Communication is the most important activity of scientists, technicians and managers in terms of working time spent (Ackhoff and Halbert 1958; Frost and Whitley 1971; Allen 1970). Several studies have shown that the amount of communication is positively related to performance (see, e.g., Pelz and Andrews 1976). Today, we can also find researchers working together even though they are not physically in the same room or even in the same building. Even beyond research labs, many other organizations are also attempting to transform their structures and processes through virtual teamwork, global integration and networking. Virtual teamwork has been made possible by electronic networks that support computer-mediated-communication (CMC). Such communication networks are expected to enable organization members to work more flexibly, to span contexts and boundaries, and to collaborate more effectively (Orlikowski and Yates 1994). The problem of distance is no longer an issue: distance has been pronounced dead. ‘With the invention of groupware, people expect to communicate easily with each other and accomplish difficult work even though they are remotely located or rarely overlap in time. Major corporations launch global (virtual) teams, expecting that technology will make “virtual collocation” possible’ (Olson and Olson 2000: 139).

**Key issues**

- Improved communication = improved performance
- Electronic networks have enabled virtual teamwork
- Distance is declared dead

Does virtual communication really work? The answer to that question probably is: yes, but not always – just like face-to-face communication does not always work. In spite of all enthusiasm, much uncertainty remains about the prospects of virtual teams and technology that supports collaboration. By now, the examples of grandiose failures are at least as numerous as examples of huge successes (Robey and Boudreau 1999; van den Besselaar et al., 2001). Failures cannot be explained by virtuality alone and neither can the successes. More factors need to be considered. It is highly unlikely that the collocation versus non-collocation dilemma can be
solved on the basis of technical arguments, if only because technology is constantly developing. The people who argue that ‘distance is dead’ may always fall back to the assertion that distance will be dead very soon because new technologies will overcome all sorts of constraints.

Despite recent technological development, there still is a large number of researchers and practitioners (see Olson and Olson 2000) who argue that interaction at a distance (using contemporary technologies as well as improved technologies that are expected to be there in the next 50 years) will never be able to replace collocated interaction. None the less, these authors emphasize the need for technological improvements to make effective virtual teams possible. They suggest that advances in technology (e.g. greater bandwidth) in combination with well-designed organizational arrangements and well-prepared virtual team members will suffice to approximate some aspects of face-to-face communication, and they also point out that in the future technical capabilities may arise that are in some way superior to face-to-face options (Olson and Olson 2000: 143). The authors make a distinction between ‘behavior that will change for the better when the technology achieves certain qualities’ and ‘behavior that will never change’. But they keep warning that ‘collaborative work at a distance will be difficult to do for a long time, if not forever’ (ibid.: 173). And although the technology of the future might be able to support collaborative work better, Olson and Olson remain ultimately skeptical: ‘it is our belief that in these future descriptions, distance will continue to matter’.

The position adopted by Olson and Olson can be traced back to an older research tradition. In the media richness theory (MRT) of the 1980s it was argued that the potential richness or leanness of communication is an inherent property of the communication medium. Rich communication was deemed only possible if ‘rich’ media were being used. The first empirical studies in the field of CMC focused on the choice of the proper medium for cooperation and communication. It was argued that cooperation requiring intensive (‘rich’) communication would have to be based on the use of ‘rich’ media, defined as media that allow for the exchange of various kinds of signals between people. Face-to-face communication was ranked as the richest form of communication, because of its capacity to transmit the highest levels of non-verbal cues. Lean media such as e-mail were seen as impersonal, technical and distant (Daft and Lengel 1986).

The view that face-to-face is the preferred communication medium continues to be influential. Weisband (2002: 407) argues that in distributed work, there is considerable uncertainty about others’ behaviors: ‘Because of delays in remote communication, feedback about others’ behaviors is difficult to obtain. With delayed feedback or inaccurate feedback, messages may require several iterations for clarification. Some messages
are long, making a response effortful and time consuming.’ To reduce this uncertainty, group members need information about the remote work and what other group members are doing. All interdependent work entails uncertainty about others’ behaviors. ‘Will other group members complete their part of the work in time? Will they do the work they said they would do? Will they pay attention to quality? Will they be available to work this weekend?’ Some argue that in face-to-face groups, feedback about what others are doing is immediate and can be acquired passively. Group members are able to observe who attends meetings or participates in hallway conversations (Kraut et al., 2001). It is also possible to glance over another person’s shoulder to see if he is working, or you can hear the sound of a particular machine and know what work is being done (Olson et al., 2002; Gutwin et al., 1996). In contrast, in virtual teams there are long periods of silence during which team members will not obtain any information about the team-mates’ activities. Virtual team members often have to rely entirely on the messages that appear on the computer screen to figure out what other members of the work group are doing. However, being a virtual team does not per se mean that members cannot pick up the phone and ask for information, therewith supplementing e-mail communication with other forms of communication.

Advantages of face-to-face vis-à-vis virtual communication

- Immediate feedback
- Less uncertainty about others’ behavior
- More personal and informal

The MRT approach has been extensively used in analyses of computer-mediated communication (CMC) (Daft and Lengel 1986; Rice 1984; Rice and Love 1987; Spears and Lea 1992). Over time, however, theoretical and practical objections have been raised against this theory, which has led to several alternative approaches that argue that CMC media can (sometimes) be as rich as face-to-face communication (Townsend et al., 1998; Ngwenyama and Lee 1997; Spears and Lea 1992).

The earliest criticism of MRT stuck to the idea that technology can be an obstacle for rich communication, but argued instead that technology would be able to conquer some of the barriers in, say, the next 50 years. The idea that face-to-face communication is the richest, most effective, warm, personal, trust-enabling form of communication has remained dominant in this approach. However, as technology improves, it is argued that it might be able to imitate, substitute, or in some cases even outperform face-to-face communication. Both media richness theory (MRT)-related research and
these early critical approaches still tend to focus on the role of technology in communication, thereby excluding many other factors that may enable or constrain (virtual) communication.

This emphasis on the role of technology has been questioned by later studies. Lipnack and Stamps (1997, 2000), for instance, suggest that questions about communication at a distance cannot be answered, or only partly, by referring to technological possibilities. These authors are well aware that technology alone is not enough to make a virtual team work. They state that the success of a virtual team depends 90 percent on the people and 10 percent on the technology. In the present study we will take these remarks as our point of departure, exploring the prospects of an approach in which technology is one among many factors that, in conjunction, shape the communication processes to evolve in virtual teams.

Thus far, the field of CMC has been dominated by questions that tend to juxtapose face-to-face communication and CMC, such as:

1. Do the characteristics of CMC impose strict limitations on the functioning of a virtual team?
2. Under what circumstances (if any) is face-to-face communication necessary for the functioning of a team?
3. What are the characteristics of communication processes when face-to-face communication is replaced by CMC?

The present study will also take up these questions, but in the course of the research its scope has been broadened to reflect the insight that the possibilities of CMC are probably underestimated, if face-to-face communication is considered as the default optimum solution. If we leave the perspective of comparing CMC and face-to-face communication, and start looking at CMC as a communication medium in its own right, increasingly used for the purpose of communication and cooperation in dispersed (non-collocated) teams, questions can be asked that reflect new theoretical views concerning communication and media use (particularly emphasizing the importance of context), or reflect technological or organizational advances in relation to communication and media use:

4. What are the conditions for effective communication in a virtual team? Where do they differ for effective communication in a non-virtual team?
5. Are there any special problems and risks involved in the management and organization of teams that mix virtual and face-to-face modes of communication?

We will explore these questions through a critical review of the literature as well as through detailed studies of the communication patterns developing
in three different virtual teams. Reading the literature, it is difficult to come to firm conclusions because so much emphasis is put on the technology that constrains or enables communication, while little attention is paid to other constraining or enabling factors such as the organizational and institutional context of the cooperation and communication. The MRT has influenced the nature of the discussion with an emphasis on the technical characteristics of communication. In addition to that, the lack of attention to non-technical factors probably also originates from the fact that much of the previous research was very experimental, creating virtual teams for study purposes but ignoring real-life situations. In our study a broader point of view will be taken through examining real-life teams in different organizational and institutional contexts. We will not systematically compare different forms of CMC – which is why we did not include this subject in our list of questions – as we are primarily interested in communication and collaboration processes as evolving in such real-life virtual teams.

In sum, we will explore in this study how social, organizational and institutional factors complement technological factors in the development of computer-mediated communication in teams. We seek to identify the conditions that enable or constrain the (virtual) collaboration process.

Throughout our qualitative analysis (chapters 3, 4 and 5), we were extensively relying on comments provided by interviewees. In order to protect their anonymity, we decided not to specify in detail which member of the Delta team (chapter 3), Advance group (chapter 4) and Debian community (chapter 5) have been the source of the comments. In some cases (e.g. if secondary data sources were consulted), we provided the source for the quote.

This book consists of three parts: theory, case studies (method) and reflection. Chapter 1 provides a theoretical overview of the literature in the field of CMC. The first part of this theoretical chapter is general but becomes more refined in relation to the specific case studies conducted. The first part of the literature overview focuses mainly on the media richness tradition and the ‘substitution hypothesis’ (Nohria and Eccles 1992), i.e. the view that CMC may replace face-to-face communication. We will systematically compare the different approaches in the CMC field. The second part will show that the questions about substitution were not as important as we thought. Chapter 2 will present the methodological approach(es) used in this study, including the research questions and methodology. Chapter 3 (Delta case), 4 (Advance case) and 5 (Debian case) are the real-life case studies. These studies were chosen in a cumulative way and each provided input and questions for the next study. The final part of this study consists of a comparison of the three cases (Chapter 6) and our conclusions and suggestions for future research (Chapter 7).