Introduction: Electronic Groups, Social Networks, and Academic Communication

There is much speculation about the (potential) impact of the Internet on society. In the second half of the 1990s the first empirical studies were published supporting or refuting different claims about the impact on cohesion and social involvement in society (see e.g. DiMaggio et al. 2001). One important discussion is about the consequences that the use of different tools of the Internet has for the social networks of its users. Sometimes it is argued that the Internet would weaken social involvement, whereas other analysts claim that the Internet would strengthen social bonds (see e.g. Kraut et al. 2001; Kraut et al. 1998; Wellman et al. 2001; Cole 2000; Hampton 2001).

For the research system a similar discussion is evolving. There is much speculation about the potential effects that Internet tools could have for the social networks of researchers. One prominent idea is that the Internet could reduce an important kind of social inequality in the academic system, namely inequalities in the informal social contacts between researchers (e.g. Gresham 1994a; Walsh and Bayma 1996a; Walsh 1998f; Hiltz and Turoff 1978; Turoff and Hiltz 1998e). It is a widely accepted idea that informal communication and informal contacts are crucial for scientific progress and for individual career advancement in the academic system (Meadows 1974; Garvey and Griffith 1964; Crane 1972; Cronin 1982; Becher 1989). Nevertheless, access opportunities for making and maintaining contacts are very unevenly distributed (Crane 1969; Crane 1972; Weedman 1993; Gaston 1972; Zaltman 1974; Price 1971), which is regarded as a hindrance, especially for younger researchers to make use of their full potential (e.g. Cronin 1982). Some analysts claim that electronic groups of the Internet could reduce this inequality (e.g. Gresham 1994a) and will even be able to counteract the so-called Matthew effect in science (Merton 1973), which implies a growing inequality between the ‘haves’ and ‘have-nots’ during their career development. Evidence for these claims, however, is missing. Chapter 3 presents results of empirical analyses that allow an assessment of the validity of this claim, the 'equality hypothesis' as I would like to call it, and other related claims about impacts on the social networks of researchers.

A related question about social inequality in the academic system is concerned with disciplinary differences in the use of Internet tools. It is completely unclear whether in the long run the Internet will unite the different academic disciplines of the scholarly
system by stimulating them to use the same communication tools, or whether it will lead to a greater divergence between the disciplines that use their own specific tools. Both points of view have their representatives (see e.g. Kling and McKim 2000a; Kling and Covi 1995; Odlyzko 1996; Harnad 1991). At the moment, different disciplines experiment with their specific tools in a “trial-and-error” fashion. It would be very useful to know more about the social forces of the academic communication systems that lead to the use or the rejection of communication tools by researchers of different disciplines (Kling and McKim 2000a). Chapter 4 reviews the few existing hypotheses about such forces. It develops new ideas and tests the different hypotheses empirically.

The discussion about the effects of the Internet on the social involvement of its users is strongly related to a more general question about cohesion and social order in society, which has belonged to sociology since its beginning (Durkheim 1964). In this discussion the point of concern is whether electronic groups of the Internet enhance or diminish cohesion and cooperation between individuals. Some authors argue that they can have important community properties, whereas others claim that so-called ‘virtual communities’ are a kind of ‘instant community’ that cannot obtain ‘true’ community qualities (see e.g. Wellman and Gulia 1997; Baym 1995; Etzioni 2000; Foster 1997; Rheingold 1993; Weinrich 1997; Wilbur 1997). I argue in Chapter 5 that it is not useful to speak of the effect of (electronic groups of) the Internet on cohesion, social order, or cooperation between individuals. The findings of Chapter 3 suggest that, apart from some general impact, there are qualitative distinctions between different kinds of electronic groups. Chapter 5 builds on these findings. Some electronic groups are more suited for enhancing cooperation between individuals than others. The crucial conditions for fostering cooperation and achieving the collective good of a useful group discussion are not so much the technical ones. Nor is the direct impact of a benevolent group moderator crucial who is sometimes regarded as the modern electronic version of Hobbes’ Leviathan. A more interesting factor is the existence of social networks in ‘real’ life that can facilitate or hinder the emergence of cooperation in electronic groups. Chapter 5 develops this argument in more detail. It presents existing hypotheses about conditions fostering cooperative behavior and new behavioral models that specify mechanisms by which the network embeddedness (Granovetter 1985b) of electronic groups influences the interaction and cooperative behavior of their members. Chapter 6 provides empirical evidence supporting the claim that the social embeddedness of electronic groups is one of the crucial factors influencing the development of social order in electronic groups and affecting whether they have beneficial effects.
The implications of the findings of Part II of this book are twofold. Firstly, I hope to contribute to shifting the discussion about whether and how the Internet has an impact on the science system (including the social sciences and humanities!) to a higher level. The empirical evidence makes it possible to weight the pros and cons of some arguments about the ‘impact discussion’ in a better way than before (see Chapter 3). At the same time, I hope to bring in a new idea regarding the discussion about the social forces that shape disciplinary differences in the use of Internet tools (see Chapter 4). Part II A of this book (Chapter 3 and Chapter 4) is concerned with these issues of Internet and academic communication.

Secondly, I hope to contribute to the realization that the discussion should not only focus on the effects of (electronic groups of) the Internet. The discussion can go one step further by asking the question ‘under which conditions does the Internet (or do electronic groups) help to achieve certain beneficial effects?’, for example the making of new contacts or the emergence of cooperation. Part IIB (Chapter 5 and Chapter 6) shows that a first answer to this question can be given by studying interaction in electronic groups and their interrelationship with ‘real’ life social networks. An analysis of interaction in electronic groups may lead to insight about how to structure groups so that they can reach their beneficial potential. The crucial point is that such an analysis of interaction in electronic groups is useful not only for the academic system but also for a variety of different kinds of academic and non-academic electronic groups of the Internet. Chapter 7 presents some concluding remarks that highlight possibilities for a general analysis of electronic groups, of which this study is just a single example for the academic system.

This point of view emphasizing a comparative analysis of interaction in different electronic groups contrasts with the large number of studies describing or sometimes analyzing single deliberately selected groups and their use of Internet tools (see the descriptions of empirical studies in Chapter 3 and Chapter 5). The developing field of ‘Internet studies’1 still seems to be dominated by such case studies of electronic groups, together with interested speculation. Other studies using data that allow more general conclusions to be drawn tend to focus on descriptive questions or correlational analyses without going into a causal analysis that theorizes about ‘cause’ and ‘effect’ (see e.g. PEW Center for the People and the Press 2000; PEW Center for the People and the Press 2001; Cole 2000). What is conspicuously missing for an analysis of the academic system is data about a general population including a variety of different user groups. What is missing in general (not only for the academic system) are studies
trying to disentangle what is the ‘cause’ and what is the ‘effect’ by developing and testing theories that specify how Internet tools affect human interaction under what conditions. For such an analysis it is fruitful not to take ‘the’ Internet as a technological constant that cannot be shaped. While it is useful to look at general tendencies about how the Internet affects human relations (e.g. Nie and Erbring 2000), this study tries to complement such analyses by going more into the details of the (shapeable) conditions under which some effects appear (see Chapter 5).

Additionally, I try to complement approaches that emphasize the uniqueness of social phenomena on the Internet that would need their own distinct theories and methods (see e.g. Preece 2000: 392; Turkle 1995; Jones 1999). Contrary to this, the study aims to show that much can be learned by subsuming problems of Internet research as special cases of general problems studied in sociology. Contrary to many social-psychological approaches developed especially for studying electronic interaction (see e.g. Walther 1995d; Short, Williams, and Christie 1976; Kiesler, Siegel, and McGuire 1984; Dubrovsky, Kiesler, and Sethna 1991; Postmes, Spears, and Lea 1998c; Postmes, Spears, and Lea 2000; Daft and Lengel 1986), this study suggests that making use of general behavioral models (see e.g. Coleman 1990c; Becker 1976) can be useful for studying electronic interaction.

Naturally, it is impossible to study “the” effects of “the” Internet on “society” in one investigation. This study focuses empirically on a specific subsystem of society, namely the academic system. Moreover, it restricts itself to analyzing a specific tool of the Internet, namely the so-called academic Internet Discussion Groups. They include academic mailing lists and newsgroups.

A mailing list consists of a group of individuals with an email account who are interested in a certain subject, the topic of the list. Usually one can subscribe to a list by sending an email to the appropriate email address. The discussion about the topic is performed by sending emails to another list-address. Through specialized communication software, controlled by the list manager, these centrally received emails are automatically sent to every subscribed member. The technical preconditions for becoming a member of a group are fulfilled for the great majority of researchers in Europe and North America. A contribution to the group discussion usually consists either of an announcement (e.g. of a conference), a question with regard to the topic, or an answer to a question. Every group member can receive this email and has the chance to read it and to reply (see e.g. Gilster 1993). The technical preconditions of Newsgroups differ. A Newsgroup user does not

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1 The expressions ‘online research’, ‘Internet research’, or ‘Internet studies’ are used interchangeably
automatically receive messages in his email box. He actively has to use different software for reading them. However, the basic principle is the same. Contributions can be received by everyone. In both kinds of groups passive members who read only can be distinguished from active participants who additionally contribute by sending questions, answers, or other announcements to the group. The term "Internet Discussion Group" (IDG) that is used here describes asynchronous communication tools for the communication between one sender and many receivers, namely mailing lists and newsgroups. Email software or some freely available software is sufficient for this communication. Synchronous communication tools, such as on-line chat-programs etc., are not included. Moreover, the empirical findings presented in Chapter 3 and Chapter 4 make it clear that this study is most of all about mailing lists, which are used by a much larger proportion of researchers than newsgroups for pursuing professional activities.

Before presenting in detail the arguments for focusing on academic Internet Discussion Groups (IDGs) as a study topic in section 1.1, I would like to draw the attention to one pivotal advantage that the following empirical analyses have. Many empirical studies, e.g. on the effects of the use of email for academic communication, face the problem that it is very hard to distinguish between the supposed causes and effects. It may be that frequent use of email leads to new contacts for the researcher. At the same time, it may be that the large number of contacts that a researcher has stimulates his use of email. Some studies find associations between the researcher’s frequency of email use and his number of contacts. Usually these analysts either confine themselves to describing associations that may have no causal relevance at all or they argue that further longitudinal empirical analyses are needed to assess the causal relevance of their findings (see e.g. the studies of Walsh et al. 2000; Walsh 1998f)., When carefully designed to allow the disentanglement of what is a ‘cause’ and what is an ‘effect’, the study of Internet Discussion Groups can avoid this difficulty. I claim that the analyses of Part II of this book exemplify this advantage.

1.1 Why Internet Discussion Groups?

Does it make any sense to restrict the analysis of this book to studying ‘only’ Internet Discussion Groups (IDGs), that is, academic mailing lists and newsgroups? In the following section I first pinpoint the potential relevance for research policy that such an analysis may have before I highlight the potential relevance for theoretical research, since I expect many Internet researchers to be interested in policy questions.
1.1.1 Potential Relevance for Research Policy and Knowledge Management

The formal publication system is being changed by the Internet because of the introduction of so-called electronic journals (see e.g. Peek and Newby 1996; Harnad 1995; Kling and Covi 1995; Kling and McKim 1999). Informal communication may not be as visible as formal communication. Nevertheless, it is regarded as one of the pivotal ingredients for scientific progress (Garvey 1979; Meadows 1974). Empirical evidence, restricted as it is, indicates that the informal communication system is influenced very strongly by the Internet and especially by the different possibilities that the use of electronic mail provides for bilateral or group communication (Meadows and Buckle 1992a; Koku, Nazer, and Wellman 2001; Freeman 1984b; Hesse et al. 1993a; Scholl, Pelz, and Rade 1996c; Walsh and Bayma 1996f; Cohen 1996d).

Internet Discussion Groups are expected to be relevant tools for the individual researcher to gain information and to make new contacts (Gresham 1994a; Turoff and Hiltz 1998e). General evidence for this hope, however, is missing. At the same time, large computer systems for the maintenance and support of academic mailing lists such as the former British Mailbase System, the US H-Net System, or the Dutch Surfnet System, require financial input. There are also enormous time costs involved for the moderators or list managers (Conner 1992c; Berge and Collins 1993). Active mailing lists aggravate the problem of information overload for every user (Whittaker and Sidner 1997; McCarty 1992). Although academic mailing lists are very popular among many researchers (Mailbase 1999a), there is anecdotal evidence that some researchers seriously doubt their usefulness (Bainbridge 1995b). What are the benefits that justify these costs, if there are any benefits at all?

The impact of IDGs on the macro system of academic communication is regarded as no less crucial than their micro-impacts (see Matzat 2000 for details of the following). Some analysts expect IDGs to reduce the negative effects of communication barriers between very central researchers and those at less prestigious research institutes (Gresham 1994a; Walsh and Bayma 1996a; Walsh 1998f). As a consequence, social inequality in the academic communication system and its negative effects would be reduced (see the discussion above and in Chapter 3 for details). Other analysts fear that IDGs may create new dangers for the structure and functioning of informal
communication. Alstyne & Brynjolfsson (1996a) describe a possible scenario of IDG use leading to a “balkanization of the sciences”. In such a situation researchers in different fields hardly communicate any more with each other because they focus on ever more specialized communities of academic interests. These authors stress the importance of monitoring the developments in the field of informal academic communication.

Other policy questions focus not on the impact of the tools of the Internet but on factors that could act as barriers or stimuli for the spread of specific electronic tools. The current situation in the research system is characterized by a variety of divergent pathways of information & communication technology (ICT) use in different disciplines. Some specific tools are tried out in one discipline without taking into account the experiences that another discipline has already gained with the use of these tools. The development, propagation, and maintenance of ICTs imply substantial costs. These costs could be avoided or reduced if we knew more about the factors that contribute to the acceptance of ICTs by some users and the rejection of ICTs by others (Kling 2000). In short, knowledge of the social factors in the academic communication system leading to the acceptance or rejection of communication tools is needed in order to avoid the disadvantages of the current “trial-and-error” practices in many disciplines (Kling and McKim 2000a). In particular, the study of Internet Discussion Groups offers advantages for gaining such knowledge. If we want to gain insight into the factors leading to the distinctive ICT practices of different disciplines, we need to conduct a comparative analysis of different disciplines. The strength of the study of IDGs is that IDGs are a ‘traditional’ communication tool of the Internet with a relatively low technological threshold. They have already been functioning for some time in a variety of different disciplines (see e.g. Mailbase 1999a), which is a precondition for a comparative study. Disciplinary differences in the prevalence of IDG use cannot easily be explained by the ‘novelty’ of IDGs. Knowledge of the social forces leading to the acceptance or rejection of a specific communication tool, however, can also be useful for gaining more insight into the as yet unfulfilled communication needs of researchers. Such knowledge is useful for decisions to be made about the introduction of other, perhaps technically more advanced tools in different disciplines. As a consequence, the study of IDGs may provide knowledge relevant to policy decisions about ICT and Internet tools in general.

Another ‘policy question’ is how to make use of IDGs, once it has been decided that they should be used. Not all electronic groups are of the same ‘quality’. Some

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2 Since the end of November 2000, mailing lists from the Mailbase service were migrated to another
researchers left IDGs after they realized that IDGs did not meet their high expectations (Bainbridge 1995b). Other research suggests that the making of new contacts may be a good predictor for so-called ‘Internet drop-out’ (Steering Committee on Research Opportunities Relating to Economic and Social Impacts of Computing and Communications 1998). It is of practical relevance to gain knowledge that would help IDGs to reach their full potential. Which conditions ensure an efficient transfer of information and make it more likely that IDG users are satisfied with the list discussion? Which conditions facilitate the making of new contacts? I argue in Chapter 5 that in order to answer these questions it is useful to have some ideas about what stimulates the provision of help and information by group members. In particular, the analysis of academic IDGs is suited to finding out whether information incentives or social incentives (as I argue in Chapter 5 and Chapter 6) have a greater effect in stimulating group members to participate actively in the group discussion.

Finally, for all these questions it is advantageous to analyze a tool that is not at the cutting-edge of technology applications. Such applications tend to be used more often in academic environments with extra-ordinary flexibility, above-average resources, or individuals who are very enthusiastic about technology (Attewell 1998). This study, however, is concerned with the implications for the 'ordinary' researcher and thereby with general outcomes.

1.1.2 Potential Relevance for Theory Development

Online research is concerned with some classical questions of sociology. At the same time, very often the answers given are not influenced by sociological theory. The development of sociological theory related to the Internet and electronic communication has not yet progressed very far. Sociological theory could help to predict and explain under which conditions and by which mechanisms tools of the Internet (or the Internet in general) have certain micro- and macro-outcomes. It could help to predict and explain which factors influence by which mechanisms the use or acceptance of new information and communication technologies, and which conditions have by which mechanisms an impact on how individuals behave in electronic groups leading to desired or undesired outcomes at the group level.

service. Since then only fee-paying lists are supported by Mailbase (Mailbase 2001).
Current Internet research, however, is very often a (nevertheless interesting) kind of ‘impact research’ that relates some input, e.g. the frequency or intensity of Internet use, to some output, e.g. some forms of social involvement (see e.g. Kraut et al. 1998 for a methodologically very well designed study). After yielding empirical results, some studies proceed to post-hoc speculation in order to explain them. Other Internet research is either somewhat speculative, making no use of theories in an analytical sense (see e.g. Castells 1996), or it makes use of very specific hypotheses about computer mediated communication (see e.g. Postmes, Spears, and Lea 1998c) that make it difficult to relate the research to macro-outcomes in society. Theory-guided research on the Internet that makes use of general models of human behavior is scarce (see e.g. Kollock 1999; Friedman and Resnick 2001; Bacharach and Board 1999, for some examples).

In this book I would like to show that it is useful to link research on the effects of the Internet and on interaction in electronic groups to general sociological theories about human behavior. Such a link makes it possible to explain under which social conditions an Internet tool is accepted or rejected by the user, how it is used, and what outcomes can be expected from the use of a tool of the Internet. The strategy used here is to utilize a very simple model of goal-oriented human behavior to explain the relationship between different phenomena at the macro-level (Coleman 1990c: Chapter 1).

In more detail, this book aims to contribute to theory development with regard to three aspects.

Firstly, it tries to develop new models that show how the social embeddedness (Granovetter 1985b) of electronic Internet groups contributes to the *emergence of cooperative behavior* between individuals and thus to social order on the Internet. The models specify by which mechanisms social networks influence active discussion participation in electronic groups. Active participation in electronic groups by way of public provision of help and answers is an important form of cooperative behavior. Additionally, the interaction is related to the members’ satisfaction by the quality of the group discussion. A group discussion of satisfying quality and with an adequate number of discussion contributions can be regarded as a collective good (Olson 1965) since every member profits from it independently of his contribution to the discussion. The public provision of help and answers in an IDG is thus analyzed as an important contribution to a collective good (see especially Chapter 5 and Chapter 6).
Secondly, it tries to systematize existing hypotheses about conditions influencing disciplinary differences in the prevalence of use of information & communication technology (Kling & McKim 2000a; Walsh & Bayma 1996f) and to add a new idea to this existing knowledge. The mechanisms implicit in the existing hypotheses are made explicit (see especially Chapter 4).

Thirdly, it tries to show under which conditions access to electronic groups of the Internet can be converted into (different kinds of) advantages for the academic performance of their members and by which mechanisms. In this sense, it analyzes under which conditions electronic groups give their members access to social capital (see especially Chapter 3, but also Chapter 5 and 6).

For the developing field of Internet or online research this book tries to make two points clear. Firstly, even for answering questions with relevance to policy, it is useful to have a theoretical foundation for conducting Internet research. Secondly, the use of rational choice theories is very appealing for developing a theoretical foundation for Internet research. This does not imply that more specific approaches of computer mediated communication are of no use. However, in order to answer a number of central questions in this field of research it is more fruitful to use general behavioral models than to use specific approaches of computer mediated communication.

1.2 The Main Questions

This book tries to contribute to answering three central research questions. I first present the three (groups of) questions very broadly before I re-formulate them (Ultee 1974) in section 1.3 to take into account existing research that has been performed on these problems.

1.) What kinds of benefits do academic Internet Discussion Groups (IDGs) provide in general? This question implies the following sub-questions.
Do IDGs provide the same kinds of benefits for researchers in different fields or does the use of IDGs differ so much between them that it is impossible to make any generalizations about the benefits? Are information benefits the most prevalent benefits or do social benefits, such as the making of new contacts, matter more for researchers in diverse disciplines? If there are contact benefits, do those who have less contacts profit more from the opportunities to get in contact with other researchers such that existing inequalities are reduced? Are there disciplinary differences with
regard to benefits? If there are general benefits, do all IDGs provide them to the same extent or do IDGs differ with regard to their usefulness in providing these benefits?

2.) How can disciplinary differences in the prevalence of IDG use be explained? This question implies the following sub-questions.

Do distinctions exist in the communication systems of different disciplines that contribute to disciplinary differences in the prevalence of IDG use? Do researchers in different disciplines have distinct communication needs that are more suited to some Internet tools? Do problems of trust between researchers vary in importance between dissimilar disciplines and do these trust problems influence whether researchers make use of IDGs, thus (partially) explaining disciplinary differences in IDG use?

3.) How can it be explained that some IDGs reach a level of group discussion that is beneficial for the members and thereby achieve a collective good, whereas other IDGs fail to achieve adequate discussion contributions from the members? This question implies the following sub-questions.

What factors influence whether a researcher provides help and answers to the questions of other members, even though he does not directly profit from his own information? Under which conditions are researchers more motivated to participate actively in the group discussion? Do information incentives or social incentives stimulate active participation? How do (offline) social networks facilitate the emergence of cooperative, help-providing behavior of group members? How can differences in the users’ satisfaction with regard to a number of aspects of the group discussion be explained?

The following analyses neglect two other questions. Firstly, they do not investigate whether the use of IDGs, in particular the use of academic mailing lists, can sometimes lead to an information overload for the researcher. Those who ever subscribe to a very large and active mailing list will probably experience this phenomenon. As an aside, Chapter 6 provides data showing that the probability of receiving too high a number of emails is related to the amount of communication activity in the list, which comes as no surprise. The analysis of the impact of IDGs in Chapter 3, however, is not concerned with this problem. Moreover, it is not studied whether the use of IDGs may lead to a “balkanization of the sciences”, as Alstyne & Brynjolfsson (1996b) describe one possible outcome scenario. According to my point of view, we hardly know whether there is any general impact of IDGs on the communication networks of researchers whatsoever. It is too early to analyze under what conditions a balkanization may take place; we must first know whether the precondition of this scenario, namely the making of new contacts by IDG users with
some regularity, is fulfilled at all. The empirical foundation for such an analysis is otherwise too thin. Stated differently, I wanted to avoid the analysis of “premature problems” (Ultee 1974).

1.3 The Main Ideas

Section 1.3 briefly presents the main ideas without going into the details of the literature. The reader is recommended to refer to the corresponding chapters for details and more references.

Existing research into the impact of IDGs on academic communication often only looks at a group of researchers in a specialized field (see e.g. Tombaugh 1984; Harasim and Winkelmans 1990; Lewenstein 1995a). It is left open whether the findings can be generalized to other fields. Moreover, many studies do not analyze whether certain outcomes are only associated with IDG use or whether there is a causal link (see e.g. Cohen 1996d). No clear distinction is made between different kinds of outcomes, for example involving information and social contacts. If contacts are analyzed then it is barely taken into account that a tradition within social network analysis that makes a distinction between the quality of the contact exists, for example a distinction between weak and strong ties (see e.g. Cohen 1996d; Scholl, Pelz, and Rade 1996c; Rojo and Ragsdale 1997a; Walsh 1998f).

In Chapter 3, this study attempts to find out whether researchers in eight disciplines in the humanities, the social sciences, and the natural sciences working at universities in England and the Netherlands make use of the opportunities that IDGs are expected to offer. A distinction is made between potential information benefits and contact benefits. Information benefits are split up into research information benefits and practical, helpful information benefits. Contact benefits for researchers are split up into weak contacts (exchange of information), so-called reception contacts (exchange of papers etc.), and strong contacts (collaboration). Additionally, it is analyzed whether the attainment of benefits differs between peripheral and well-integrated researchers in order to find out whether IDGs affect the degree of social inequality between groups of researchers on the macro level.

If it is true that, for example, using IDGs provides opportunities that can be converted into contact benefits then the analysis should not only investigate whether ceteribus paribus IDG users have more contacts than non-users. Additionally, the amount of benefits should be related to the degree of communication in the researcher’s IDGs.
researcher has more opportunities to make new contacts when he makes use of a number of very active IDGs than when he makes use of a number of IDGs that hardly show any communication activity. The degree of communication in all IDGs that the researcher uses is dependent on the communication activities of a very large number of other researchers and is only to a very small degree dependent on himself. Taking a proxy for the degree of communication in all IDGs that the researcher uses, makes it possible to interpret unambiguously a significant association between the proxy and the amount of benefits in multivariate analyses with regard to the causal direction. Such an analysis allows an assessment of the impact of IDGs on academic communication in a much better way than existing studies do (e.g. Walsh 1998f).

Research into disciplinary differences in the spread of use of Internet tools is very scarce. Much research into the acceptance of information & communication technology (ICT) is done in a 'diffusion of innovation' frame (Rogers 1995). While such a frame correctly takes into account the importance of social networks with regard to the decision to start using a specific ICT, it neglects the many differences between the communication systems of researchers in different disciplines. Social aspects of the disciplinary communication system, however, may affect the researcher's communication needs (his goals in relation to IDG use) and may restrict or enhance his opportunities for making use of IDGs successfully. Existing research into disciplinary differences puts forward a number of ideas related to the relationship between disciplinary differences in the communication system and ICT use (Kling and McKim 2000a; Walsh and Bayma 1996f). It does not, however, take into account possible effects of social networks, nor does it put the ideas into a systematic theoretical framework that clarifies the mechanisms by way of which aspects of the social organization of the scholarly communication system influence the decision to make use of ICTs.

In Chapter 4, this study tries to avoid the above deficiencies. Additionally, it challenges a prominent idea about the consequences of disciplinary differences in the 'visibility' of research activities in a field. While existing research argues that a lower degree of visibility leads to 'trust problems' inhibiting the use of specific ICTs, I argue that it may lead to special 'communication needs' stimulating the use of IDGs.

Empirical research into factors influencing cooperation between members in electronic groups, and eventually leading to a satisfying group discussion, focuses on the information incentives that members face (or miss) with active participation (Thorn and Connolly 1987c). At the same time, theoretical research argues that active participation could also be motivated by social incentives (Kollock 1998d). Network
analysts claim that interaction and relationships in electronic groups are strongly related to the (so-called offline) social networks of their members (Wellman 1997; Garton, Haythornwaite, and Wellman 1997). However, it is left open how a social embeddedness (Granovetter 1985b) of electronic groups is constituted and how the embeddedness is related to what kinds of social incentives. Moreover, there is a lack of theory that clearly specifies by which mechanisms the social embeddedness influences the degree of active participation of electronic group members in the discussion.

In Chapter 5, this study tries to fill this gap by developing two new models specifying the mechanisms involved. Both models combine Becker's (1976) theory of social interaction with the theory of social production functions (Lindenberg 1986). The contact model argues that members use their active participation in an electronic group as a means of making new contacts with other group members. A central idea of the reputation model is that active participation is influenced by the researcher's goal of enhancing his reputation within the academic community. Electronic groups with a high degree of social embeddedness are expected to offer additional opportunities to the members for enhancing their reputations via active participation and provision of help. Moreover, under a high degree of embeddedness group norms are assumed to develop that prescribe the provision of help by members. Both theories focus much more on social incentives for active participation than on information incentives. They are contrasted with a reciprocity model (Thorn and Connolly 1987c) that focuses on information incentives for active participation.

The empirical tests of the three models in Chapter 6 make use of a data set consisting of two kinds of data. Information on the directly observed communication behavior of researchers in 49 academic mailing lists is combined with questionnaire data obtained from an online survey of these researchers.

1.4 Short Overview of the Book

The analyses for answering the three questions described above make use of two different kinds of data sets that are briefly described in Chapter 2. Chapter 2 gives some background information about the sampling procedure and provides a few descriptive statistics. Nevertheless, I have tried to write the different chapters in such a way that they provide self-contained information about the data used for a specific analysis. Chapters 3 – 6 are the core theoretical-empirical chapters of this book. Part IIA (Chapter 3 and Chapter 4) is more concerned with specific outcomes for the
In Chapter 3 I conduct an empirical analysis to investigate the general benefits of IDGs. The analysis makes use of data about the communication behavior and social networks of 1063 randomly selected university researchers in England and the Netherlands. The researchers belong to eight different disciplines in the humanities, the social sciences, and the natural sciences. The analysis aims at answering the first research question about the nature of the general benefits of IDGs, namely information benefits or contact benefits. Chapter 4 analyzes the factors that can explain disciplinary differences in the use of IDGs. It makes clear that striking disciplinary differences exist and analyzes whether trust problems between researchers or distinct communication needs of researchers in different disciplines are better at explaining these disciplinary differences. For this analysis a subset of the data set used in Chapter 3 is utilized.

Part IIB analyzes the conditions that facilitate the emergence of computer-mediated cooperation between members of electronic groups. Chapter 5 reviews existing theories about the production of a collective good (in this case: a satisfying group discussion) that can be applied to electronic groups. Additionally, it develops new models for specifying how social networks may affect interaction in electronic groups. Three theories prove to be most adequate for potentially answering the research questions about which conditions facilitate cooperative behavior. Chapter 6 conducts empirical tests of these three theories to answer the question of whether information incentives or social incentives can explain better the emergence of cooperation. Chapter 6 makes use of the second data set consisting of information about the communication behavior of researchers in 50 academic mailing lists and their answers to an online survey. Whereas Chapters 3 and 4 can be read on their own, Part IIB deviates from this structure. Before reading Chapter 6, it is strongly recommended that Chapter 5 is consulted. Chapter 7 tries to bring together the findings of the previous chapters to draw a more consistent picture of what the general outcomes of this book are. An outlook is given on how to use the insights and findings of this book to go beyond the study of a specific communication tool, namely IDGs, and beyond the analysis of a specific social system, namely the academic one. Some very first ideas for future research on electronic groups are given.