



FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

Effectiveness of Communication Technologies for Distributed Business Meetings

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Be true to the game, because the game will be true to you. If you try to shortcut the game, then the game will shortcut you. If you put forth the effort, good things will be bestowed upon you. That's truly about the game, and in some ways that's about life too.

Michael Jordan

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INTRODUCTION

CHAPTER I: INTRODUCTION

“We meet because people holding different jobs have to cooperate to get a specific task done. We meet because the knowledge and experience needed in a specific situation are not available in one head, but have to be pieced together out of the knowledge and experience of several people.” (Drucker 2009, p. 45)

Business meetings are a means to coordinate activities and achieve objectives related to business operations (Rogelberg et al., 2006; Schwartzman, 1989). In a meeting, two or more individuals engage in purposeful, work-related interaction and sustain a single focus of cognitive attention (Goffman, 1961; Romano and Nunamaker, 2001). A business meeting can be held for a range of objectives, including to share opinions, to exchange information, to generate ideas, to make a decision, and to solve a problem. These objectives serve various business operations, for instance, order fulfillment, new product development, project management, or change management. Since business operations increasingly span multiple organizations, meetings are not merely important for coordination and communication within a company, but also for interactions with suppliers, partners, and customers (Ambrose et al., 2008; Vickery et al., 2004). Face-to-face meetings are preferred over other means of coordination and communication, such as a written report, e-mail, or telephone, because they are considered to be more effective (Daft et al., 1987; Rice, 1993).

In addition to serving business operations directly, meetings provide a way to make sense of the organizational activities to the meeting participants (Raes et al., 2007; Schwartzman, 1989). According to Jay (1976, p. 45), a meeting is a “status arena” as individuals negotiate and validate their formal and informal relationships to each other while they are aiming to achieve the business-related objectives (Schwartzman, 1989; Weick, 1995). Moreover, business meetings function as a key venue to create, negotiate, and disseminate organizational culture, and serve as a powerful social symbol, making the organization and its structure visible and apparent to its members (Nielsen, 2009; Rogelberg et al., 2007).

In this introduction, the increasing importance of business meetings is discussed and the need for distributed meetings is highlighted. Then, the research questions are formulated, which concern the effectiveness of communication technologies and face-to-face interaction for business meetings. In addition, the expected contributions and implications of this dissertation are discussed, and the outline of this dissertation is presented.

1. THE IMPORTANCE OF BUSINESS MEETINGS

Meetings are omnipresent in business life. The number of business meetings at any given hour during a working day has been estimated at 1 million, in the United States alone (Napier and Gershenfeld, 1973), and business meeting pervasiveness has increased steadily over time (Romano and Nunamaker, 2001). Managers spend as much as 60 % to 80 % of their time in meetings and this proportion is expected to further increase in the future (Mintzberg, 1973; Rogelberg et al., 2006). As a result, the direct and indirect organizational costs associated with business meetings are enormous (Rogelberg et al., 2011; Romano and Nunamaker, 2001). Consider the following example of how a single meeting ripples through an organization and profoundly consumes human resources (Doyle and Straus, 1982): at a large company, weekly status meetings of the executive committee are held. In total, 7,000 person hours are spent in these meetings during one year, yet another 300,000 hours are consumed by additional meetings in preparation of this weekly meeting (Mankins et al., 2014).

According to Schwartzman (1989, p. 10): “Meetings have generally been the background structure for examining and assessing what are assumed to be the ‘really’ important matters of organizational life.” Consider the Dutch East-Indian Company, one of the first multinational organizations in the 17th century, as an example. The board of this organization, the “Heeren XVII,” consisted of 17 delegates of six port cities, who met three times a year for one or more weeks to discuss the number of ships and crew to be sent to different areas, the quantity of goods, gold and silver to be sent, and the list of products that the directors wished to receive in return (Gaastra and Kasteleijn, 1982).

Meetings have always been key in organizations, and their importance is not likely to decrease (Rogelberg et al., 2007). Indeed, as the pace of change quickens, companies have to operate dynamically and facilitate interactions among and across employees at all levels and departments of the organization, which entails changes in the organizational structure. In addition, the geographically distributed nature of operations requires employees at distant locations to coordinate and communicate. These two trends are briefly discussed in turn.

1.1 Changes in organizational structure

An organizational strategy involves the establishment of a structure for planning and coordinating resources and activities, in order to efficiently and effectively transform inputs into outputs (Miles et al., 1978). An organizational structure involves a vertical dimension,

which consists of designating formal reporting relationships, defining the span of control of managers, and identifying individuals into departments, as well as a horizontal dimension, involving interactions to coordinate processes and workflows across departments and business units. To accomplish the overall goals of the organization, top management needs to decide on the ideal combination of the vertical and the horizontal structural approach (Daft, 2007).

A predominantly vertical structural approach is associated with centralized decision making, formal hierarchical reporting systems, clearly defined authority and responsibility, standardized rules and regulations, and individual, routine tasks. This approach was dominant during the Industrial Revolution, emphasizing efficiency and productivity in a low-cost leadership strategy. However, as decision-making authority resides with upper-level managers in a vertical structure, it does not allow for rapid responses to problems and opportunities that arise due to competitors' actions, environmental changes or customer demand shifts. In addition, in a rapidly changing environment, the key assets of an organization shift from tangible resources to information and knowledge held by employees, hence employees must be empowered to share knowledge and make decisions. In response, organizations are increasingly shifting away from the traditional vertical structure towards a more flexible, horizontal approach (Fulk and DeSanctis, 1995). The horizontal structural approach is associated with a differentiation strategy, decentralized decision making, few formal reporting systems and rules, shared tasks, teamwork, and employee engagement.

This shift in structural approach has increased the need for business meetings as a means to coordinate and communicate. In particular, in a vertical structure, coordination is established through “a codified blueprint of action” (Van De Ven et al., 1976, p. 323), consisting of rules, procedures and reports, and minimal synchronous interaction is required. On the other hand, in a horizontal structure with a high interdependence among activities, it becomes increasingly important to manage information flows of business processes, spanning different divisions, functional units, or even organizations (Basu and Blanning, 2003; Basu and Kumar, 2002). Therefore, dynamic coordination mechanisms, such as business meetings, are needed (Van De Ven et al., 1976). Moreover, in complex and uncertain situations, the problems managers are confronted with shift from routine and specific to non-routine and ambiguous. In these situations, there are multiple and possibly conflicting interpretations among managers, especially if they belong to different functional departments or organizations (Daft, 1986; Vickery et al., 2004). When subjective views and opinions need to be exchanged to establish a common frame of reference, rich communication media are required (Daft et al., 1987).

1.2 Distributed operations

The need to respond rapidly to changes is further accelerated by the trend that organizations increasingly adopt a global strategy. Organizations operate globally to access raw materials and other resources at the lowest cost, and to obtain further scale advantages, when the domestic market is saturated (Barkema et al., 2002). Also, a global presence facilitates being close to the customer and learning about their preferences across countries and cultures, while also benefiting from synergies to serve them. This globalization trend is facilitated by the availability of technologies for intra- and inter-organizational communication (Fulk and DeSanctis, 1995).

A global strategy has further implications for the structure of an organization and its business processes, as it entails coordination and communication across time and space. In addition, countries and regions differ in terms of their economic development, languages spoken, political and governmental systems, cultural norms, and transportation and technological infrastructures. This increases the complexity considerably, which managers must handle by balancing efficiency – the standardization of processes and products – and differentiation – being responsive to local preferences. The more differentiated the organization, the higher the need for horizontally coordinating and sharing distributed knowledge and capabilities becomes (Daft, 2007).

To address their coordination challenges, global organizations need strong corporate leadership that provides clear strategic direction and cultivates a shared vision. In addition, organizations often make use of temporary or permanent teams to establish horizontal linkages and address complex problems that require interactions between employees with complementary information and expertise (Fulk and DeSanctis, 1995). Teams that involve members at geographically dispersed locations are referred to as virtual teams (Govindarajan and Gupta, 2001; Jarvenpaa and Leidner, 1999; O’Leary and Cummings, 2007). While members of virtual teams may travel to meet face-to-face, they mainly interact using communication technologies in a distributed setting (Desanctis and Monge, 1999; Townsend et al., 1998). As the activities involved are increasingly complex and interdependent, rich media are required to establish a common frame of reference and to communicate effectively (Daft et al., 1987; Maznevski and Chudoba, 2000).

2. RESEARCH QUESTIONS AND CONTRIBUTIONS

Given the increasing importance and prevalence of distributed business meetings, organizing them effectively is a key topic for both managers and academics (Rogelberg et al., 2007; Scott et al., 2012). Meeting effectiveness can be defined as the extent to which the objectives set for the meeting are achieved, and is influenced by cultural, organizational, temporal, and situational factors (Burton-Jones and Grange, 2013; Leach et al., 2009; Nixon and Littlepage, 1992). The role of some of these factors, such as the meeting chair or agenda, in enhancing meeting effectiveness has been examined in prior research (Dennis et al., 1988; Doyle and Straus, 1982; Nixon and Littlepage, 1992; Volkema and Niederman, 1996). In this dissertation, a distinction is made between meeting effectiveness and business meeting mode effectiveness. In keeping with prior research, the term ‘mode’ refers to the primary means of interpersonal communication, and comprises technology-enabled as well as face-to-face interaction (A. Allen et al., 2014; Denstadli et al., 2011; Fjermestad, 2004; Zack, 1993). For example, although the meeting mode that is being used may be effective for achieving meeting objectives, there can be other factors that negatively impact meeting effectiveness. While the broader notion of meeting effectiveness has been studied in prior research, there is a paucity of research on the subject of effectively selecting a business meeting mode.

Indeed, the availability of communication technologies for business meetings enriches the choice set for meeting organizers, yet it also creates a non-trivial decision problem. In particular, communication technologies, such as audio-conferencing, video-conferencing and telepresence, provide potentially less costly and more environmentally friendly alternatives for interpersonal interaction between people across multiple and possibly distant locations than the traditional face-to-face setting. More specifically, the cost of utilizing a meeting mode includes travel-related expenditures, participants’ time, and the cost of hardware and software (Reinsch and Beswick, 1990). Therefore, the cost of a face-to-face meeting varies significantly by location of participants and can thus be higher or lower than the cost of a technology-enabled meeting. However, the communication capabilities of technologies are limited relative to face-to-face interaction (Daft et al., 1987; Dennis et al., 2008; Kock, 2004; Short et al., 1976). More specifically, audio-conferencing enables interaction through speech and vocal tone. In addition to audio, video-conferencing transmits visual representations of meeting participants, reduced in size. Furthermore, in telepresence meetings, each person’s voice comes from the direction of their screen image (spatial audio), participants at different locations see each other in true life size, and can make eye contact. In addition, lighting and

furniture across locations are matched for a seamless look and feel of co-location, resulting in an experience close to that of a face-to-face meeting (Bartlett, 2007; Conti, 2007). The ‘trade-off’ between the cost and the communication capabilities of business meeting modes is visualized in Figure 1.1, and highlights the importance of making a deliberate business meeting mode selection.

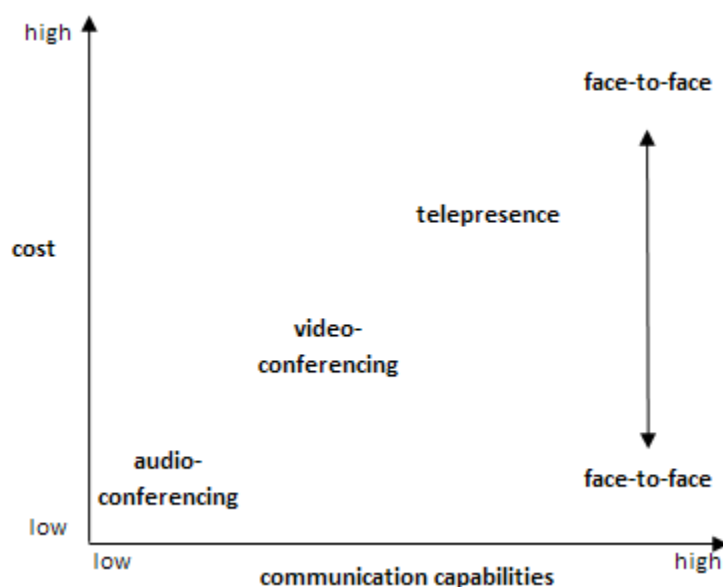


Figure 1.1. Cost and Communication Capabilities of Business Meeting Modes¹

A vast body of research – not specific to the business meeting context – provides insight into the selection of communication media (George et al., 2013; Te’eni, 2001). The dominant driver of media preference is considered to be the task or objective at hand (Daft et al., 1987; Short et al., 1976). In particular, according to social presence and media richness theory, media choice should be such that the medium is effective for the objective(s) at hand, which follows from matching the requirements of the objective(s) to the capabilities of the medium (King and Xia, 1997; Rice, 1993). Moreover, there is a widespread belief that face-to-face is the gold standard for communication, relative to which technology-enabled communication is deficient (Dennis et al., 2008; Kock, 2004; Trevino et al., 1987). Nevertheless, prior research has suggested that face-to-face interaction is not necessarily more effective in every situation (Kock, 2001; Walther, 1992), and that communication technologies potentially offer capabilities “beyond being there” (Hollan and Stornetta, 1992; O’Leary et al., 2014). It is important to recognize that medium selection is not only a function of the preference for

¹ Note that the positioning of the modes is not to scale for both dimensions; For a face-to-face meeting the travel cost varies significantly by location of participants and can thus be higher or lower than the cost of utilizing communication technologies.

capabilities, but is also contingent on factors such as cost, access, urgency, social norms and customs (Kraut et al., 1998; Robert and Dennis, 2005; Watson-Manheim and Bélanger, 2007; Yoo and Alavi, 2001). As a result, the capabilities of the medium that is ultimately selected can be higher or lower than what is required for the objective(s) at hand.

This dissertation keeps with the perspective that the meeting objective is a key factor in the evaluation of meeting modes, and that matching meeting mode capabilities to the requirements of the meeting objectives leads to effectiveness (Daft et al., 1987; Rice, 1992; Short et al., 1976). In this dissertation, the effectiveness of four business meeting modes, with progressive communication capabilities, is examined: audio-conferencing, video-conferencing, telepresence, and face-to-face. Their comparative effectiveness is assessed for a comprehensive list of business meeting objectives, ranging from a routine exchange of information to resolving conflicts and disagreements. Thus, this dissertation does not depart from the premise that face-to-face is the gold standard for communication and instead compares mutual differences in effectiveness. Hence, the first research question examines business meeting mode effectiveness, which is the extent to which the meeting mode facilitates achieving the objectives set for the meeting (Hoegl and Gemuenden, 2001; Westmyer et al., 1998), and is as follows:

Research Question 1: What is the comparative effectiveness of different business meeting modes?

In prior research on organizational communication, various media conceptualizations have been developed, including social presence and media richness (Daft et al., 1987; Short et al., 1976). In this literature, media capabilities are generally integrated into broader concepts to explain the effects of media. As studies using these “*integrated perceptions*” (Te’eni, 2001, p. 272; author’s italics) have led to contradictory findings, a higher level of granularity is desirable (Dennis et al., 2008; Te’eni, 2001). Therefore, in this dissertation, the influence of various meeting mode capabilities (e.g., seeing body language) is examined. In keeping with prior research, the capabilities of a meeting mode are determined by intrinsic mode attributes (e.g., transmitting visual cues) as well as by the context in which the mode is used (Brown et al., 2010; Dennis et al., 2008; Watson-Manheim and Bélanger, 2007). The context refers to the way the meeting mode is used and appropriated, which is influenced by social norms and

prior experience (Carlson and Zmud, 1999; DeSanctis and Poole, 1994; Fulk et al., 1987; Trevino et al., 2000). Therefore, the second research question is as follows:

Research Question 2: How do different capabilities of meeting modes influence the effectiveness of the modes?

In addition, the number of participants and the meeting duration are important considerations for business meetings (Leach et al., 2009; Monge et al., 1989). In particular, technology-enabled meetings can “include individuals who otherwise might not have participated due to time, cost, or other restrictions that travel for person-to-person meetings would face” (Dutton et al., 1982, p. 171). In addition, prior research has found that technology-enabled meetings were shorter in duration than face-to-face meetings and offered different explanations for this observation (Denstadli et al., 2011; Kydd and Ferry, 1994). In particular, technology-enabled meetings require more concentration and it is difficult to keep meeting participants focused for a longer time (Kydd and Ferry, 1994). Furthermore, technology-enabled interaction involves less social, non-task related exchanges than face-to-face interaction, and is therefore more focused on the task at hand (Bordia, 1997). Hence, the influence of meeting size and duration are also examined, and the third research question is as follows:

Research Question 3: How do the number of meeting participants and the duration of the meeting influence the effectiveness of different business meeting modes?

It is important to note that this dissertation focuses on business meetings in an intra- rather than an inter-organizational setting. This choice was made deliberately, to mitigate extraneous effects. In particular, the advantage of only considering internal meetings is consistency in meeting culture, in access to and experience with modes, and in social norms concerning technology use (Kettinger and Grover, 1997). While the effectiveness of technologies for intra-organizational communication has been studied in the literature, this dissertation has several novel features that underlie its contribution to the field.

First, prior research has predominantly compared the effectiveness of a face-to-face meeting with other communication modes such as e-mail, telephone, or written communication or compared different media for a specific objective. In this dissertation, the effectiveness of a broad set of meeting modes, with progressive levels of communication capabilities, is evaluated for a comprehensive list of objectives. Therefore, the findings of this

study provide insight into which communication technologies can be used as effective substitutes for face-to-face, and can possibly be even preferred over face-to-face. Also, a list of business meeting objectives is compiled that is broad and comprehensive and that can serve as a basis for future research on business meetings. Likewise, the list of business meeting mode capabilities, developed in this dissertation, provides a useful basis to assess differences in effectiveness across communication technologies and face-to-face, and refines previous communication media conceptualizations.

Second, a distinction of this work is the empirical approach. In particular, the field studies, used to evaluate the research questions, are based on actual, real-life business meetings at three large organizations. At each organization, the four meeting modes are widely used, and data from working professionals is used as the basis for the analysis. Therefore, the data provide “a realistic context and point of reference” (Trevino et al., 2000, p. 169) to evaluate the effective use of the meeting modes. This is distinct from most prior studies on media choice and effectiveness, in which hypothetical choices or perceived appropriateness of different media for specific situations were examined (Dennis and Kinney, 1998; Markus, 1994).

Third, the set of technology-enabled meeting modes includes audio-conferencing, video-conferencing, and telepresence. While audio- and video-conferencing technologies are widely adopted as business meeting modes in organizations, telepresence technology was introduced more recently and is currently being deployed by a variety of organizations across the world. Although both practitioners and researchers have highlighted the importance of understanding how and why managers use new communication technologies (Markus, 1994; Rice, 1992), this study is the first to examine the effective use of telepresence systems in organizations. As it is recommended to evaluate new communication technology as one of many in a spectrum to discern the situations it is suited for (Denstadli et al., 2013; Lengel and Daft, 1989; Rice, 1992), this study provides unique insight into the effective use of telepresence.

The findings of this dissertation have implications for practitioners, organizations, and society at large. For practitioners, the results can provide guidance for planning a business meeting, based on the objectives the organizer wants to achieve. In addition to considering meeting modes and their capabilities, this study points to the importance of deliberately setting a meeting duration and inviting meeting participants. For organizations, this study offers preliminary insight into optimizing investments in communication technologies and planning which locations, divisions, teams, and employees to equip with what technology-

enabled meeting mode. Moreover, the insight on the use of telepresence can be helpful for organizations that consider investing in telepresence systems and/or the paid use of telepresence facilities from service providers. The results of his study can also serve as a basis to train employees in terms of how to effectively select a business meeting mode and/or to build a tool that automates the meeting mode planning procedure. By optimizing the use of communication technologies for business meetings, organizations can potentially reduce business travel, which would result in cost savings, a better work-life balance for employees, and a lower environmental footprint. Moreover, a reduction in business travel across organizations could impact the travel industry, for which business travel is an important and highly profitable segment. Finally, it is important to note that the managerial relevance of the questions addressed in this dissertation will only increase, as organizations progressively need to operate at a faster pace, on a larger, global scale, and at a lower cost.

3. DISSERTATION OUTLINE

This dissertation consists of eight chapters. A brief introduction to the contents of the remaining chapters is provided below.

Chapter 2 presents the relevant literature with the purpose of establishing the theoretical foundations of this dissertation. It includes a review of literature on business meetings and on organizational communication, including research on communication media capabilities, media effectiveness, media choice, and communication objectives. Chapter 3 presents three communication technologies that can be used for conducting distributed business meetings. Chapter 4 introduces the research design that is used to address the research questions and involves two phases. The first phase consists of compiling a list of business meeting objectives and of business meeting mode capabilities, and the second phase involves four field studies. Chapter 5 addresses the first research question on the comparative effectiveness of meeting modes for achieving meeting objectives, based on two of the four field studies. Chapter 6 addresses the second research question on the influence of business meeting mode capabilities on the effectiveness of the modes, based on the other two field studies. Chapter 7 addresses the third research question on the influence of the number of meeting participants and of the meeting duration on meeting mode effectiveness, based on three out of the four field studies. Finally, Chapter 8 provides a conclusion of this dissertation, as to the main findings and implications in terms of the research questions. Limitations of the research as well as future research directions are also outlined.

LITERATURE REVIEW

CHAPTER II: LITERATURE REVIEW

In this chapter, two streams of literature are reviewed. First, prior research on business meetings is discussed, including studies on business meeting characteristics, cost, support systems, and effectiveness. A gap in the literature is identified concerning the role and effectiveness of different business meeting modes.

To address this gap, this dissertation draws from prior literature on organizational communication, which is the second stream of literature that is reviewed. The literature on organizational communication is extensive and covers various topics such as communication structures and networks (Leavitt, 1951), communication genres (Orlikowski and Yates, 1994), directionality of communication (Roberts and O'Reilly, 1974), and the role of communication in developing trust (Becerra and Gupta, 2003) in group decision making processes (Nunamaker et al., 1991b) and in teamwork quality (Hoegl and Gemuenden, 2001). For the purpose of this dissertation, the literature review focuses on organizational communication in a mediated setting. This stream of literature generally addresses the following questions (George et al., 2013; Whittaker, 2003): (1) What are the capabilities of communication media and how do they differ from face-to-face communication; (2) How do these different capabilities produce differences in communication effectiveness; and (3) What factors determine the selection of communication media. The literature addressing these questions not only includes foundational work on social presence and media richness theory (Short et al., 1976; Trevino et al., 1987), it also comprises more recent mediated communication research (Bartelt and Dennis, 2014; Dennis et al., 2009; Kock, 2009).

1. BUSINESS MEETINGS

A business meeting is an organizational activity that involves synchronous interaction between two or more people to achieve shared objectives in business (Romano and Nunamaker, 2001; Yates and Orlikowski, 1992). Based on their review of decades of research on the expenses, productivity, processes, and outcomes of business meetings, Romano and Nunamaker (2001, p. 1) conclude that “meetings are costly and unproductive on the one hand, yet essential and increasing in number and duration on the other.” Extant literature on business meetings is limited, which is due to meetings being so basic, ordinary, and prevalent that they have rarely been recognized as an interesting research topic (Schwartzman, 1989),

and also due to the difficulty of gaining access to meetings and their participants (Volkema and Niederman, 1996). Nevertheless, prior research has examined various aspects of business meetings, such as objectives, duration, size, composition, costs, support systems, satisfaction and effectiveness (Briggs et al., 2003; Dennis et al., 1988; DeSanctis and Gallupe, 1987; Nunamaker et al., 1991b; Panko and Kinney, 1995; Romano and Nunamaker, 2001; Trevino et al., 2000).

1.1 Business meeting characteristics

Examples of types of business meetings include a staff, a committee, a study group, a project team, a task force, and a board meeting (Jay, 1976; Romano and Nunamaker, 2001). Business meetings can be characterized in terms of their frequency, for instance daily, weekly, monthly, or occasional (irregular) meetings (Jay, 1976). In addition, a meeting can be scheduled and involve a set date, time, location, composition, duration, and agenda, or unscheduled (Schwartzman, 1989). Also, a meeting can involve participants from one organization only (intra-organizational) or from different organizations (inter-organizational) (Ambrose et al., 2008; Paulraj et al., 2008). Furthermore, research on Electronic Meeting Systems incorporates the notion of temporal dispersion in meetings, and also considers asynchronous meeting support (Dennis et al., 1988; Nunamaker et al., 1991b; Tung and Turban, 1998).

Another way to characterize business meetings is in terms of the objective(s) they serve (Jay, 1976; Romano and Nunamaker, 2001). Examples of business meeting objectives include: make decisions, socialize, review progress, solve problems, plan, exchange information, build trust or teams, share visions, build consensus, handle emergencies, reconcile conflict, gain support, and explore ideas and concepts (Denstadli et al., 2011; Jay, 1976; Monge et al., 1989; Romano and Nunamaker, 2001). A business meeting usually serves more than one objective and different participants in a business meeting may have different objectives at the same time (Briggs et al., 2003). While a large number of business meeting objectives has been identified, prior research has not systematically tried to categorize them. A notable exception is the work of Allen et al. (2014), in which a 16-category taxonomy of meeting purposes is proposed.

Who to invite for a business meeting is one of the key decisions a meeting organizer needs to make. Romano and Nunamaker (2001) offer guidelines and suggest to include those who have relevant expertise and knowledge, must be in on a decision, are crucial to the

implementation of meeting outcomes, are most affected by the outcomes, or have direct responsibility over the topic discussed. In terms of the size of the meeting, several studies point to the ideal number of meeting participants being between 4 and 7 attendees (Jay, 1976; Romano and Nunamaker, 2001). However, study evidence indicates most meetings have either fewer or more attendees (Romano and Nunamaker, 2001). For example, Panko and Kinney (1995) and Mintzberg (1973) report most meetings involve dyads, while Monge et al. (1989) find the median number of meeting attendees at 3M to be nine. Several studies have also reported on the duration of meetings. Monge et al. (1989) find that at 3M more than half of 903 meetings took between 0.5 and 1.5 hours, about 30 % took between 1.5 and 4 hours, and 10 % took more than 4 hours. Instead, based on 436 meetings of 22 Executive MBA students, Panko and Kinney (1995) state that most meetings are brief, as 75 % of meetings were found to take 0.5 hour or less.

1.2 Business meeting cost

Monge et al. (1989) indicate that the following factors influence the cost of a face-to-face meeting, if applicable: the hourly wages and/or salaries (including benefits) for all attendees; wages and salaries for those who prepare the meeting (including attendees, secretaries, and set up crew); cost of materials used for the meeting (handouts, visuals, etc.); overhead costs for the facilities, cost of speaker or facilitator; cost of travel, lodging, and meals; and cost of any additional miscellaneous expenses. In addition, Pye and Williams (1977) compare the cost of travelling for a face-to-face meeting with the cost of using communication technologies for meetings. The authors indicate that while travel costs may be lower, the use of communication technologies entails an additional cost related to the rental payment to technology providers and/or the investment and operating costs for the technology. Furthermore, Romano and Nunamaker (2001) point to the hidden costs of (unsuccessful) meetings, such as a decline in morale and productivity, time wasted cooling off due to frustration, and opportunity costs of the time spent in an unproductive meeting. Finally, Arnfalk and Kogg (2003) state that beyond these organizational costs, business meetings that require travel are associated with individual costs (e.g., distress, fear of flying) and societal costs (e.g., environmental and infrastructural impact).

1.3 Business meeting support systems

To support business meetings, computer-based systems can be used, which involve a set of tools to structure and enhance the achievement of (meeting) group tasks (Dennis et al., 1988; DeSanctis and Gallupe, 1987; Nunamaker et al., 1991b). These systems can be especially useful for generating, organizing, and prioritizing ideas (Nunamaker et al., 1991b), for example by enabling anonymous input of ideas and votes, providing an electronic blackboard, summarizing ideas, displaying ratings and rankings, handling agendas, and facilitating multi-criteria decision making (DeSanctis and Gallupe, 1987; Fjermestad, 2004; Nunamaker et al., 1991a; Zigurs and Buckland, 1998). As a result, these systems are associated with enhanced group productivity, equal participation, reduced status effects, and improved decision quality (Jarvenpaa et al., 1988; McLeod et al., 1997; Mejias, 2007; Nunamaker et al., 1991b; Tyran et al., 1992).

1.4 Business meeting satisfaction and effectiveness

Briggs et al. (2003, 2006) define meeting satisfaction as the affective arousal with a positive valence toward a meeting and its outcomes. Meeting satisfaction is generally decomposed into two constructs: satisfaction with the meeting process and satisfaction with the meeting outcomes (Briggs et al., 2006; Davison, 1997; Mejias, 2007). Similarly, meeting attitude denotes subjective thoughts, feelings, and evaluations of meetings, related to whether the meeting was helpful and pleasant (O'Neill and Allen, 2012; Trevino et al., 2000). Meeting effectiveness can be defined as the extent to which the objectives set for the meeting are achieved (Leach et al., 2009; Nixon and Littlepage, 1992), which can be negatively impacted by political and group process problems, such as production blocking, conformance pressure, evaluation apprehension, free riding, domination, information overload, and cognitive inertia (Davison, 1997; Mejias, 2007; Nunamaker et al., 1991b). As a result, managers are often reported to be dissatisfied with meetings and to find them frustrating and a waste of time (Rice, 1973; Trevino et al., 2000). Also, the more meetings a manager attends, the more likely this person is to have a negative attitude towards meetings (Trevino et al., 2000). However, managers hold a more positive attitude towards meetings when they consider meetings to symbolize teamwork, participation, involvement, or cooperation (Trevino et al., 2000).

In response, several authors have identified and examined key success factors for conducting business meetings effectively. For example, before the meeting, a meeting

announcement and agenda establish the objectives and structure of the meeting, and allow meeting participants to prepare for the meeting (Leach et al., 2009; Schwartzman, 1989; Volkema and Niederman, 1996). Also, adherence to the agenda during the meeting and beginning and ending the meeting on the appointed times, enhances timeliness and effectiveness (Doyle and Straus, 1982; Nixon and Littlepage, 1992; Rogelberg et al., 2013). Moreover, the number of meeting participants should be large enough to gather all the required viewpoints, expertise and knowledge, yet larger meetings are more difficult to handle and require more structure (Doyle and Straus, 1982; Romano and Nunamaker, 2001). Furthermore, Nixon and Littlepage (1992) find that while meeting leaders should keep the meeting focused and moving forward, they should also restrain from giving their opinions. Similarly, focused but open communication and wide participation during the meeting lead to better outcomes and more commitment (Bang et al., 2010; Kauffeld and Lehmann-Willenbrock, 2012; Nixon and Littlepage, 1992; Schwartzman, 1989). In addition, the use of computer-based systems in business meetings, involving a set of tools to structure the achievement of meeting group tasks, can also enhance effectiveness (Dennis et al., 1988; DeSanctis and Gallupe, 1987; Nunamaker et al., 1991b). After the meeting, minutes and recordings can be used as an information link-pin between meetings, and to inform absent members about the outcomes of the meeting (Volkema and Niederman, 1996).

While prior research on business meeting effectiveness has provided insight on the role of these factors, there is a paucity of research on the role and effectiveness of business meeting modes. Modes refer to communication media as well as face-to-face interaction, and prior research on organizational communication has investigated the capabilities of communication media, their effective use, and media choice. This literature is reviewed next.

2. ORGANIZATIONAL COMMUNICATION

The review of prior research on organizational communication in a mediated setting is organized in four subsections. The first subsection considers the capabilities of communication media and discusses several media conceptualizations, as well as contingency factors influencing perceived media capabilities (Carlson and Zmud, 1999). The second subsection concerns the effectiveness of communication media, and includes a review of the seminal work by Short et al. (1976) and Daft et al. (1987), as well as of more recent theories, such as social information processing (Walther, 1995), task-technology fit (Zigurs and

Buckland, 1998), media naturalness (Kock, 2007), and media synchronicity (Dennis et al., 2009). The third subsection addresses media choice, and examines media choice both as a function of matching the medium to the objective, and as a result of social and contextual factors. In the fourth subsection, communication objectives are identified, which were found to influence communication media choice and/or effectiveness. In Appendix A, an overview of prior studies on media effectiveness and choice is presented, in chronological order.

2.1 Communication media capabilities

In general terms, a communication medium transmits or carries a message from a sender to a receiver (Steuer, 1992; Te'eni, 2001). The way in which the message is formed and transmitted depends on the capabilities of the medium, which are, in turn, determined by the medium's inherent attributes and the context in which the medium is used (Dennis et al., 2008). For example, a medium that transmits visual cues (attribute) enables using facial expressions (capability). However, if a user does not dispose of a camera, that person cannot use facial expressions (context). Various media capabilities have been described in the literature and they are usually integrated into broader media conceptualizations. While several conceptualizations of communication media have been developed, social presence and media richness are generally considered to be the most impactful.

The social presence concept was developed by Short, Williams, and Christie (1976), who studied different synchronous communication media in an organizational context. Social presence of a medium involves the extent to which it conveys the physical presence of communication partners and enables them to experience mutual psychological presence. In particular, Short et al. (1976, p. 65) refer to social presence of a medium as the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships." Social presence is defined as a single dimension of the medium, comprising factors such as the capacity to transmit gestures, facial expressions, direction of looking, posture, dress, and nonverbal vocal cues. The extent to which each of these factors contributes to the social presence of a medium is subjectively perceived by the user, who holds a mental set towards the medium. The authors use four bipolar, semantic differential scales to measure the social presence of a medium: cold – warm; insensitive – sensitive; impersonal – personal; unsociable – sociable. The more warm, sensitive, personal, and sociable a medium is perceived to be, the higher is its social presence. Communication media can accordingly be

ordered on a continuum, with face-to-face providing the highest level of social presence (Short et al., 1976).

The social presence concept is closely related to media richness (Chidambaram and Jones, 1993; Rice, 1993). In particular, Daft, Lengel, and Trevino (1987) argue that communication media differ in their capacity for processing equivocal (ambiguous) information and that the higher the richness of media, the better (faster) they enable reaching a shared understanding. Four criteria constitute the richness of a medium: multiple cues (physical presence, voice inflection, body gestures, words, numbers, and graphic symbols), immediacy of feedback, language variety (numbers or natural language), and personal focus (using feelings and emotions). A medium is considered to be richer if it has the capacity to convey more cues, allows for immediate feedback, uses natural language, and allows for a personal focus (Daft et al., 1987). Similar to the continuum based on social presence, media can be hierarchically classified from high to low richness, as follows: physical presence (face-to-face), interactive media (telephone, electronic media), personal static media (memos, letters, tailored computer reports), and impersonal static media (flyers, bulletins, generalized computer reports) (Lengel and Daft, 1989).

Several researchers have built on the social presence and media richness concepts to further refine communication media conceptualizations. For example, Zmud, Lind and Young (1990) draw from media richness theory and examine the communication medium dimensions that are perceived by users as differentiators. In addition to three media richness dimensions (immediacy of feedback, cue variety, and personalization), they consider medium accessibility, information quality (relevance, accuracy, reliability, and timeliness of information), and receiver accessibility. Based on an empirical study, the authors put forward three key differentiating dimensions: medium accessibility, information quality, and feedback immediacy (Zmud et al., 1990). Similarly, Zack (1993) developed interaction theory, in keeping with the multiple cues, language variety, and personal focus dimensions of media richness theory, yet addresses the immediacy of feedback characteristic of a medium in a broader sense. In particular, the author argues that in addition to continuous feedback, the characteristics of a medium include simultaneity of information exchange, turn-taking flexibility, spontaneity, and ability to interrupt or preempt (Zack, 1993).

Likewise, Te'eni (2001) builds on the dimensions of media richness, and characterizes media in terms of interactivity (potential for immediate feedback), channel capacity (potential to transmit a high variety of cues and language), and adaptiveness (potential to adapt a message to a particular receiver) in his cognitive-affective organizational communication

model. Also, Barry and Fulmer (2004) define three key attributes of communication media: the first is 'social bandwidth,' which refers to the transmission of social, relational, and symbolic cues. Second is interactivity of a medium, which captures the rate of communication message exchanges and is referred to as either synchronous or asynchronous. A third attribute is surveillance, which refers to the extent to which using a medium is public to outside parties.

Additional conceptualizations of communication media have been developed. For example, Clark and Brennan (1991) and Olson and Olson (2000) describe media in terms of eight dimensions that are needed to establish common ground: copresence (same physical environment), visibility (visible to each other), audibility (speech), contemporality (message received immediately), simultaneity (both speakers can send and receive), sequentiality (turns cannot get out of sequence), reviewability (able to review other's messages), and revisability (messages can be revised before they are sent). Furthermore, Fish et al. (1992) derive a similarity measure between nine different media (one-on-one face-to-face meetings, group meetings, telephone, e-mail, answering machines, fax, handwritten notes, printed documents, desktop video-conferencing) based on their appropriateness for 14 communication activities, and identify two key dimensions: the degree of interactivity a particular medium provides and the amount of information it can exchange (Fish et al., 1992). Using a similar approach, Rice (1993) identifies synchronicity and mediation as key dimensions of communication media.

Also, Hoffman and Novak (1996) specify objective characteristics for interpersonal and computer-based communication media: the number of linked sources and the associated communication model (one-to-one, few-to-few, many-to-many), the content transmitted (text, image, audio, video, experiential), and temporal synchronicity. Moreover, several researchers have studied the support for contextualization that a medium provides (Te'eni, 2001; Zack, 1993). Contextualization refers to the provisioning of information about the situation, intentions, and feelings about an issue or action in a structured and easy to absorb way (Majchrzak et al., 2005) and comprises the extent to which a medium provides ownership information (who authored a message), easy travel (moving effortlessly among messages), multiple perspectives (comparison of perspectives on a message), indeterminacy (partial and tentative messages), and emergence (emergence of new categories, constructs, and of levels of abstraction concerning messages) (Majchrzak et al., 2005).

More recently, Dennis and his colleagues developed the media synchronicity concept (Dennis and Valacich, 1999; Dennis et al., 2009, 2008). Synchronicity refers to a shared pattern of coordinated behavior among individuals as they work together. Five media capabilities determine media synchronicity: transmission velocity, (naturalness and

appropriateness of) symbol sets, parallelism, rehearsability, and reprocessability. While the first two capabilities are positively related to the synchronicity capacity of a medium, the latter three are negatively related to it. The authors also provide a synchronicity ordering of media, as follows (from high to low): face-to-face, video-conference, telephone conference, synchronous instant messaging, synchronous electronic conferencing, asynchronous electronic conferencing, asynchronous electronic mail, voice mail, fax, and documents (Dennis et al., 2008).

Another recent concept is media naturalness, which refers to the (dis)similarity of a medium to the face-to-face setting (Kock, 2004, 2009). Media naturalness is characterized by the extent to which the medium supports the following elements of face-to-face communication: co-location (shared context), synchronicity (quickly exchanging communicative stimuli), and the ability to transmit facial expressions, body language, and speech. Furthermore, these elements are divided into two overarching dimensions: the space-time dimension (comprising co-location and synchronicity) and the expressive-perceptual dimension (comprising the transmission of facial expressions, body language, and speech). Kock (2004, p. 334) put forward the “speech imperative proposition” highlighting that the extent to which the medium supports the ability to convey and listen to speech is the key element of the expressive-perceptual dimension.

In addition, prior research has highlighted how the context in which the medium is used, influences its capabilities (Carlson and Zmud, 1999; Fulk et al., 1987; Zack, 1993). For example, Fulk et al. (1987) propose that perceived media capabilities are also constructed by prior media experience and by coworkers’ attitudes, statements, and behavior concerning a medium. Likewise, Carlson and Zmud (1999) argue that different experiences impact an individual’s perception and actual use of media. Their channel expansion theory asserts that perceived media richness is expanded by the experience the user has with the medium, with the other user(s), with the message topic at hand, and with the organizational context (Carlson & Zmud, 1999). In a similar vein, Yoo and Alavi (2001) note that perceived social presence is influenced by group cohesion in established groups. Also, electronic propinquity theory considers the influence of the perceived choice set of media available to an individual (Walther and Bazarova, 2008). In particular, the perception of social presence is negatively impacted when the alternative media support a wider variety of cues, and vice versa. Similarly, Chidambaram and Jones (1993) find that the addition of computer support decreases social presence in face-to-face interaction, while it does not lower social presence perceptions for distributed groups using audio-conferencing.

Finally, several researchers have argued that communication media are not necessarily appropriated faithfully to their attributes and that communication capabilities can be adapted over time in a social context (DeSanctis and Poole, 1994; Majchrzak et al., 2000; Yates and Orlikowski, 1992). For example, the adaptive structuration theory of DeSanctis and Poole (1994) argues that the use of (new) technology is not deterministic, but structured through a process of mutual influence between the technology and socially embedded use processes. Likewise, Yates and Orlikowski (1992) consider reciprocal and recursive relationships between media and organizational communication. More recently, Markus and Silver (2008, p. 622) developed the concept of functional affordances, defined as “the possibilities for goal-oriented action.” The authors draw from adaptive structuration theory to argue that what a user may do with technology follows from a reciprocal relationship between the user(s) and the technology and depends on the user’s capabilities and goals. An example of increasing the inherent richness of a medium is the use of underlining, punctuation, and emoticons in e-mail or instant messaging (Riordan and Kreuz, 2010). On the contrary, users’ behavior may decrease the inherent richness of a medium, for example, when a person refuses to pick up the telephone when it rings, the caller may be referred to voice mail, and the interaction inadvertently becomes asynchronous (Markus, 1994).

To summarize, the above literature provides valuable insight into the capabilities of communication media. First, every medium provides distinct communication capabilities and media can be arrayed along a continuum accordingly, with face-to-face providing the most advanced capabilities (Daft et al., 1987; Dennis et al., 2008; Kock, 2004; Short et al., 1976). Current communication technologies transmit some sensory information available in a face-to-face setting (auditory and visual cues), but not others (touch, smell, and taste), although these could also be useful to support communication (Dennis et al., 2008; Kock, 2009; Overby, 2008). Second, media capabilities are also determined by the context in which the medium is used, which includes factors such as users’ attitudes and experience and the media choice set (Carlson and Zmud, 1999; Fulk et al., 1987; Walther and Bazarova, 2008). Third, communication capabilities of a medium can be adapted over time within a group, through an iterative process (DeSanctis and Poole, 1994; Markus and Silver, 2008).

Having discussed conceptualizations and capabilities of communication media, the question arises on how different media impact effectiveness. In the next section, the literature that addresses media effectiveness is reviewed.

2.2 Effectiveness of communication media

Several theories on the effectiveness of communication media have been proposed. The same two theories, dominant in terms of describing media, social presence and media richness, are also very influential in terms of their perspectives on media effectiveness. In particular, both consider a medium to be effective to the extent that its capabilities match the requirements of the task. More recent theories on media effectiveness include media naturalness and media synchronicity. In addition, research on group support systems, computer-mediated communication, and contextualization is relevant to understanding the effectiveness of communication media.

The underlying principle of social presence theory is that, to communicate effectively, the level of personal involvement and attention that is required for the communication task should be matched with the social presence of the medium (Short et al., 1976). The tasks most sensitive to the medium used, involve interpersonal relationships, the expression and perception of emotions, a great need for timing and coordination of turn taking, and/or a need to manipulate others. On the other hand, tasks involving simple cognition are considered to be less sensitive to the medium used (Short et al., 1976). Similarly, media richness theory highlights that “for effective communication to occur, the richness of the medium should match the level of ambiguity” (Daft, Lengel, & Trevino, 1987, p. 359). In particular, ambiguous (or equivocal) messages are non-routine and open to interpretation, hence the use of richer media decreases ambiguity and enables the negotiation of a mutual understanding more quickly (Daft et al., 1987). On the other hand, for unambiguous, routine messages, a shared meaning is already established and lean media suffice to carry the message. Moreover, in this case rich media may contain unnecessary, surplus meaning, possibly distracting from the core message. Markus (1994) summarizes that when the chosen medium is not rich enough, there is a possibility for miscommunication, whereas too much richness is likely to be wasteful.

However, the principles of social presence and media richness theory were contradicted by the empirical findings of several studies (Dennis et al., 2008; Kock, 2004; Palvia et al., 2011; Straub and Karahanna, 1998). For example, Markus (1994) finds managers use lean media effectively for equivocal communication and Dennis and Kinney (1998) find that using richer media does not improve performance for equivocal tasks. Such findings have motivated further theoretical developments. For example, Dennis and his colleagues developed media synchronicity theory, in which high synchronicity is “associated with

reduced cognitive effort to encode and decode messages” (Dennis et al., 2008, p. 582). The authors argue that tasks are at a too broad level to examine medium effectiveness, and propose two micro-level communication processes of tasks, with different synchronicity needs: low synchronicity for the conveyance of information, and high synchronicity for the convergence of meaning (Dennis and Valacich, 1999; Dennis et al., 2008, 2009). Since completing a task involves both processes, Dennis and colleagues conclude that the use of a variety of media, either concurrently or consecutively, improves communication effectiveness (Dennis et al., 2008).

Furthermore, based on an extensive literature review, Te’eni (2001) presents a cognitive-affective organizational communication model, which breaks away from “*integrated perceptions*” (p. 272, author’s italics), such as social presence and media richness, and instead considers what each attribute of a medium affords separately. The cognitive-affective model proposes that the communication process starts with specific communication goals (instructing action, managing interdependent action, managing relationships, and influencing). These communication goals involve inherent sources of cognitive and affective complexity that affect communication strategies (control-testing and adjusting, control-planning, contextualization, perspective taking, affectivity, and attention focusing). Finally, the communication strategies imply an effective selection of medium attributes and of message form, in order to have communication impact, in terms of mutual understanding and relationships. Te’eni et al. (2001) test the model at an academic institution, examining written and recorded communication, and find indeed that people prefer certain medium attributes for specific communication strategies.

A communication strategy that has received attention recently is contextualization (Katz and Te’eni, 2014, 2007; Majchrzak et al., 2005). Contextualization involves layers around the core message that build an explicit interpretation of the core message (Katz and Te’eni, 2007; Te’eni, 2001). For example, Zack (1993, 1994) states that for building a shared interpretative context, a highly interactive communication mode (e.g., face-to-face) is appropriate and effective, whereas lower interactive modes are appropriate within an established context. Drawing from Te’eni’s work, Majchrzak et al. (2005) developed a model that relates IT support for contextualization to the development of collaboration know-how in distributed teams. The authors find a positive relationship between contextualization and collaboration know-how development for non-routine tasks, while for a routine task the relationship is found to be convex, which means that low and high contextualization are better than intermediate contextualization. Similarly, Katz and Te’eni (2007) find that

contextualization is only effective when there is a difference in perspectives (“misunderstanding”) between collaborators. In this case, contextualization increases mutual understanding and performance. However, in situations of shared perspectives, contextualization is not found to be effective, and even counterproductive (Katz and Te’eni, 2007). Furthermore, Katz and Te’eni (2014) find that higher cognitive communication complexity situations impair performance, unless communicators provide more contextualization. Furthermore, contextualization is positively associated with the cognitive effort required by both sender and receiver. Collectively, the findings point to the cost-benefit analysis communicators need to make when contextualizing (Katz and Te’eni, 2014).

In addition, several researchers have focused on the cognitive effort associated with the use of different communication media, to explain differences in their effectiveness. For example, Kock (2004) proposes media naturalness theory, based on Darwinian evolution. His “psychobiological” model predicts that lower naturalness leads to higher cognitive effort in a collaborative task, preventing effective communication to occur (Kock, 2004, 2009). In a similar vein, Ferran and Watts (2008) use dual-process cognitive theory to show that there is an increased cognitive workload in video-conferencing versus face-to-face communication, and as a result people are less influenced by argument quality and more by heuristic cues such as source likeability. Likewise, Robert and Dennis (2005) present a cognitive-based view of social presence based on the elaboration likelihood model and identify a paradoxical impact of social presence on performance, which is that high social presence increases the motivation to process a message, but decreases the ability to process it.

A number of theory refinements have further enhanced views of effective communication. For example, Hollingshead et al. (1993) suggest that work groups develop communication norms with regards to media that can compensate for limitations of the medium (e.g., caps and emoticons in e-mail). Similarly, the compensatory adaptation model by Kock (2001, 2007) indicates that users of lean media overcompensate for the obstacles encountered and as a result generate better outcomes than expected. Furthermore, Walther (1992, 1995) developed social information processing theory and argues that interpersonal communication through lean media can be at a comparable level as face-to-face, given sufficient time and message exchanges. Also, Burke and Chidambaram (1999) find that face-to-face is perceived to be more effective than synchronous text-based communication at the start of their repeated-measures study, while no perceived difference is found by the end of it. Likewise, Rice (1993) and King and Xia (1997) find that the perceived appropriateness of (technology-enabled) media changes over time and through experience. Similarly, Bartelt and

Dennis (2014) argue that social behavior regarding a communication technology, which is enacted without a conscious decision (automatically) and evolves over time, influences the nature of the interaction. In particular, the authors find that the use of instant messaging in habitual situations involves more non-task related social discussion than the use of discussion forums, resulting in differences in outcome perceptions. However, under heightened time pressure, the use of instant messaging becomes more task-focused, resulting in similar behavior and comparable outcomes for both technologies. These findings suggest that contingency factors, such as time pressure, may inhibit the enactment of social behavior.

Prior research on group support systems and computer-mediated communication also provides useful insights on media effectiveness. For example, the theory of task-technology fit underscores the importance of achieving a fit between the task and the supporting technology for performance (Goodhue and Thompson, 1995; Zigurs and Buckland, 1998; Zigurs and Khazanchi, 2008). Drawing from this theory, Maruping and Agarwal (2004) developed a theoretical model on effectively managing interpersonal processes (conflict management, motivating/confidence building, and affect management) in virtual teams. Furthermore, the fit-appropriation model states that beyond fit, the appropriation support received in the form of training, facilitation, and software restrictiveness, further enhances the effective use of group support systems (Dennis et al., 2001). Testing the fit-appropriation model, Fuller and Dennis (2009) find that teams using poor-fitting technology improved performance over time by innovating and adapting structures.

Early research comparing computer-mediated communication (CMC) to face-to-face interaction focused on the lack of cues available in (written) mediated communication. CMC has been associated with less social inhibition, lower privacy concerns, more depersonalization, more hostile communication (flaming), and status equalization (Dennis et al., 1988; Jiang et al., 2013; Sproull and Kiesler, 1986; Tyran et al., 1992). Contrary to the presumed effect of anonymity on breaking down social boundaries, it follows from the social identity model of deindividuation effects (SIDE model; Spears & Lea, 1994) that anonymity in CMC can lead to reinforcement of social boundaries or to the formation of new boundaries. Bordia (1997) synthesizes published experimental studies and concludes that in CMC, there is reduced normative pressure and poorer comprehension of the discussion compared to face-to-face interaction. Furthermore, discussions in CMC take longer, produce more ideas, and have greater equality of participation. Also, the author finds support for the idea that CMC groups perform better in tasks requiring less social-emotional interaction, while face-to-face groups perform better in tasks involving more social-emotional interaction (Bordia, 1997).

The above literature review provides valuable insight into the effectiveness of communication media. Effectiveness follows from a match between the capabilities of the medium and the requirements of the task at hand. With some exceptions (Fjermestad, 2004; Simon, 2006; Walther, 1996), the face-to-face setting is considered the standard relative to which technology-enabled communication media are deficient. As the capabilities of the medium increase, the medium is found to be more effective (Daft et al., 1987; Dennis et al., 2008; Kock, 2007; Rice, 1992; Shim et al., 2002; Short et al., 1976). In addition, usage norms can be developed (over time) within groups, to compensate for inherent limitations of a medium (Dennis et al., 2001; Hollingshead et al., 1993; R. King & Xia, 1997; Kock, 2001).

2.3 Media choice

A vast body of research has focused on media choice for organizational communication (George et al., 2013; Te'eni, 2001). Two complimentary perspectives are commonly discerned (Carlson and Davis, 1998; Markus, 1994; Straub and Karahanna, 1998; Watson-Manheim and Bélanger, 2007; Webster and Trevino, 1995; Yoo and Alavi, 2001): the first prescribes medium choice in terms of matching the medium to the task requirements, the second focuses on the influence of social and contextual factors.

In the previous subsections, social presence and media richness theory are discussed in terms of how they characterize communication media based on their communication capabilities, and how matching media capabilities to task requirements leads to effectiveness (Daft et al., 1987; Short et al., 1976; Te'eni, 2001). Therefore, both theories consider the task or objective to be the main determinant of medium choice, and matching media capabilities to communication task requirements is referred to as an appropriate medium choice (King and Xia, 1997; Rice, 1993). However, empirical findings of media choice research based on social presence and media richness theory, are criticized and said to be contradictory and inconclusive, especially with regards to new communication media (Carlson and Davis, 1998; Dennis et al., 2008; Kock, 2004; Straub and Karahanna, 1998).

In response, further theoretical developments followed. For example, Zack (1993, 1994) proposes a theory in which the shared interpretive context determines media choice. In addition, Watson-Manheim and Bélanger (2007) and Dennis and colleagues (2008, 2009) propose theories that describe multiple media selections. Watson-Manheim and Bélanger (2007) find that in addition to the communication objective, institutional (e.g., physical proximity) and situational (e.g., urgency) conditions influence multiple media selections.

Similarly, Dennis et al. (2008, 2009) argue that completing a task usually involves both conveyance and convergence processes, either concurrently or consecutively, and therefore a variety of media should be used to perform a task effectively. Also in response to inconclusive findings of research based on matching the medium with the task at hand, social and contextual factors for media choice have been identified and examined, as discussed next.

A key factor for communication medium use in organizations, is access of both the sender and the intended recipient(s) to that medium, which is a prerequisite of its use (Allen, 1977; Markus, 1987). Furthermore, the more people have access to a particular medium ('universal access'), the more useful it becomes, as emphasized in critical mass theory (Kraut et al., 1998). In addition to enabling access to a medium, organizations can provide implicit and explicit incentives to use it (Markus, 1994; Watson-Manheim and Bélanger, 2007). Also, temporal availability of the intended recipient(s) is an important factor (Straub and Karahanna, 1998). The intended recipients of a message are available "when they are physically able to receive it from the medium and then attend to it" (Miranda & Saunders, 2003, p. 89). Markus (1994) and Straub and Karahanna (1998) find that if an intended recipient is not available for communication via a rich medium, media lower in richness may be chosen in order to achieve "psychological" closure.

In addition, the cost of using a medium is considered a significant consideration for media choice (Christie and Kingan, 1977; Reinsch and Beswick, 1990). In particular, the cost of using a medium is generally higher if it requires same time and same place interaction (Robert and Dennis, 2005). Therefore, the geographic dispersion between communication partners also influences the cost and selection of media (Conrath, 1973; Trevino et al., 2000, 1987; Webster and Trevino, 1995). For example, Trevino et al. (2000) find that for long-distance communications individuals are less likely to choose face-to-face meetings, and more likely to choose e-mail, fax, and other written media. Similarly, the number of recipients impacts media choice, as the communication model, and therefore the effort and cost to reach recipients differs across media (Trevino et al., 1987; Webster and Trevino, 1995). For example, the communication model for e-mail is one-to-few, while for postal mail and fax it is one-to-one (Hoffman and Novak, 1996).

Other situational factors that influence media choice are related to the message itself. For example, the urgency of the message, which is the extent to which a quick response from the receiver is required (Trevino et al., 1987; Watson-Manheim and Bélanger, 2007). More specifically, people are inclined to choose synchronous communication media for urgent messages (Palvia et al., 2011; Straub and Karahanna, 1998). Other message characteristics

that influence media choice include its form and integrity (Palvia et al., 2011; Webster and Trevino, 1995), length (Watson-Manheim and Bélanger, 2007), sensitivity (Markus, 1994; Palvia et al., 2011; Watson-Manheim and Bélanger, 2007), valence (Sheer and Chen, 2004), and traceability (Carlson and Davis, 1998; Palvia et al., 2011). Finally, privacy concerns may impact the selection of media (Webster, 1998).

The social context in which a medium is used, also influences its selection (Burke and Chidambaram, 1999; Palvia et al., 2011). For example, Fulk et al. (1990) introduced the Social Influence Model of technology use, and argue that choices and uses of media vary and are, at least in part, socially formed through work group norms, and attitudes and behaviors of coworkers and supervisors. Shared beliefs about what a medium is appropriate for are structured through the use of and interaction through communication media within a reference group and organizational structure (DeSanctis and Poole, 1994; Orlikowski and Yates, 1994; Yates and Orlikowski, 1992). Kraut et al. (1998) distinguish between two types of social influence: the first refers to the impact of a critical mass of other people using the medium, which changes the objective utility of it, and the second is related to the normative influences that are developed, shaping the manner in which the medium is used. In addition, Watson-Manheim and Bélanger (2007) and Lo and Lie (2008) identify interpersonal trust as a media choice factor. For example, while low levels of trust are associated with sending e-mails with colleagues and management in copy, high levels of trust are associated with the use of project management software for simple coordination (Watson-Manheim and Bélanger, 2007).

Another social and situational factor concerns symbolic meaning attached to the use of media. In particular, Webster and Trevino (1995, p. 1549) argue that selecting a medium “can carry meaning beyond the content of a message, and this meaning is socially constructed over time.” Symbolic meanings associated with media choice include: conveying formality, urgency, or personal concern, and showing authority or status (Markus, 1994; Trevino et al., 1987). In addition, the symbolic meaning of a medium can vary across organizations, for example, while a meeting may signal teamwork in one company, it may signal time wasted in another (Trevino et al., 2000). Furthermore, in a study examining perceived proximity, O’Leary et al. (2014, p. 1219) show how the perceptions of communication technologies shift towards “vehicles for conveying shared meaning and symbolic value.” To the extent that individuals are conscious of such symbolic meaning, they are expected to influence media choice (Trevino et al., 2000).

Media choice is conceptually akin to technology adoption (Brown et al., 2010). The literature on technology adoption, which focuses on why a particular system is used and

accepted, is mature and it is therefore important and potentially fruitful to link it to other streams of literature (Venkatesh et al., 2003a). Early work on information technology adoption involves the work of Moore and Benbasat (1991), who developed the following factors, building on Rogers' diffusion of innovations model (1962, 2010): relative advantage, compatibility, trialability, ease of use, social status obtained by using a technology, result demonstrability (tangibility of the results of using the innovation), visibility (within the organization), and voluntariness of use (the non-mandatory decision to adopt information technology). These factors have been examined in studies on the adoption of various information technologies, including organizational communication media (Agarwal and Prasad, 1998; Bajwa et al., 2008; Van Slyke et al., 2007).

In addition, the Technology Acceptance Model (TAM) hypothesizes perceived usefulness and perceived ease of use to be fundamental determinants of user acceptance of technology (Davis, 1989a; Davis et al., 1989). Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance," while perceived ease of use is referred to as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 20). The original TAM has been extended with various antecedent and moderating factors, for example, individual/user characteristics, trust, culture, gender, task type, argument quality and source likeability (Agarwal and Prasad, 1998; Bhattacharjee and Sanford, 2006; Gefen and Straub, 2000, 1997; Gefen et al., 2003; Moon and Kim, 2001; Srite and Karahanna, 2006; Straub, 1994); and several model extensions have been proposed (Brown et al., 2010; Venkatesh and Bala, 2008; Venkatesh, 2000; Venkatesh et al., 2003b). The TAM has been used to study communication media adoption (Lee et al., 2003; Williams et al., 2009), including e-mail (Adams et al., 1992; Davis, 1989a; Karahanna and Straub, 1999; Straub, 1994), voice mail (Adams et al., 1992; Karahanna and Limayem, 2000; Subramanian, 1994), fax (Straub, 1994), video-conferencing (Townsend, 2001), and instant messaging (Li et al., 2005).

Furthermore, concepts of organizational communication literature have been considered in research on information technology adoption. For example, in a study applying TAM to the adoption of e-mail, Karahanna and Straub (1999) integrate TAM with social presence, and find that media perceived as higher in social presence are viewed as being useful for a wider range of communication tasks. Similarly, Karahanna and Limayem (2000) find social presence to be a key determinant of perceived usefulness and perceived ease of use of both e-mail and voice mail. Finally, Brown, Dennis and Venkatesh (2010) examine the

adoption of collaboration technologies, and hypothesize that technology characteristics (social presence, immediacy, and concurrence) influence performance and effort expectancy, and that these relationship are moderated by the collaboration objectives.

In sum, while various contingency factors have been studied with relevance to media choice in organizational communication, the communication task or objective remains a key consideration (Te'eni, 2001). The latter is highlighted in social presence and media richness theories, which state that media choice should be based on a match between the medium and the objective to communicate effectively (Short et al. 1976; Daft et al., 1987). A list of communication objectives is identified in the following subsection.

2.4 Communication objectives

A number of communication objectives have been identified in prior research on the selection and effectiveness of communication media. In this section, these studies are reviewed.

In an empirical study on social presence, Short et al. (1976) identify the following set of objectives, referring to them as recurring office activities: exchange information, ask questions, exchange opinions, make decisions, give or receive orders, solve a problem, generate ideas, persuade, generate buy-in or consensus, resolve conflicts and disagreements, maintain friendly relations/stay in touch, bargain, and get to know someone. In a later study, Fish et al. (1992) examine many of the objectives identified by Short et al. (1976), and add the following: exchange confidential information, explain a difficult concept, exchange time-sensitive information, make commitments, schedule meetings, and check project status. Likewise, Rice (1993) and King and Xia (1997) add exchange routine information, as well as exchange important information.

Straus and McGrath (1994) examine three objectives, drawing from McGrath's task "circumplex" (McGrath, 1984): generate ideas, solve a problem, and resolve conflicts. Lengel and Daft (1989) apply the richness matching hypothesis to routine and non-routine messages. Routine messages are straightforward, contain no surprises and a common frame of reference is established; non-routine communications involve novel events for which a common frame of reference has not been established. Also, Markus (1994) studies a set of hypothetical communication tasks, drawing upon media richness theory and content analysis by Trevino et al (1987), and includes the following objectives: communicate feelings or emotions, show

personal concern or interest, show authority, status, position, and exchange confidential, private or delicate information.

Te'eni (2001) examines four communication goals, in keeping with Habermas (1987): instructing action, managing interdependent action, managing relationships, and influencing. Watson-Manheim and Bélanger (2007) identify five purposes: simple and complex coordination, knowledge sharing, information gathering, relationship development, and conflict resolution. Finally, attention has been drawn recently to the preference and choice of media for deceptive communication in organizations (Carlson and George, 2004; George et al., 2013).

3. SUMMARY

The effectiveness of business meetings is an important research topic, and prior literature has pointed to various factors that meeting participants need to consider. Although several technologies are currently used for conducting distributed meetings as alternatives to the traditional face-to-face setting, there is as of yet a lack of research on effectively selecting a business meeting mode.

To address this gap, research on organizational communication in a mediated setting was reviewed. In this literature, communication media are characterized in terms of the capabilities they provide. Accordingly, media can be arrayed along a continuum, with face-to-face providing the most advanced capabilities (Daft et al., 1987; Dennis et al., 2008; Kock, 2004; Short et al., 1976). Matching the capabilities of the medium to the requirements of the communication objective(s) at hand, leads to effectiveness (Daft et al., 1987; Short et al., 1976). While using media with too few capabilities is ineffective, using media with too many capabilities is likely to be wasteful, yet does not decrease effectiveness (Markus, 1994; Rice, 1992). Therefore, face-to-face is generally considered the standard relative to which technology-enabled communication media are deficient (Dennis et al., 2008; Kock, 2007). In terms of choosing a medium for a specific communication incident, the literature prescribes the intended objectives as the main driver (Daft et al., 1987; Short et al., 1976; Te'eni, 2001). Although prior research has often compared technology-enabled media with the face-to-face setting (Fish et al., 1992; King and Xia, 1997; Markus, 1994; Rice, 1993; Short et al., 1976; Watson-Manheim and Bélanger, 2007), it has not examined the effectiveness of different communication media in the specific context of a business meeting, nor has it investigated the importance of meeting mode capabilities to achieve meeting objectives.

In addition, the context in which media are used influences capability perceptions, effective use, and selection. For example, the experience users have with each other and with communication media is related to how media capabilities are perceived, to the development of social norms and habits for their (effective) use, and to appropriateness attitudes of media choice (Bartelt and Dennis, 2014; Carlson and Zmud, 1999; Fulk et al., 1987; Hollingshead et al., 1993; King and Xia, 1997). Furthermore, such social context influences can be adapted over time within a group, through an iterative process (DeSanctis and Poole, 1994; Markus and Silver, 2008). For the selection of media, additional contextual factors are relevant, such as cost, access, availability, and message urgency. While acknowledging the influence of various contingency factors, this dissertation focuses on the perceived effectiveness of meeting modes for achieving meeting objectives and on the influence of meeting mode capabilities.

**COMMUNICATION TECHNOLOGIES
FOR DISTRIBUTED BUSINESS
MEETINGS**

CHAPTER III: COMMUNICATION TECHNOLOGIES FOR DISTRIBUTED BUSINESS MEETINGS

Four synchronous business meeting modes are considered in this dissertation. In addition to the traditional face-to-face setting, three technology-enabled business meeting modes are examined: audio-conferencing, video-conferencing, and telepresence. They are discussed in this section.

1. AUDIO-CONFERENCING

Participants in audio-conferencing meetings communicate through real-time voice transmissions, enabling the use of speech and vocal tone to interact. Different terms have been used to refer to audio-conferencing, including tele-conferencing, conference calling, and (tele)-phone conferencing. While in interactions between two people, a direct telephone connection can be used, audio-conferencing meetings with multiple people can be set up using a conference bridge, which participants can connect to by dialing a given phone number. This service is provided by companies such as InterCall and AT&T. Increasingly, audio-conferencing meetings are set up over the Internet, through the use of specific Web-conferencing software. This software allows participants to share a screen, application, or work space and to interact using chat as well. Providers of such software include Microsoft with Skype for Business, IBM with SmartCloud Meetings, Cisco with WebEx, and Citrix with GoToMeeting. Also, to accommodate participants who cannot participate in a face-to-face meeting, audio-conferencing capabilities such as tabletop conference phones (e.g., Polycom SoundStation) can be added to the face-to-face setting.

2. VIDEO-CONFERENCING

Video-conferencing meetings support all the attributes of audio-conferencing meetings and transmit visual cues as well, enabling interaction through nonverbal cues, such as gestures and body language. The extent to which video-conferencing transmits these cues depends on the image size and quality (Lombard and Ditton, 1997). While traditional video-conferencing involved dedicated systems, it is available today on desktop and portable computers that can

utilize a high-speed data connection, a webcam, a speakerphone, and video-conferencing software (Townsend et al., 1998). Web-based video-conferencing software is provided by all of the companies mentioned in the audio-conferencing section. In addition, software that is more consumer-oriented, such as Apple's FaceTime or Google Hangout, can also be used in business meetings.

3. TELEPRESENCE

While audio- and video-conferencing technologies are widely adopted in organizations, telepresence technology was introduced more recently as a business meeting mode. The term "Telepresence" was coined by Marvin Minsky in an article that appeared in *Omni* (1980). Minsky, cofounder of MIT's Artificial Intelligence laboratory, used the term to refer to the sense of being somewhere. The author envisioned robotic instruments that enable telepresence through remote control and that would "feel and work so much like our own hands that we won't notice any significant difference" (p. 48). In his seminal article, Minsky described telepresence applications for hazardous situations (such as nuclear plants), for locations difficult or costly to reach (e.g., deep-sea or outer space), for new medical and surgical techniques, for space exploration, and for tele-working.

While the term telepresence originated in research on robotics, it was promptly adopted in other areas, including marketing, entertainment, health care, education, psychology, and organizational communication (IJsselsteijn, 2001; Lee, 2004; Lombard and Jones, 2007). Across the large variety of research fields in which the concept has been studied, there is consensus about several key components. For example, telepresence refers to the sense of "being there/somewhere" (Minsky, 1980; Steuer, 1992). In particular, Steuer (1992) states that while "presence" refers to the sense of being somewhere through natural, unmediated means, "telepresence" is the sense of being in an environment by means of a medium. The medium can be a book, television, computer, telephone, etc. The "environment" can be actual (real) or computer-generated (unreal) (Lombard and Ditton, 1997; Steuer, 1992). In addition to a user's feeling of being there, telepresence is used to refer to a user's perception of other people and objects being (present) with him or her (i.e., the person or object "being here"), and to the sense multiple users can have of "being together" (Lombard and Ditton, 1997).

The "person/object is here" telepresence-experience occurs when the user of a medium does not interpret a representation as symbolic. A classic example concerns the very first

filmgoers, who were said to panic and run away when an oncoming train locomotive was shown on the movie screen. As to the sense of “being together,” telepresence is defined by Buxton (1991, p. 27) as “the use of technology to establish a sense of shared presence or shared space among geographically separated members of a group.” This shared space consists of a shared person space that is seamlessly integrated with a shared task space (Buxton, 1991). It is worth mentioning that the understanding of telepresence as the sense of being together is closely related to concepts such as “co-location” and “co-presence” (Biocca et al., 2003; IJsselsteijn, 2001).

Telepresence is also associated with both perceptual and psychological immersion. Perceptual immersion results from the users’ senses perceiving the mediated environment instead of the actual environment (Draper et al., 1999; Lombard and Ditton, 1997). Psychological immersion refers to a state of mind in which someone is involved and engaged with what he/she is doing in the mediated environment. For example, Draper, Kaber and Usher (1998, p. 356) refer to “experiential telepresence” to denote the “mental state in which the user feels physically present” in the mediated rather than the actual environment. In a similar vein, Lee (2004, p. 32) defines telepresence as a “psychological state in which the virtuality of experience is unnoticed.”

Another key element of telepresence is the unobtrusiveness of the technology that enables the experience. For example, telepresence is referred to as the “perceptual illusion of non-mediation” by Lombard and Ditton (1997); it is associated with the aim of making the technology/medium as transparent as possible (IJsselsteijn et al., 2000); and it is referred to as the experience “in which a person fails to accurately and completely acknowledge the role of technology” (Lombard and Jones, 2007, p. 198). In keeping with Draper et al.’s attentional resource model (1998), IJsselsteijn et al. (2000, p. 3) add that distractions should be avoided in order to enable “a seamless continuity between the real and the mediated environment.”

Furthermore, the level of telepresence experienced depends on the type of behavior in the mediated environment. In particular, Lee (2004) describes three levels of behavior with regards to objects experienced through telepresence. The experienced ‘object’ can be physical (entities and/or environments), social (humans or artificially created human cues) or representing the user (identifications with (part of) self-representations). The three types of behavior are perception, manipulation, and interaction. At the lowest level, users can perceive (identify and interpret) objects through mediated signals. A higher level of experience is related to manipulating the perceived objects (e.g., changing their location). When there is

mutual influence between the user and the object, the highest level of telepresence occurs, namely interaction (Lee, 2004).

Notwithstanding extensive efforts to define and conceptualize telepresence, its impact still needs further study (Lombard and Ditton, 1997). Some outcomes that have been associated with telepresence include flow², involvement, enjoyment, and arousal (Biocca et al., 2003; Lombard and Ditton, 1997). However, Ijsselstein et al. (2001) note that the effects of telepresence are still unclear (p. 181): “For example, under which circumstances does an enhanced sense of presence aid task performance, or learning and memory? ... In which contexts of use will presence be of most value?”

The first commercially available technology that was designed with the explicit goal of providing a telepresence experience for business meetings was called TeleSuite. It was developed by a company named TelePort and launched in 1993. The idea of the founders of the company, David Allen and Herold Williams, originated from their experience in the hotel and resort business, as they noticed their most profitable customers cut their stays shorter and shorter year after year, in order to attend important business meetings. To reduce the need for guests to rush home, their idea was to develop technology that allows business people to attend these business meetings “in real-life” without leaving the resorts (Lichtman, 2006).

These telepresence systems were described as follows at the time³: “TeleSuite systems allow users in distant locations to experience life-size, virtual personal contact. During a TeleSuite conference, all participants appear simultaneously on screen, life-size without any delay and seemingly just across the table from each other. Through the use of TelePort's patent-pending video mirror concept, the suites provide a natural setting that gives users the perception of being together in one location. Participants communicate in fully synchronized audio and video, with each person making ‘virtual eye contact’ with the image of others on screen. The absence of visible wires, microphones, speakers or cameras ensures a relaxed and pleasant meeting environment.”

Since then, several companies have developed telepresence systems for business meetings, including Cisco, Hewlett Packard (its telepresence division is now part of Polycom), Huawei, LifeSize, Polycom, Tandberg (acquired by Cisco), and Teliris. In Appendix B, pictures of several telepresence systems are shown.

² Telepresence is closely related to “flow” (Animesh et al., 2011; Draper et al., 1998; Novak et al., 2000), which is a mental state in which “nothing else seems to matter” (Csikszentmihalyi, 1975). Telepresence has been modeled as both an antecedent of, as well as a component of flow in prior research (Nah et al., 2011).

³ <http://www.hospitalitynet.org/news/4000665.html>

Finally, it is noteworthy that telepresence meetings come at a significant cost and are substantially more expensive than audio- and video-conferencing meetings. First, they require an investment in specialized software and hardware. Especially the hardware, which includes high-definition screens and cameras, furniture (tables and chairs), and lighting, comes at a high cost, ranging between \$60,000 and \$700,000 (US) (Bartlett, 2007). Moreover, significant modifications to an organization's office facilities may be required before telepresence hardware can be installed, such as removing a wall or repositioning a door (Lichtman, 2006). In addition, a monthly service contract adds to the cost, services can include maintenance, a help desk, and a reservation system (Conti, 2007). Finally, installing telepresence systems may necessitate IP network infrastructure investments, as the requirements in terms of bandwidth are high (about 20 Mbps per room), and very low packet loss, jitter, and latency are critical for a smooth telepresence experience (Bartlett, 2007). Instead of making an investment, telepresence meetings can also be accessed through the paid use of systems of service providers, such as The Regus Group, AT&T, and TATA Communications. Using such a publicly available telepresence room comes at a cost of about \$500 (US) per hour⁴.

4. BUSINESS MEETING MODE ATTRIBUTES

In keeping with the literature review (see Chapter 2), the four meeting modes can be ordered in terms of the progressive communication attributes they support (see Table 3.1). Notably, each successive meeting mode provides the intrinsic communication attributes of the previous mode, with equal or better quality. For example, the quality of auditory cue transmission in audio- and video-conferencing is the same, while the transmission of auditory cues in telepresence is spatially faithful. In addition, the transmission of visual cues in telepresence is typically through higher quality video than in video-conferencing, and involves directional life-size images of participants.

⁴ <http://tatatelepresence.com/locations/rates/>

Table 3.1. Business Meeting Mode Attributes⁵

	Audio-conferencing	Video-conferencing	Telepresence	Face-to-face
Transmission of auditory cues	X	X	X	X
Transmission of visual cues		X	X	X
Transmission of spatial auditory and visual cues			X	X
Transmission of life-size visual cues			X	X
Transmission of physical cues				X
Shared computer screens (virtual work space)	X	X	X	X
Co-location experience (adjusted lighting, similar furniture, matched room colors)			X	X
Shared actual physical space				X

In this dissertation, the comparative effectiveness of these four meeting modes is examined for a comprehensive set of meeting objectives. In addition, the influence of a list of meeting mode capabilities, enabled by the meeting mode attributes (e.g., hearing attendees or seeing body language), is explored.

⁵ X refers to the attributes being supported by the meeting mode

RESEARCH DESIGN

CHAPTER IV: RESEARCH DESIGN

This chapter describes the research designs that were used to address the research questions and provides an overview of the field studies.

As shown in Table 4.1, four field studies were conducted across three companies, to address the three research questions. In order to conform to the wishes of the different companies involved, pseudonyms are used in this discussion.

Table 4.1. Overview of Companies, Research Questions, and Field Studies

	Research Question 1	Research Question 2	Research Question 3
NetworkingCo	Study 1	Study 3	Study 1
FinancialCo	Study 2		Study 2
EngineeringCo		Study 4	Study 4

Research study collaborations were established with three Forbes Global 500-companies: NetworkingCo, FinancialCo, and EngineeringCo.

NetworkingCo designs, manufactures, and sells networking products and services. The company is publicly traded on multiple exchanges, headquartered in the U.S.A., and active in 150 countries. NetworkingCo employs over 70,000 people across 380 locations worldwide. Every employee has access to WebEx, which is an online conferencing system that provides real-time data-, application-, voice-, and video-sharing capabilities. In addition, all employees have access to rooms equipped with telepresence technology. There are more than 1,000 fully immersive telepresence rooms deployed at NetworkingCo, in close to 300 offices across 80 countries.

FinancialCo provides bank and financial services. The company is publicly traded on the Euronext exchange, headquartered in Europe, and active in 75 countries. FinancialCo employs nearly 185,000 people, including 141,500 in Europe and 12,000 in the U.S.A.. For their distributed meetings, FinancialCo employees have access to WebEx and Arkadin for audio- and video-conferencing meetings, and to telepresence. FinancialCo has deployed 25 telepresence rooms worldwide.

EngineeringCo designs, manufactures, and delivers connected components, systems, and solutions. The company is publicly traded on the New York Stock Exchange, headquartered in Europe, and active in 150 countries. EngineeringCo employs over 90,000 people in 50 countries. For their distributed business meetings, the employees have access to

audio-conferencing, using AT&T Conferencing or Microsoft Lync, and video-conferencing using Intercall or Microsoft Lync. In addition, they deploy about 20 telepresence rooms worldwide, to which all employees have access.

At each company, the four meeting modes (audio-conferencing, video-conferencing, telepresence, and face-to-face) were employed on a relatively broad basis. In addition, every employee had access to all of these modes and had the freedom to choose between them for each meeting. Therefore, these companies provided unique field settings to study the use of communication technologies and face-to-face interaction for business meetings.

As Table 4.1 also shows, two field studies were used to address Research Question 1, two other studies were used to address Research Question 2, and to address Research Question 3, three out of the four field studies were used. The detailed research designs are described in the following sections, for each of the three research questions.

1. RESEARCH QUESTION 1

The research design that was used to address Research Question 1, on the comparative effectiveness of different business meeting modes for achieving business meeting objectives, consisted of two phases. The first phase involved the development of a comprehensive list of business meeting objectives that was used as a basis for field data collection in the second phase.

1.1 Phase 1: List of business meeting objectives

Since prior work on business meetings has not systematically considered different business meeting objectives, the literature on organizational communication was reviewed to compile a list of objectives. Based on this review (see Chapter 2, section 2.4 on p. 33), a comprehensive list of communication objectives reported in the literature was compiled, as shown in Table 4.2. In this table, the objectives are listed in the order in which they first appeared in the literature.

Table 4.2. Communication Objectives Identified in the Literature

Communication Objective	References
Exchange information	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976)
Ask questions	(Fish et al., 1992; Rice, 1993; Short et al., 1976)
Exchange/share opinions or views on a topic or issue	(Short et al., 1976)
Make a decision	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976)
Give or receive orders	(Short et al., 1976)
Find a solution to a problem that has arisen	(Short et al., 1976; Straus and McGrath, 1994)
Generate ideas on products, projects or initiatives	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976; Straus and McGrath, 1994)
Generate buy-in or consensus on an idea	(Short et al., 1976; Te'eni, 2001)
Resolve conflicts and disagreements within a group	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976; Straus and McGrath, 1994; Watson-Manheim and Bélanger, 2007)
Build trust and relationships with one or more individuals	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976; Te'eni, 2001; Watson-Manheim and Bélanger, 2007)
Maintain relationships with one or more other people and stay in touch	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976)
Negotiate or bargain on a deal or contract	(Fish et al., 1992; King and Xia, 1997; Rice, 1993; Short et al., 1976)
Communicate positive or negative feelings or emotions on a topic or issue	(Markus, 1994; Trevino et al., 1987)
Show personal concern about or interest in a particular issue or situation	(Markus, 1994; Trevino et al., 1987)
Assert and/or reinforce your authority, status, position to your team or others	(Markus, 1994; Trevino et al., 1987)
Give or receive feedback	(Trevino et al., 1987)
Assemble a team and/or motivate teamwork on a project	(Trevino et al., 1987)
Routine exchange of information	(King and Xia, 1997; Lengel and Daft, 1989)
Non-routine exchange of information	(King and Xia, 1997; Lengel and Daft, 1989)
Clarify a concept, issue or idea	(Fish et al., 1992; King and Xia, 1997)
Exchange confidential, private or sensitive information	(Fish et al., 1992; King and Xia, 1997; Markus, 1994; Rice, 1993)
Exchange time-sensitive information	(Fish et al., 1992; Rice, 1993))
Make commitments	(Fish et al., 1992)
Schedule meetings	(Fish et al., 1992)
Check project status	(Fish et al., 1992)
Exchange important information	(Rice, 1993)
To deceive someone	(Carlson and George, 2004; George et al., 2013)

This list was then checked with practitioners for relevance in a business meeting context, which is in keeping with Rosemann and Vessey's (2008) recommendation of conducting an applicability check on the research objects of interest. To identify practitioners for in-depth interviews, a convenience sampling strategy was used. While a convenience sample involves minimal selection costs, it does not allow for generalizations to broader

populations. Using a convenience sample is justifiable for exploratory purposes, as long as the sample shows clear relevance to the topic under study (Ferber, 1977).

At NetworkingCo, a convenience sample of managers was drawn, contacted through e-mail or telephone, and solicited to evaluate the list for relevance. Each interview participant was first screened to ensure that they regularly organize business meetings, using the different meeting modes. In total, 39 upper and middle level managers agreed to an in-depth interview. Each interview was conducted in a separate session lasting about an hour and was recorded and transcribed afterwards. Each session started with a series of questions to determine the interviewee's level of familiarity and experience with each meeting mode. These were followed by questions to determine how the interviewee chose a particular meeting mode, and then what objectives were relevant for the interviewee's meetings. Finally, the list of objectives compiled from the literature (see Table 4.2) was presented to the interviewee, who was asked to review it and to offer feedback about the adequacy and completeness of this list in the context of his or her business meetings.

From the interviews, no additional meeting objectives emerged and hence the list of business meeting objectives included all objectives of the interviewees' meetings. Conversely, based on their feedback, the list was shortened, from 27 to 19 objectives, with 8 objectives being considered redundant and/or irrelevant for business meetings. The resulting list, presented in Table 4.3, consists of 19 objectives.

At FinancialCo, the list of 19 business meeting objectives (see Table 4.3) was presented to a group of nine experts and assessed by them in terms of its completeness for business meetings. Likewise, at EngineeringCo, the list was checked for relevance with eight experts for business meetings. From both checks, no additional meeting objectives emerged, and the list was found to be adequate for field data collection with a broader set of managers at the companies.

Table 4.3. Business Meeting Objectives after Relevance Check

Exchange/share opinions or views on a topic or issue
Make a decision
Give or receive orders
Find a solution to a problem that has arisen
Generate ideas on products, projects or initiatives
Generate buy-in or consensus on an idea
Resolve conflicts and disagreements within a group
Build trust and relationships with one or more individuals
Maintain relationships with one or more other people and stay in touch
Negotiate or bargain on a deal or contract
Routine exchange of information
Non-routine exchange of information
Communicate positive or negative feelings or emotions on a topic or issue
Show personal concern about or interest in a particular issue or situation
Assert and/or reinforce your authority, status, position to your team or others
Give or receive feedback
Assemble a team and/or motivate teamwork on a project
Clarify a concept, issue or idea
Exchange confidential, private or sensitive information

While several classifications cover subsets of these objectives (e.g., McGrath, 1984; Watson-Manheim and Bélanger, 2007), it is of interest to note that prior research does not provide a canonical basis to classify all of the meeting objectives listed in Table 4.3. Moreover, while the objectives vary in terms of different dimensions, such as salience of the interpersonal relationship, socio-emotional contents, equivocality, reciprocity, conveyance/convergence, and complexity (Daft et al., 1987; Dennis et al., 2008; King and Xia, 1997; Rice and Love, 1987; Riordan and Kreuz, 2010; Short et al., 1976; Te'eni, 2001; Zigurs and Buckland, 1998), prior literature does not provide a complete assessment of the extent to which these dimensions apply to the meeting objectives, as illustrated in Table 4.4.

For instance, in their seminal work, Short et al. (1976) identified 12 communication activities. While the authors referred to different dimensions of these activities, such as the salience of the interpersonal relationship, the expression and perception of emotions, the need for timing and coordination of turn taking, and/or the need to manipulate others, they did not classify the activities in terms of these dimensions. Rice (1993) subsequently studied these activities and identified the extent to which they required social presence (see Table 4.4). In addition, Daft et al. (1987) distinguished between two factors influencing information processing: uncertainty and equivocality. While uncertainty refers to the absence of information, equivocality (or ambiguity/unanalyzability) refers to multiple and conflicting interpretations and differing frames of reference (Daft et al., 1987; Rice, 1992). In prior work,

multiple incidents of managerial communication were evaluated in terms of richness requirements (Markus, 1994; Trevino et al., 1987).

Furthermore, King and Xia (1997) analyzed 11 activities (see Table 4.4) and suggested reciprocity to describe them. While non-reciprocal communication “can be effectively accomplished by having one party engaged in the process” (p. 892), reciprocal communication requires high involvement of both sender and recipient at the same time. Likewise, Dennis et al. (2008) argued that all communication tasks entail both conveyance and convergence processes. Conveyance processes involve the transmission of (new) information and therefore often require time for individual processing. Convergence processes on the other hand, refer to the discussion of preprocessed information and typically require rapid, back and forth interaction. The authors furthermore argued that different tasks and contexts have different requirements for these processes. However, the relationships between tasks/objectives and these process requirements have not been examined.

Also, different dimensions of complexity have been identified in prior research (Campbell, 1988; Zigurs and Buckland, 1998): multiplicity of outcome expectations, multiplicity of courses of action to obtain a goal, conflicting solution schemes, and solution scheme/outcome uncertainty. Based on these dimensions, Zigurs and Buckland (1998) delineated five task categories: simple tasks, problem tasks, decision tasks, judgment tasks, and fuzzy tasks. However, the meeting objectives listed in Table 4.4 have not been connected with these categories in prior research. Additional complexity dimensions of communication include cognitive and affective complexity (Te’eni, 2001). While cognitive complexity involves interdependency between communicators and multiplicity of views in communication, affective complexity involves different attitudes or changes in disposition among communicators (Te’eni, 2001). Te’eni (2001) discussed four broad communication goals involving different levels of cognitive and affective complexity (see Table 4.4): instructing action, managing interdependent action, managing relationships, and influencing.

Table 4.4 shows the list of meeting objectives, and indicates for different dimensions, identified in prior research, whether the objective scores high (H) or low (L) on that dimension. The table reveals that prior literature provides useful dimensions to characterize some of the meeting objectives, yet none of the dimensions covers all of the meeting objectives. In addition, integrating different dimensions to develop an inclusive classification is not feasible, as there is overlap (objectives are assessed based on multiple dimensions) and inconsistency (e.g., for *Maintain relationships and stay in touch*) among them. Therefore, in this dissertation, the objectives are presented and analyzed individually.

Table 4.4. Alternative Classifications of Meeting Objectives

Business Meeting Objective	Social Presence (Rice, 1993)	Richness (Markus, 1994; Trevino et al., 1987)	Reciprocity (King and Xia, 1997)	Cognitive/Affective complexity (Te'eni, 2001)	
Exchange/share opinions or views on a topic or issue				H	L
Make a decision	H		H		
Give or receive orders				H	L
Find a solution to a problem that has arisen					
Generate ideas on products, projects or initiatives	H		H		
Generate buy-in or consensus on an idea		H		H	H
Resolve conflicts and disagreements within a group	H		H	H	H
Build trust and relationships with one or more individuals*	H		H	L	H
Maintain relationships with one or more other people and stay in touch**	L		L	L	H
Negotiate or bargain on a deal or contract	H		H		
Routine exchange of information	L	L	L	L	L
Non-routine exchange of information		H			
Communicate positive or negative feelings or emotions on a topic or issue		H			
Show personal concern about or interest in a particular issue or situation		H			
Assert and/or reinforce your authority, status, position to your team or others		L			
Give or receive feedback		H			
Assemble a team and/or motivate teamwork on a project		H			
Clarify a concept, issue or idea			L		
Exchange confidential, private or sensitive information	H	H	H		

* The wording for this objective in Rice (1993) and King and Xia (1997) was “Get to know someone.”

**The wording for this objective in Rice (1993) and King and Xia (1997) was “Stay in touch.”

1.2 Phase 2: Field data collection

In the second phase, two field studies were conducted. The first study, referred to as Study 1, was conducted at NetworkingCo, while the second study, referred to as Study 2, was conducted at FinancialCo.

In Study 1, employees working at NetworkingCo were invited to provide access to their online calendaring and meeting scheduling systems. Between April 2012 and July 2012, 208 meetings were identified, across the four modes, and the meeting organizers were invited after the meeting to complete a brief online questionnaire (see Appendix C). This invitation involved a personally addressed e-mail with a personal salutation (Barron and Yechiam, 2002; Joinson and Reips, 2007). In the questionnaire, the respondent was requested to indicate the meeting mode that was selected for the specific meeting from a list (audio-conferencing, video-conferencing, telepresence, or face-to-face). In addition, the same online questionnaire was sent to a set of 4,739 NetworkingCo employees, as a part of worldwide research on the use of internal collaboration tools. In Study 2, mutually exclusive lists of employees that recently organized an internal business meeting using one of the four meeting modes (audio-conferencing, video-conferencing, telepresence, or face-to-face) were compiled. In August 2013, e-mail invitations were sent to 716 employees, requesting them to refer to a meeting they organized recently using a specific meeting mode, and to complete a brief online questionnaire (see Appendix D).

In both studies, the list of 19 business meeting objectives, developed in Phase 1 (see Table 4.3), was presented to the respondents in the online questionnaires (see Appendices C and D). The respondents were asked to identify the *relevant* objectives of the specific meeting, and to evaluate the effectiveness of the selected business meeting mode for each of the relevant objectives. Effectiveness was defined as the extent to which the selected meeting mode facilitated the achievement of each specific business meeting objective. A five-point scale was used to measure the perceived effectiveness of the selected business meeting mode, ranging from 1: 'Not at all effective' to 5: 'Very effective' (Rice, 1992; Westmyer et al., 1998). The questionnaires also asked the respondents to indicate the prior use of the selected meeting mode. Furthermore, the subject of hybrid meetings emerged from the analysis of Study 1. A hybrid meeting is a meeting in which one or more attendees participate through a meeting mode with lower communication capabilities (Chidambaram and Jones, 1993). For example, the organizer can set up a video-conferencing, telepresence, or face-to-face meeting

and one or more participants may attend using audio only. To explore the effectiveness of hybrid meeting modes, the questionnaire in Study 2 also asked the respondents to indicate whether the meeting was a hybrid meeting (see Appendix D). This analysis is presented as part of Research Question 1, in Chapter 5 (see section 3 on p. 79).

In both studies, the invitation e-mails indicated endorsement by top management of the company (Markus, 1994), and the respondents were offered a summary of the research study results as an incentive to participate. Also, the respondents were assured that the results would be reported in the aggregate only and without any attribution. To reduce the influence of socially desirable responses, respondents were ensured anonymity (Podsakoff et al., 2003). Furthermore, respondents were requested to refer to a specific recently organized meeting, to minimize recall decay bias (Hufnagel and Conca, 1994). This approach is consistent with the study of Trevino et al. (2000), who asked respondents to think about the last time they used a specific medium for a communication task, and with the study of Leach et al. (2009), who asked respondents to refer to the last business meeting they attended. Therefore, the data provide “a realistic context and point of reference” (Trevino et al., 2000, p. 169).

Data was obtained from 420 respondents in Study 1, and from 406 respondents in Study 2. However, respectively 28 and 61 responses were deleted because of missing values or suspicious repetition. Table 4.5 shows the distribution of usable responses across the business meeting modes for Study 1 and Study 2.

**Table 4.5. Distribution of Respondents across the Business Meeting Modes
(Study 1 & Study 2)**

	Study 1	Study 2
Audio-conferencing	171	90
Video-conferencing	122	75
Telepresence	56	71
Face-to-face	43	109
Total	392	345

Since data was collected through two studies at two different companies, the concern for common method bias is moderate. However, in each study, the data on the objectives relevant to the meeting and the perceived effectiveness of the meeting mode in achieving the objectives relevant to the meeting were obtained from a single questionnaire. To further help rule out common method bias, several measures were taken. First, the list of meeting objectives was presented in a randomized order for each respondent, to remove a potential

order effect. Second, for a subset of 154 meetings in Study 1, the meeting mode selected by the respondent was validated against, and found to be consistent with, the meeting mode set for each meeting in the online calendaring and meeting scheduling system. Third, the responses of 139 meeting attendees (i.e., participants who were not organizers of the meeting) were obtained for 86 meetings for which organizer input was also obtained. For each of the objectives that were indicated by both organizer and attendee as relevant for the meeting, paired sample T-tests revealed no significant differences in the perception of the effectiveness, as shown in Table 4.6⁶. Thus, common method bias was not a significant issue in this study.

Table 4.6. Comparison of Organizer and Attendee Scores for Meeting Mode Effectiveness (Study 1)

Business Meeting Objectives	Organizer	Attendee	T-test Statistic	p-value
Exchange/share different opinions or views of a topic or issue	4.16	4.31	-1.29	0.200
Make a decision	4.13	4.13	0.00	1.000
Find a solution to a problem that has arisen	4.10	4.15	-0.26	0.793
Generate ideas on products, projects or initiatives	3.93	4.16	-1.47	0.146
Generate buy-in or consensus on an idea	4.09	4.23	-1.07	0.289
Resolve conflicts and disagreements within a group	4.17	4.00	0.804	0.438
Build trust and relationships with one or more individuals	4.27	4.23	0.36	0.717
Maintain relationships with one or more other people and stay in touch	4.34	4.25	0.85	0.400
Routine exchange of information	4.19	4.11	0.41	0.681
Non-routine exchange of information	4.39	4.10	1.52	0.135
Communicate positive or negative feelings or emotions on a topic or issue	4.11	4.29	-1.29	0.205
Show personal concern about or interest in a particular issue or situation	4.28	4.23	0.28	0.781
Give or receive feedback	4.22	4.37	-1.07	0.289
Assemble a team and/or motivate teamwork on a project	4.14	4.18	-0.30	0.767
Clarify a concept, issue or idea	4.31	4.37	-0.66	0.511
Exchange confidential, private or sensitive information	4.22	4.26	-0.15	0.879

⁶ This analysis is based on the aggregate averages, across the four meeting modes, because of the limited number of observations for some of the objectives. Also, three objectives were left out of this analysis, because of the limited number of responses pertaining to them.

2. RESEARCH QUESTION 2

This section describes the research design that was used to address Research Question 2, on the influence of different capabilities of business meeting modes on meeting mode effectiveness. The research design again consisted of two phases. The first phase involved the development of a list of different capabilities of business meeting modes that was used as a basis for field data collection in the second phase.

2.1 Phase 1: List of business meeting mode capabilities

Since prior work on business meetings has not systematically considered different business meeting modes and their capabilities, the literature on organizational communication was reviewed. Based on this review (see Chapter 2, section 2.1 on p. 20), a list of communication media capabilities⁷ was compiled, as shown in Table 4.7.

This table contains capabilities identified in the literature on mediated organizational communication: synchronous interaction, hearing each other's voices, visual capabilities, and experiencing co-location. In addition, it includes a set of capabilities that are particularly relevant to synchronous group interactions. These capabilities include "Have side conversations" (Buxton, 1991; Olson and Olson, 2000), "Use shared computer screens and/or work spaces" (Buxton, 1991; Daft et al., 1987), and "Do side-tasks that others are unaware of" (Reinsch et al., 2008; Watson-Manheim and Bélanger, 2007) (see capabilities 9-11 in Table 4.7). In addition, capabilities that are typically associated with face-to-face interaction were also identified (see capabilities 12-14 in Table 4.7), including "Examine physical objects" (Sellen, 1995), "Use ancillary resources" (Olson and Olson, 2000), and "Have ancillary interaction" (Fish et al., 1992; Hinds and Mortensen, 2005).

⁷ It is of interest to note that different terms have been used in prior research to refer to the capabilities in this list, including capacities, criteria, characteristics, features, functionalities, and dimensions.

Table 4.7. Capabilities Identified in the Literature

	Capability	References
1	Synchronicity	(Dennis and Kinney, 1998; Te'eni, 2001; Zack, 1993)
2	Hear attendees' voices (speech and vocal tone)	(Daft et al., 1987; Dennis et al., 2008; Kock, 2004; Short et al., 1976)
3	Observe appearance (posture, clothing, etc.) of attendees	(Daft et al., 1987; Short et al., 1976)
4	See attendees' body language and gestures	(Daft et al., 1987; Kock, 2004; Short et al., 1976)
5	Have eye contact with other attendees	(Sellen, 1995)
6	Discern attendees' facial expressions	(Kock, 2004; Short et al., 1976)
7	Observe what attendees are looking at	(Short et al., 1976; Vertegaal, 1999)
8	Experience co-location (the sense of being in the same physical location)	(Kock, 2004; Olson and Olson, 2000)
9	Have side conversations with one or more attendees	(Buxton, 1991; Olson and Olson, 2000)
10	Use shared computer screens and/or work spaces	(Buxton, 1991; Daft et al., 1987)
11	Do side-tasks that other attendees are unaware of	(Reinsch et al., 2008; Watson-Manheim and Bélanger, 2007)
12	Examine and/or manipulate specific physical objects (e.g. prototypes or samples)	(Sellen, 1995)
13	Use ancillary resources such as a flip-chart	(Olson and Olson, 2000)
14	Have ancillary interaction before or after the formal meeting	(Fish et al., 1992; Hinds and Mortensen, 2005)

This list was also checked with practitioners for applicability in a business meeting context (Rosemann and Vessey, 2008), using a convenience sample (Ferber, 1977). In particular, a set of other managers at NetworkingCo was contacted through e-mail or telephone and solicited to evaluate the list for relevance. Again, each participant was required to regularly organize business meetings, across the different meeting modes. In total, 15 upper and middle level managers agreed to an in-depth interview. Each interview was conducted in a separate session lasting about half an hour and started with a series of questions to determine the interviewee's level of familiarity and experience with each meeting mode. These were followed by questions to determine the importance of different communication capabilities in their meetings. After the interviews were completed, the list of capabilities compiled from the literature (see Table 4.7), was shared with the interviewees via e-mail, and they were asked to offer feedback on the adequacy and completeness of this list in the context of their business meetings.

The list of capabilities was considered to be adequate, and no additional capabilities emerged. However, one capability (synchronicity) was considered to be redundant, since

business meetings are confined to synchronous interaction. The resulting list, presented in Table 4.8, consists of 13 capabilities of business meeting modes.

Table 4.8. Business Meeting Mode Capabilities after Relevance Check

Hear attendees' voices (speech and vocal tone)
Observe appearance (posture, clothing, etc.) of attendees
See attendees' body language and gestures
Discern attendees' facial expressions
Observe what attendees are looking at
Have eye contact with other attendees
Experience co-location (the sense of being in the same physical location)
Have side conversations with one or more attendees
Use shared computer screens and/or work spaces
Do side-tasks that other attendees are unaware of
Examine and/or manipulate specific physical objects (e.g. prototypes or samples)
Use ancillary resources such as a flip-chart
Have ancillary interaction before or after the formal meeting

The list of 13 capabilities of business meeting modes (see Table 4.8) was also presented to a group of eight experts at EngineeringCo, and assessed in terms of its completeness for business meetings at the company. No additional meeting mode capabilities emerged, and hence the list was found to be adequate for field data collection with a broader set of managers at EngineeringCo.

2.2 Phase 2: Field data collection

In the second phase, two field studies were conducted to address Research Question 2. The first study, referred to as Study 3, was conducted at NetworkingCo, while the other study, referred to as Study 4, was conducted at EngineeringCo.

In Study 3, individually addressed invitation e-mails with personal salutations were sent to 1,245 members of an online community interested in e-collaboration at NetworkingCo, in September 2014. In this invitation e-mail, the community members were invited to complete a brief online questionnaire (see Appendix E). In this questionnaire, the respondents were requested to indicate the meeting mode that was selected for the specific meeting from a list (audio-conferencing, video-conferencing, telepresence, or face-to-face). In Study 4, mutually exclusive lists were compiled of employees that recently organized an internal business meeting using one of the four meeting modes (audio-conferencing, video-conferencing, telepresence, or face-to-face). In November 2014, e-mail invitations were sent

to 9,938 employees, requesting them to refer to a meeting they organized recently, using a specific meeting mode, and to complete an online questionnaire (see Appendix F).

In both questionnaires, the list of 19 business meeting objectives (see Table 4.3) was presented to the respondents, and they were asked to identify the *key* objectives for a specific meeting (see Appendices E and F). Furthermore, the list of 13 business meeting mode capabilities, developed in Phase 1 (see Table 4.8), was presented, and respondents were asked to rate the importance of each of these capabilities for achieving the key objectives of the meeting, on a scale of 1: ‘Not at all important’ to 5: ‘Very important’ (Webster and Trevino, 1995).

In both studies, the invitation e-mails indicated top management endorsement and the respondents were offered a summary of the study results. In addition, several measures were taken to rule out biases. To reduce the influence of socially desirable responses, respondents were ensured anonymity (Podsakoff et al., 2003) and to minimize recall decay bias, respondents were requested to refer to a specific recently organized meeting (Hufnagel and Conca, 1994). Also, while the concern for common method bias is moderate, since data was collected through two studies at two different companies, the data on the objectives key to the meeting and the perceived importance of the meeting mode capabilities in achieving the objectives key to the meeting, were each time obtained from a single questionnaire. To remove a potential order effect, the lists with objectives and capabilities were presented in a randomized order for each respondent.

Data was obtained from 403 respondents in Study 3, and from 970 respondents in Study 4. However, respectively 44 and 45 responses were deleted because of missing values or suspicious repetition. Table 4.9 shows the distribution of usable responses across the business meeting modes for Study 3 and Study 4.

**Table 4.9. Distribution of Respondents across the Business Meeting Modes
(Study 3 & Study 4)**

	Study 3	Study 4
Audio-conferencing	101	277
Video-conferencing	191	235
Telepresence	30	137
Face-to-face	37	276
Total	359	925

3. RESEARCH QUESTION 3

To address Research Question 3, which concerns the influence of the number of meeting participants and of the meeting duration on the effectiveness of different meeting modes for achieving business meeting objectives, additional data was collected in Study 1, 2, and 4. In particular, in Study 1, data was collected on the number of meeting participants and the scheduled duration of the meeting from the online calendaring and meeting scheduling system, which was made available for the study, for 154 of the 392 meetings. In Study 2 and 4, the questionnaire additionally asked the respondents to provide information on the number of meeting participants and on the meeting duration (see Appendices D and F). The distribution of respondents across the modes for the subset of 154 meeting in Study 1 is shown in Table 4.10, the distribution of respondents across the modes in Study 3 and Study 4 is shown in Table 4.9.

**Table 4.10. Distribution of Respondents across the Business Meeting Modes
(Subset Study 1)**

	Subset Study 1
Audio-conferencing	59
Video-conferencing	34
Telepresence	30
Face-to-face	32
Total	154

As to the concern for common method bias, this is lowered as three different studies were conducted at three different companies. While in study 1, the data on the number of meeting participants and on the meeting duration were obtained using a different method (from the online calendaring and meeting scheduling system), this data was obtained from the same questionnaire in which the respondent evaluated the meeting mode effectiveness (in Study 2) or the importance of meeting mode capabilities (in Study 4). The measures taken to rule out biases are described above, for each study.

THE EFFECTIVENESS OF BUSINESS MEETING MODES

CHAPTER V: THE EFFECTIVENESS OF BUSINESS MEETING MODES

In this chapter, the first research question is addressed: *What is the comparative effectiveness of different business meeting modes?* To address this research question, two field studies were conducted, referred to as Study 1 and Study 2 in Chapter 4 (see p. 54). In the first section of this chapter, the data in both studies is analyzed in terms of the frequencies of the 19 business meeting objectives across the four meeting modes (audio-conferencing (AC), video-conferencing (VC), telepresence (TP), and face-to-face (FTF)). In the second section, the effectiveness of the meeting modes, with respect to achieving the 19 business meeting objectives, is assessed for both studies. In the third section, the influence of the hybrid nature of the meeting is analyzed. In the final section of this chapter, the findings are discussed.

4. ANALYSIS OF FREQUENCIES OF OBJECTIVES

The data collected in Study 1 and 2 is analyzed in terms of the frequencies of meeting objectives, to gain insight into their relevance. In particular, the average frequency is calculated on an overall basis⁸, as well as for each of the meeting modes separately. For each meeting objective, an ANOVA indicates whether the frequency differs significantly across the meeting modes. In order to statistically account for multiple testing when conducting the ANOVA tests, the critical p-value is divided by the number of tests. Given the conservative nature of this procedure, the confidence coefficient is set at 90% (Neter et al., 1996). When the ANOVA tests indicate significant differences across the meeting modes for an objective, post-hoc tests are used to identify the pairs of meeting modes for which the frequencies differ significantly⁹. Note that this is an exploratory analysis, specific to the data sets, which is not intended to represent the overall distribution of the frequencies of objectives, across all meetings at both companies. The findings are presented for Study 1 and Study 2 in turn.

⁸ To rule out the influence of the differences in sample size across the meeting modes, the overall average is calculated using equal weights for each mode (1/4).

⁹ Bonferroni post-hoc tests are used when equal variances can be assumed and Tamhane's T2 post-hoc tests are used when equal variances cannot be assumed; a critical p-value of 0.10 is used.

1.1 Analysis of Study 1

The overall frequency of relevance of business meeting objectives in Study 1, as indicated by 392 business meeting organizers, is shown in Table 5.1 in decreasing order. In general, 15 out of the 19 objectives are indicated as relevant for 50% or more of the meetings. The two most frequently cited business meeting objectives across the modes are *Clarify a concept, issue or idea* and *Exchange/share different opinions or views* (81% and 76% of meetings respectively). Conversely, four objectives are indicated as being relevant in less than 50% of the meetings: *Resolve conflicts and disagreements* (41%), *Give or receive orders* (40%), *Assert and/or reinforce your authority, status, position* (39%), and *Negotiate or bargain on a deal or contract* (27%).

Table 5.1. Frequency of Relevance of Business Meeting Objectives (Study 1)

Business Meeting Objectives	% Relevance	AC	VC	TP	FTF
Clarify a concept, issue or idea	81%	82%	84%	79%	77%
Exchange/share different opinions or views of a topic or issue	76%	81%	82%	79%	60%
Maintain relationships with one or more other people and stay in touch	74%	69%	80%	84%	63%
Build trust and relationships with one or more individuals	74%	68%	83%	86%	58%
Generate buy-in or consensus on an idea	71%	68%	77%	75%	63%
Give or receive feedback	71%	71%	73%	73%	65%
Generate ideas on products, projects or initiatives	68%	67%	75%	70%	60%
Make a decision	66%	73%	75%	61%	56%
Routine exchange of information	64%	72%	74%	57%	53%
Show personal concern about or interest in a particular issue or situation	62%	54%	71%	68%	56%
Find a solution to a problem that has arisen	62%	72%	70%	48%	58%
Non-routine exchange of information	61%	62%	70%	70%	42%
Assemble a team and/or motivate teamwork on a project	58%	58%	62%	68%	42%
Communicate positive or negative feelings or emotions on a topic or issue	56%	57%	66%	63%	37%
Exchange confidential, private or sensitive information	50%	50%	59%	48%	44%
Resolve conflicts and disagreements within a group	41%	44%	48%	38%	35%
Give or receive orders	40%	50%	45%	30%	33%
Assert and/or reinforce your authority, status, position to your team or others	39%	37%	46%	46%	26%
Negotiate or bargain on a deal or contract	27%	30%	33%	23%	23%

Table 5.1 also displays the frequencies of the relevance of the objectives for each of the four meeting modes. The results of 19 ANOVAs, comparing the frequencies across the meeting modes, are shown in Table 5.2. The table shows that for 2 of the 19 objectives, the differences are significant at the 0.005 ($= 0.10/19$) significance level: *Build trust and relationships* and *Find a solution to a problem that has arisen*. Post-hoc tests reveal that the frequency of *Build trust and relationships* is significantly different between video-conferencing and both audio-conferencing and face-to-face, and between telepresence and both audio-conferencing and face-to-face. In addition, the frequency of the objective *Find a solution to a problem that has arisen* is found to be significantly different between telepresence and both audio- and video-conferencing. Therefore, the data suggests that video-conferencing and telepresence are used relatively more for *Build trust and relationships*, and that telepresence is used relatively less for *Find a solution to a problem that has arisen*.

**Table 5.2. ANOVA of Frequencies of Objectives across Business Meeting Modes
(Study 1)**

Business Meeting Objectives	df	F	p-value
Clarify a concept, issue or idea	(3, 388)	0.44	0.725
Exchange/share different opinions or views of a topic or issue	(3, 388)	3.27	0.021
Maintain relationships with one or more other people and stay in touch	(3, 388)	3.53	0.015
Build trust and relationships with one or more individuals	(3, 388)	6.18	0.000*
Generate buy-in or consensus on an idea	(3, 388)	1.53	0.207
Give or receive feedback	(3, 388)	0.35	0.787
Generate ideas on products, projects or initiatives	(3, 388)	1.42	0.236
Make a decision	(3, 388)	3.01	0.030
Routine exchange of information	(3, 388)	3.50	0.016
Show personal concern about or interest in a particular issue or situation	(3, 388)	3.45	0.017
Find a solution to a problem that has arisen	(3, 388)	4.40	0.005*
Non-routine exchange of information	(3, 388)	4.21	0.006
Assemble a team and/or motivate teamwork on a project	(3, 388)	2.58	0.053
Communicate positive or negative feelings or emotions on a topic or issue	(3, 388)	3.77	0.011
Exchange confidential, private or sensitive information	(3, 388)	1.33	0.265
Resolve conflicts and disagreements within a group	(3, 388)	1.12	0.343
Give or receive orders	(3, 388)	2.98	0.031
Assert and/or reinforce your authority, status, position to your team or others	(3, 388)	2.41	0.066
Negotiate or bargain on a deal or contract	(3, 388)	0.86	0.464

* $p < 0.005$

1.2 Analysis of Study 2

The overall frequency of relevance of business meeting objectives in Study 2, as indicated by 345 business meeting organizers, is shown in Table 5.3 in decreasing order. Overall, all of the objectives are indicated as relevant for more than 46% of the meetings. The two most frequently cited business meeting objectives are *Exchange/share different opinions or views* and *Clarify a concept, issue or idea* (88% and 87% of meetings respectively). Conversely, *Assert and/or reinforce your authority, status, position* (56%), and *Negotiate or bargain on a deal or contract* (46%) are least frequently cited.

Table 5.3. Frequency of Relevance of Business Meeting Objectives (Study 2)

Business Meeting Objectives	% Relevance	AC	VC	TP	FTF
Exchange/share different opinions or views of a topic or issue	88%	93%	85%	89%	87%
Clarify a concept, issue or idea	87%	91%	90%	77%	88%
Make a decision	84%	89%	79%	79%	89%
Give or receive feedback	83%	91%	81%	74%	87%
Find a solution to a problem that has arisen	80%	89%	79%	64%	89%
Communicate positive or negative feelings or emotions on a topic or issue	78%	83%	81%	74%	74%
Maintain relationships with one or more other people and stay in touch	78%	82%	81%	71%	76%
Routine exchange of information	77%	87%	81%	70%	71%
Build trust and relationships with one or more individuals	77%	78%	79%	76%	75%
Generate buy-in or consensus on an idea	77%	80%	78%	74%	74%
Show personal concern about or interest in a particular issue or situation	76%	76%	72%	76%	79%
Non-routine exchange of information	75%	75%	81%	69%	76%
Generate ideas on products, projects or initiatives	72%	82%	82%	51%	74%
Assemble a team and/or motivate teamwork on a project	66%	73%	69%	54%	67%
Give or receive orders	64%	78%	63%	43%	72%
Resolve conflicts and disagreements within a group	63%	72%	67%	49%	66%
Exchange confidential, private or sensitive information	63%	63%	58%	64%	67%
Assert and/or reinforce your authority, status, position to your team or others	56%	61%	57%	46%	62%
Negotiate or bargain on a deal or contract	46%	49%	54%	34%	46%

Table 5.3 also shows the frequencies across the meeting modes, and Table 5.4 shows the ANOVA results, which reveal significant differences across the modes for three objectives at the 0.005 (= 0.10/19) significance level: *Find a solution to a problem*, *Generate ideas*, and *Give or receive orders*. Post-hoc tests reveal that the frequency of each of these objectives in telepresence meetings is different (lower) than the frequencies in the other meeting modes.

Table 5.4. ANOVA of Frequencies of Objectives across Business Meeting Modes (Study 2)

Business Meeting Objectives	df	F	p-value
Exchange/share different opinions or views of a topic or issue	(3, 341)	1.02	0.384
Clarify a concept, issue or idea	(3, 341)	3.34	0.020
Make a decision	(3, 341)	2.32	0.076
Give or receive feedback	(3, 341)	2.85	0.038
Find a solution to a problem that has arisen	(3, 341)	7.71	0.000*
Communicate positive or negative feelings or emotions on a topic or issue	(3, 341)	0.97	0.407
Maintain relationships with one or more other people and stay in touch	(3, 341)	1.02	0.385
Routine exchange of information	(3, 341)	2.91	0.034
Build trust and relationships with one or more individuals	(3, 341)	0.20	0.895
Generate buy-in or consensus on an idea	(3, 341)	0.23	0.874
Show personal concern about or interest in a particular issue or situation	(3, 341)	0.49	0.692
Non-routine exchange of information	(3, 341)	1.04	0.373
Generate ideas on products, projects or initiatives	(3, 341)	9.24	0.000*
Assemble a team and/or motivate teamwork on a project	(3, 341)	2.68	0.047
Give or receive orders	(3, 341)	9.35	0.000*
Resolve conflicts and disagreements within a group	(3, 341)	3.88	0.009
Exchange confidential, private or sensitive information	(3, 341)	0.23	0.874
Assert and/or reinforce your authority, status, position to your team or others	(3, 341)	2.04	0.110
Negotiate or bargain on a deal or contract	(3, 341)	2.55	0.060

* $p < 0.005$

These findings provide insight into the overall relevance of business meeting objectives, as well as into their relevance across meeting modes, and will be discussed further in the discussion section of this chapter. In the next section, the effectiveness scores of the four meeting modes, with respect to achieving the 19 business meeting objectives, are analyzed.

2. ANALYSIS OF BUSINESS MEETING MODE EFFECTIVENESS

For each study, the mean effectiveness scores (and standard deviations) of the meeting modes, for the 19 meeting objectives, are calculated. In addition, ANOVA tests are used to assess whether there are significant differences in the effectiveness scores across the meeting modes. Finally, when ANOVA tests indicate significant differences for an objective, post-hoc tests are used to identify which pairs of effectiveness scores differ significantly¹⁰. In order to statistically account for multiple testing when conducting the ANOVA tests, the critical p-value is divided by the number of tests. Given the conservative nature of this procedure, the confidence coefficient is set at 90% (Neter et al., 1996). Note that the analysis is specific to the studies, and is not intended to represent the overall effectiveness of meeting modes, across all meetings at both companies.

2.1 Analysis of Study 1

Table 5.5 shows the mean effectiveness scores (on a scale of 1-5) of the four meeting modes for each of the 19 meeting objectives, based on the responses of 392 business meeting organizers in Study 1. In general, meeting modes with higher capabilities seem to be associated with higher effectiveness scores. Also, the mean effectiveness scores across all meeting modes are between 3.5 and 4.65 on a scale of 1 to 5, suggesting that meeting organizers were familiar enough with the meeting modes to avoid ineffective meeting mode choices.

¹⁰ Bonferroni post-hoc tests are used when equal variances can be assumed and Tamhane's T2 post-hoc tests are used when equal variances can not be assumed; a critical p-value of 0.10 is used.

Table 5.5. Mean Business Meeting Mode Effectiveness Scores (and Standard Deviations)
(Study 1)

Business Meeting Objectives	Mean Business Meeting Mode Effectiveness Scores (and standard deviation)			
	AC	VC	TP	FTF
Clarify a concept, issue or idea	4.11 (0.81)	4.18 (0.67)	4.59 (0.62)	4.39 (0.97)
Exchange/share opinions or views on a topic or issue	3.97 (0.85)	4.27 (0.78)	4.34 (0.78)	4.54 (0.65)
Maintain relationships with one or more other people and stay in touch	4.01 (0.91)	4.24 (0.81)	4.53 (0.65)	4.37 (0.84)
Build trust and relationships with one or more individuals	3.58 (1.06)	4.03 (0.81)	4.63 (0.61)	4.52 (0.82)
Generate buy-in or consensus on an idea	3.85 (0.96)	4.05 (0.79)	4.31 (0.78)	4.44 (0.64)
Give or receive feedback	4.00 (0.88)	4.12 (0.74)	4.59 (0.63)	4.29 (0.81)
Generate ideas on products, projects or initiatives	3.76 (0.94)	4.10 (0.79)	4.05 (0.86)	4.35 (0.80)
Make a decision	3.96 (0.87)	4.01 (0.81)	4.21 (0.98)	4.50 (0.78)
Routine exchange of information	4.25 (0.74)	4.21 (0.79)	4.19 (0.90)	3.96 (1.15)
Show personal concern about or interest in a particular issue or situation	3.74 (0.95)	4.02 (0.85)	4.34 (0.88)	4.25 (0.74)
Find a solution to a problem that has arisen	3.92 (0.87)	4.12 (0.76)	4.00 (0.92)	4.48 (0.71)
Non-routine exchange of information	3.88 (1.04)	4.02 (0.72)	4.33 (0.70)	4.17 (1.15)
Assemble a team and/or motivate teamwork on a project	3.68 (1.04)	4.08 (0.88)	4.18 (0.87)	4.33 (0.91)
Communicate positive or negative feelings or emotions on a topic or issue	3.58 (0.96)	3.90 (0.81)	4.43 (0.70)	4.63 (0.62)
Exchange confidential, private or sensitive information	3.63 (1.04)	4.04 (0.72)	4.26 (1.10)	4.37 (0.83)
Resolve conflicts and disagreements within a group	3.33 (1.15)	3.88 (0.85)	4.24 (0.89)	4.33 (0.98)
Give or receive orders	4.00 (0.90)	4.12 (0.93)	4.59 (0.87)	4.29 (0.73)
Assert and/or reinforce your authority, status, position to your team or others	3.57 (0.89)	3.50 (0.97)	3.88 (0.95)	4.00 (1.18)
Negotiate or bargain on a deal or contract	3.25 (1.15)	3.93 (0.83)	4.31 (0.95)	3.70 (0.95)

The three objectives at the bottom of Table 5.5 (*Give or receive orders; Assert and/or reinforce your authority, status, position; and Negotiate or bargain on a deal or contract*) are not considered for further analysis, because of the limited number of observations in some meeting modes ($N < 15$). Table 5.6 shows the results of the ANOVA tests that assess the

significance of the differences in effectiveness scores across the meeting modes, for the 16 remaining objectives. The effectiveness scores are evaluated to differ significantly if the p-values of the ANOVA tests are below 0.006 (= 0.10/16).

Table 5.6. ANOVA of Business Meeting Mode Effectiveness Scores (Study 1)

Business Meeting Objectives	df	F	p-value
Clarify a concept, issue or idea	(3, 318)	5.18	0.002*
Exchange/share different opinions or views of a topic or issue	(3, 307)	5.89	0.001*
Maintain relationships with one or more other people and stay in touch	(3, 289)	5.02	0.002*
Build trust and relationships with one or more individuals	(3, 289)	19.29	0.000*
Generate buy-in or consensus on an idea	(3, 279)	5.26	0.002*
Give or receive feedback	(3, 279)	5.82	0.001*
Generate ideas on products, projects or initiatives	(3, 270)	4.58	0.004*
Make a decision	(3, 274)	3.10	0.027
Routine exchange of information	(3, 267)	0.85	0.466
Show personal concern about or interest in a particular issue or situation	(3, 241)	5.16	0.002*
Find a solution to a problem that has arisen	(3, 260)	3.49	0.016
Non-routine exchange of information	(3, 248)	2.62	0.051
Assemble a team and/or motivate teamwork on a project	(3, 230)	4.94	0.002*
Communicate positive or negative feelings or emotions on a topic or issue	(3, 227)	13.10	0.000*
Exchange confidential, private or sensitive information	(3, 203)	5.92	0.001*
Resolve conflicts and disagreements within a group	(3, 170)	8.00	0.000*

* $p < 0.006$

The ANOVA results reveal there are significant differences across the meeting modes for 12 out of the 16 objectives. While the test is clearly insignificant for *Routine exchange of information* ($p = 0.466$), it is marginally insignificant for *Make a decision* ($p = 0.027$), *Find a solution to a problem* ($p = 0.016$), and *Non-routine exchange of information* ($p = 0.051$).

The results of the post-hoc pairwise comparisons are shown in Table 5.7. In particular, the table shows the pairs of meeting modes for which the post-hoc test indicates there is a significant difference in the mean effectiveness scores.

**Table 5.7. Post-hoc Pairwise Comparisons of Meeting Mode Effectiveness Scores
(Study 1)**

Business Meeting Objectives	Significantly differing pairs
Clarify a concept, issue or idea	(AC, TP); (VC, TP)
Exchange/share different opinions or views of a topic or issue	(AC, VC); (AC, TP); (AC, FTF)
Maintain relationships with one or more other people and stay in touch	(AC, TP)
Build trust and relationships with one or more individuals	(AC, VC); (AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Generate buy-in or consensus on an idea	(AC, TP); (AC, FTF)
Give or receive feedback	(AC, TP); (AC, FTF); (VC, TP)
Generate ideas on products, projects or initiatives	(AC, VC); (AC, FTF)
Show personal concern about or interest in a particular issue or situation	(AC, TP); (AC, FTF)
Assemble a team and/or motivate teamwork on a project	(AC, VC); (AC, TP); (AC, FTF)
Communicate positive or negative feelings or emotions on a topic or issue	(AC, VC); (AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Exchange confidential, private or sensitive information	(AC, VC); (AC, TP); (AC, FTF)
Resolve conflicts and disagreements within a group	(AC, VC); (AC, TP); (AC, FTF)

For all of the significantly differing pairs of meeting modes (shown in Table 5.7), the mean effectiveness score of the higher capability meeting mode is higher than the mean effectiveness score of the lower capability meeting mode (see Table 5.5). Based on this finding, patterns of meeting mode effectiveness orderings can be delineated, which apply to categories of business meeting objectives, as shown in Table 5.8. In particular, for four objectives in a first category (AC, VC, TP, FTF), no significant differences are found across the four meeting modes. For four other objectives in a second category (AC < (VC, TP, FTF)), audio-conferencing is significantly less effective than the three other meeting modes, and these three meeting modes do not differ in effectiveness mutually. Finally, for two other objectives in a third category (AC < VC < (TP, FTF)), audio-conferencing is less effective than video-conferencing, in addition, video-conferencing is less effective than both telepresence and face-to-face, and the latter two modes do not differ in effectiveness mutually.

Table 5.8. Categories of Business Meeting Objectives (Study 1)

Category	Description	Relationship between meeting modes	Objectives
1	No significant differences in effectiveness	(AC, VC, TP, FTF)	Make a decision
			Routine exchange of information
			Find a solution to a problem that has arisen
			Non-routine exchange of information
2	VC, TP, and FTF are equally effective, and more effective than AC	AC < (VC, TP, FTF)	Exchange/share different opinions or views
			Assemble a team and/or motivate teamwork
			Exchange confidential, private or sensitive information
			Resolve conflicts and disagreements
3	Effectiveness increases gradually with capabilities, however TP and FTF are similar	AC < VC < (TP, FTF)	Build trust and relationships
			Communicate positive or negative feelings or emotions

2.2 Analysis of Study 2

Table 5.9 shows the mean effectiveness scores for each of the 19 business meeting objectives, based on the responses of 345 meeting organizers in Study 2. In general, meeting modes with higher capabilities seem to be associated with higher effectiveness scores. Also, the mean effectiveness scores across all meeting modes range from 1.91 to 4.32 on a scale of 1 to 5, which seems to suggest that meeting organizers did not always make effective meeting mode choices.

Table 5.9. Mean Business Meeting Mode Effectiveness Scores (and Standard Deviations)
(Study 2)

Business Meeting Objectives	Mean Business Meeting Mode Effectiveness Scores (and standard deviation)			
	AC	VC	TP	FTF
Exchange/share different opinions or views of a topic or issue	3.27 (1.02)	3.39 (0.90)	4.19 (0.67)	4.01 (0.96)
Clarify a concept, issue or idea	3.01 (1.02)	3.32 (0.97)	3.98 (0.86)	4.20 (0.83)
Make a decision	3.29 (0.93)	3.25 (0.77)	3.91 (1.09)	3.87 (1.01)
Give or receive feedback	3.40 (1.04)	3.33 (1.09)	3.96 (0.88)	4.13 (0.98)
Find a solution to a problem that has arisen	3.29 (1.00)	3.23 (0.95)	3.67 (0.83)	4.13 (0.85)
Communicate positive or negative feelings or emotions on a topic or issue	2.44 (0.98)	2.67 (1.22)	3.83 (1.01)	4.22 (0.86)
Maintain relationships with one or more other people and stay in touch	3.34 (1.21)	3.56 (1.01)	3.90 (1.06)	4.12 (0.92)
Routine exchange of information	4.01 (0.90)	3.70 (1.07)	3.96 (0.98)	3.48 (1.24)
Build trust and relationships with one or more individuals	2.46 (0.97)	2.80 (1.10)	3.51 (1.19)	4.24 (0.85)
Generate buy-in or consensus on an idea	2.68 (0.94)	2.76 (0.95)	3.64 (1.00)	4.00 (1.03)
Show personal concern about or interest in a particular issue or situation	2.93 (1.16)	2.98 (0.93)	3.87 (0.95)	4.08 (0.94)
Non-routine exchange of information	3.22 (1.14)	3.21 (0.90)	3.88 (0.90)	3.88 (1.08)
Generate ideas on products, projects or initiatives	2.82 (1.04)	2.95 (1.02)	3.81 (0.95)	3.93 (0.93)
Assemble a team and/or motivate teamwork on a project	2.61 (0.96)	2.83 (1.19)	3.47 (1.18)	4.11 (1.03)
Give or receive orders	3.17 (0.93)	3.04 (1.05)	3.83 (1.02)	3.81 (1.03)
Resolve conflicts and disagreements within a group	2.14 (1.04)	2.35 (1.09)	3.41 (1.08)	4.18 (1.11)
Exchange confidential, private or sensitive information	1.91 (1.12)	2.24 (1.00)	3.67 (1.19)	4.32 (1.02)
Assert and/or reinforce your authority, status, position to your team or others	2.42 (0.88)	2.80 (0.98)	3.22 (1.10)	3.76 (1.08)
Negotiate or bargain on a deal or contract	1.95 (1.01)	2.12 (0.97)	3.08 (1.28)	3.92 (1.10)

To evaluate the significance of the differences in effectiveness across the four meeting modes, 19 ANOVA tests are used, one for each objective. The effectiveness scores are assessed to significantly differ if the p-values of the ANOVA tests are below 0.005 (= 0.10/19). The results of the ANOVA tests are shown in Table 5.10.

Table 5.10. ANOVA of Business Meeting Mode Effectiveness Scores (Study 2)

Business Meeting Objectives	df	F	p-value
Exchange/share different opinions or views of a topic or issue	(3, 301)	18.10	0.000*
Clarify a concept, issue or idea	(3, 296)	29.47	0.000*
Make a decision	(3, 288)	9.85	0.000*
Give or receive feedback	(3, 285)	12.00	0.000*
Find a solution to a problem that has arisen	(3, 277)	17.05	0.000*
Communicate positive or negative feelings or emotions on a topic or issue	(3, 267)	53.30	0.000*
Maintain relationships with one or more other people and stay in touch	(3, 266)	8.24	0.000*
Routine exchange of information	(3, 265)	3.93	0.009
Build trust and relationships with one or more individuals	(3, 263)	45.87	0.000*
Show personal concern about or interest in a particular issue or situation	(3, 262)	24.76	0.000*
Generate buy-in or consensus on an idea	(3, 261)	31.38	0.000*
Non-routine exchange of information	(3, 258)	9.09	0.000*
Generate ideas on products, projects or initiatives	(3, 250)	22.33	0.000*
Assemble a team and/or motivate teamwork on a project	(3, 227)	26.84	0.000*
Give or receive orders	(3, 224)	9.36	0.000*
Resolve conflicts and disagreements within a group	(3, 218)	50.08	0.000*
Exchange confidential, private or sensitive information	(3, 215)	67.12	0.000*
Assert and/or reinforce your authority, status, position to your team or others	(3, 195)	19.71	0.000*
Negotiate or bargain on a deal or contract	(3, 158)	34.30	0.000*

* $p < 0.005$

Table 5.10 shows that, for all but one objective (*Routine exchange of information*), significant differences are found across the meeting modes. For all these objectives, the test results are highly significant ($p < 0.00003$). The post-hoc tests reveal for which pairs of meeting modes the mean effectiveness scores differ significantly. In Table 5.11, significantly differing pairs of meeting modes are presented, for each meeting objective.

**Table 5.11. Post-hoc Pairwise Comparisons of Meeting Mode Effectiveness Scores
(Study 2)**

Business Meeting Objectives	Significantly differing pairs
Exchange/share different opinions or views	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Clarify a concept, issue or idea	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Make a decision	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Give or receive feedback	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Find a solution to a problem that has arisen	(AC, FTF); (VC, FTF); (TP, FTF)
Communicate positive or negative feelings or emotions	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Maintain relationships with one or more other people and stay in touch	(AC, TP); (AC, FTF); (VC, FTF)
Build trust and relationships with one or more individuals	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF); (TP, FTF)
Show personal concern about or interest in a particular issue or situation	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Generate buy-in or consensus on an idea	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Non-routine exchange of information	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Generate ideas on products, projects or initiatives	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Assemble a team and/or motivate teamwork on a project	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF); (TP, FTF)
Give or receive orders	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF)
Resolve conflicts and disagreements within a group	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF); (TP, FTF)
Exchange confidential, private or sensitive information	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF); (TP, FTF)
Assert and/or reinforce your authority, status,	(AC, TP); (AC, FTF); (VC, FTF)
Negotiate or bargain on a deal or contract	(AC, TP); (AC, FTF); (VC, TP); (VC, FTF); (TP, FTF)

For all of the significantly differing pairs of meeting modes (shown in Table 5.11), the score of the higher capability meeting mode is higher than the score of the lower capability meeting mode (see Table 5.9). Based on this finding, categories of objectives can be delineated, for which the same meeting mode effectiveness ordering apply (see Table 5.12). For a first category (AC, VC, TP, FTF), which contains only one objective, no differences in effectiveness are found. For a second category ((AC, VC) < (TP, FTF)), counting ten objectives, there are no significant differences in effectiveness between audio- and video-conferencing or between telepresence and face-to-face. However, the mean scores of both audio- and video-conferencing are significantly lower than the scores of both telepresence and face-to-face. For five other objectives in category 3 ((AC, VC) < TP < FTF), there is an additional significant difference between telepresence and face-to-face. In a final category ((AC, VC, TP) < FTF), containing one objective, all the technology-enabled meeting modes

are found to be significantly less effective than face-to-face, and do not differ in effectiveness mutually.

Table 5.12. Categories of Business Meeting Objectives (Study 2)

Category	Description	Relationship between meeting modes	Objectives
1	No significant differences in effectiveness	(AC, VC, TP, FTF)	Routine exchange of information
2	Effectiveness of TP is equally high as effectiveness of FTF. TP and FTF are more effective than AC and VC, which are similar in effectiveness	(AC, VC) < (TP, FTF)	Exchange/share different opinions or views of a topic or issue
			Clarify a concept, issue or idea
			Give or receive orders
			Give or receive feedback
			Communicate positive or negative feelings or emotions
			Show personal concern about or interest in a particular issue or situation
			Generate buy-in or consensus on an idea
			Non-routine exchange of information
			Generate ideas on products, projects or initiatives
3	TP and FTF are more effective than AC and VC, which are similar in effectiveness. Effectiveness of TP is lower than effectiveness of FTF	(AC, VC) < TP < FTF	Make a decision
			Build trust and relationships with one or more individuals
			Negotiate or bargain on a deal or contract
			Resolve conflicts and disagreements within a group
			Exchange confidential, private or sensitive information
4	FTF is more effective than technology-enabled meeting modes	(AC, VC, TP) < FTF	Assemble a team and/or motivate teamwork on a project
			Find a solution to a problem that has arisen

These findings are discussed further in the final section of this chapter. Since a single meeting can be attended by different participants using different meeting modes, the influence of hybrid meetings on meeting mode effectiveness, is analyzed next.

3. ANALYSIS OF THE EFFECTIVENESS OF HYBRID MEETING MODES

In Study 1, data was also collected from other attendees than the meeting organizer. From a comparison of the meeting mode selected by the organizer with the meeting mode used by the attendee(s), it became clear that some meetings involved a hybrid setting, in which one or more attendees participate through a lower capability meeting mode. Therefore, data was collected on the hybrid nature of meetings in Study 2 (see Chapter 4, section 1.2 on p. 54). In this section, the effectiveness of hybrid meeting modes is compared with the effectiveness of non-hybrid meeting modes. The distribution of hybrid and non-hybrid meetings in video-conferencing, telepresence and face-to-face meetings, is presented in Table 5.13.

Table 5.13. Number of Hybrid and Non-Hybrid meetings (Study 2)

Meeting mode used by organizer	Hybrid	Non-Hybrid	Total
VC	43	28	71
TP	33	37	70
FTF	21	76	97
Total	97	141	238

To identify significant differences between the effectiveness scores of hybrid and non-hybrid meeting modes, 19 T-tests are used, one for each of the business meeting objectives. The critical p-value is divided by the number of tests, in order to statistically account for multiple testing (Neter et al., 1996). Hence, the effectiveness scores are considered to be significantly different if the p-values are below 0.005 ($= 0.10/19$). In addition to the critical p-value, the 0.05 significance level is reported. Table 5.14¹¹ shows the mean effectiveness scores for hybrid and non-hybrid meetings, the T-test statistics of the effectiveness comparisons, and their significance level.

¹¹ This analysis is based on the aggregate averages, across the four meeting modes, because of the limited number of observations for some of the objectives.

Table 5.14. Meeting Mode Effectiveness in Hybrid and Non-Hybrid Meetings (Study 2)

Business Meeting Objectives	Hybrid	Non-Hybrid	T-test statistic	p-value
Exchange/share different opinions or views of a topic or issue	3.80	3.98	-1.39	0.167
Clarify a concept, issue or idea	3.65	4.05	-3.02	0.003**
Make a decision	3.73	3.74	-0.09	0.929
Give or receive feedback	3.67	3.95	-1.89	0.061
Find a solution to a problem that has arisen	3.69	3.82	-0.90	0.367
Communicate positive or negative feelings or emotions on a topic or issue	3.24	3.99	-4.30	0.000**
Maintain relationships with one or more other people and stay in touch	3.83	3.92	-0.59	0.557
Routine exchange of information	3.74	3.70	0.22	0.828
Build trust and relationships with one or more	3.29	3.82	-3.05	0.003**
Generate buy-in or consensus on an idea	3.30	3.75	-2.76	0.006*
Show personal concern about or interest in a particular issue or situation	3.54	3.87	-2.11	0.036*
Non-routine exchange of information	3.49	3.81	-2.08	0.039*
Generate ideas on products, projects or initiatives	3.25	3.78	-3.16	0.002**
Assemble a team and/or motivate teamwork on a	3.20	3.78	-2.89	0.004**
Give or receive orders	3.48	3.69	-1.14	0.255
Resolve conflicts and disagreements within a group	3.02	3.78	-3.55	0.001**
Exchange confidential, private or sensitive	3.26	3.83	-2.56	0.011*
Assert and/or reinforce your authority, status, position to your team or others	3.14	3.55	-2.10	0.037*
Negotiate or bargain on a deal or contract	2.69	3.44	-3.04	0.003**

* $p < 0.05$; ** $p < 0.005$

As Table 5.14 shows, significant differences are found between hybrid and non-hybrid meeting modes for seven objectives at the 0.005 significance level (*Clarify a concept, issue or idea, Communicate positive or negative feelings or emotions, Build trust and relationships with one or more individuals, Generate ideas on products, projects or initiatives, Assemble a team and/or motivate teamwork on a project, Resolve conflicts and disagreements within a group, Negotiate or bargain on a deal or contract*), and for five additional objectives at the 0.05 significance level (*Generate buy-in or consensus on an idea, Show personal concern about or interest in a particular issue or situation, Non-routine exchange of information, Exchange confidential, private or sensitive information, Assert and/or reinforce your authority, status, position*). For each of these twelve objectives, the hybrid meeting mode is found to be less effective than the non-hybrid meeting mode. This finding is discussed in the following section.

4. DISCUSSION

In this chapter, the first research question of this dissertation was addressed: *What is the comparative effectiveness of different business meeting modes?* The findings for the three analysis sections are discussed in turn.

4.1 Frequencies of Objectives

First, the frequencies of business meeting objectives were analyzed across meeting modes. This addresses a call for research “to determine if some purposes are simply not done or less common (or more common) among different meeting modes” (A. Allen et al., 2014, p. 808). While in general, limited significant differences in frequencies across modes were found, *Find a solution to a problem* was consistently found to be relatively less frequent in telepresence meetings. It is important to note that the cross-sectional design does not allow for the inference of causal relationships between meeting objectives and meeting mode use. Moreover, there is a lack of information on other factors that may influence meeting mode choice. These issues are discussed further in the final chapter of this dissertation.

Combining the exploratory findings on the frequencies of business meeting objectives across the modes with the findings on meeting mode effectiveness, provides a basis for developing usage norms for different modes in meetings. For example, in Study 1 *Build trust and relationships* was found to be relatively more frequently relevant in video-conferencing and telepresence meetings than in audio-conferencing and face-to-face meetings. In addition, this objective was classified in the third category in Table 5.8, for which audio-conferencing was found to be less effective than video-conferencing, which was in turn less effective than telepresence and face-to-face. Hence, meeting mode choice by meeting organizers in Study 1 could be considered appropriate as they used video-conferencing more than audio-conferencing for this objective, yet it seems they could benefit further from using telepresence (and face-to-face) even more for this objective.

In addition, in Study 2, telepresence was used relatively less frequently than all the other meeting modes for *Generate ideas* and *Give or receive orders* (see Tables 5.3 and 5.4), although it was significantly more effective than audio- and video-conferencing for these objectives (see category 2 in Table 5.12). Hence, meeting organizers in Study 2 could make a more effective meeting mode choice for these objective. Conversely, while telepresence was also used relatively less frequently for *Find a solution to a problem* in Study 2, its

effectiveness was found to be equal to that of audio- and video-conferencing for this objective (see category 4 in Table 5.12). In addition, face-to-face was more effective than telepresence for this objective, and was also used relatively more for this objective. Hence, meeting organizers seemed to make a cost-effective meeting mode choice for *Find a solution to a problem* in Study 2.

4.2 Business Meeting Mode Effectiveness

In line with prior organizational communication research, the effectiveness of a meeting mode was observed to increase with the capabilities it provides (Daft et al., 1987; Kock, 2004; Short et al., 1976). In particular, statistically significant differences in effectiveness were found for 12 objectives in Study 1 and for 18 objectives in Study 2, and the significant pairwise differences were such that higher capability modes were more effective than lower capability modes. These findings highlight the importance of considering the meeting objective when selecting a meeting mode (King and Xia, 1997; Rice, 1993; Te'eni, 2001). However, it is important to recognize that factors beyond meeting mode capabilities may influence meeting mode effectiveness. This issue is elaborated on in the final chapter of this dissertation.

An interesting observation is that the additional capabilities of meeting modes did not necessarily increase their effectiveness. Hence, the effectiveness relationships among meeting modes were not uniform across objectives. In particular, from the analysis, categories of business meeting objectives emerged, for which a similar ordering of meeting mode effectiveness applied.

In Study 1, a first category of objectives involved no differences in effectiveness across the meeting modes (AC, VC, TP, FTF). Hence, voice transmissions seemed to suffice for effectively achieving the four objectives in this category (*Routine exchange of information, Non-routine exchange of information, Make a decision, Find a solution to a problem*). For *Routine exchange of information*, this finding is consistent with media richness theory, which highlights that if there is a common frame of reference between communicators, additional capabilities do not further increase effectiveness (Daft et al., 1987). For the three other objectives, the lack of significant differences in meeting mode effectiveness is somewhat surprising, since these objectives may involve high interdependency and multiplicity of views (Te'eni, 2001). However, this lack of significant differences may be due to the relatively small sample sizes for some meeting modes. In particular, the difference tests were marginally insignificant, and the absolute differences in

effectiveness scores (on a scale of 1-5) among some pairs of modes were quite large (see Table 5.5, for instance: *Make a decision* (AC: 3.96; FTF: 4.50); *Find a solution to a problem* (AC: 3.92; FTF: 4.48); *Non-routine exchange of information* (AC: 3.88; TP: 4.33)).

In addition, in Study 1, a category of objectives was delineated for which audio-conferencing was less effective than all the other meeting modes ($AC < (VC, TP, FTF)$). For the objectives in this category, visual capabilities seemed to add to the effectiveness of the mode, yet the additional capabilities of telepresence and face-to-face, relative to video-conferencing did not further increase effectiveness. The objectives in this category (*Exchange/share different opinions or views of a topic or issue*, *Resolve conflicts and disagreements*, *Assemble a team and/or motivate teamwork on a project*, *Exchange confidential, private or sensitive information*) seem to have in common that they involve different attitudes and conflicting viewpoints among meeting participants. Furthermore, these objectives “allude to the nature of the social relationship between the communicators” (Markus, 1994, p. 519). For such objectives, prior research (Fish et al., 1992; Pye and Williams, 1977) found modes that enable visual capabilities to be more effective than modes transmitting audio only.

A third category was identified in Study 1, with a similar meeting mode effectiveness ordering, yet there was an additional significant difference in effectiveness, namely between video-conferencing and telepresence ($AC < VC < (TP, FTF)$). Hence, the additional capabilities supported by telepresence and face-to-face seemed to further increase meeting mode effectiveness for the two objective in this category: *Build trust and relationships* and *Communicate positive or negative feelings or emotions*. Both objectives refer to sharing emotions and attitudes, and they involve salience of the interpersonal relationship. In prior research, face-to-face was found to be more effective than technology-enabled interaction to achieve such objectives (King and Xia, 1997; Markus, 1994; Rice, 1993; Short et al., 1976).

Since face-to-face is usually considered to be the gold standard for emotion-laden communication, the lack of a difference in effectiveness between telepresence and face-to-face for these objectives, is an intriguing finding. Moreover, in Study 1 no significant difference in effectiveness was found between telepresence and face-to-face for any of the objectives. Thus, despite the additional capabilities of a face-to-face meeting relative to the immersive lifelike setting telepresence provides, telepresence is found to be comparable in effectiveness for achieving objectives in meetings. This finding adds to prior research, by suggesting that face-to-face interaction is not necessarily superior to technology-enabled remote interaction. Hence, the findings of Study 1 suggest that in situations where face-to-

face meetings would require significant travel, time and cost, telepresence provides an effective, possibly less costly and more environmentally friendly alternative (Verdantix, 2010).

In Study 2, categories of objectives also emerged. The first category involved the same pattern as the first one in Study 1 (AC, VC, TP, FTF). Hence, for *Routine exchange of information*, there were also no differences in effectiveness across the modes in Study 2. For a second category, audio- and video-conferencing were less effective than telepresence and face-to-face ((AC, VC) < (TP, FTF)). In other words, for the objectives in this category, the additional capabilities of telepresence and face-to-face (e.g., having eye contact, experiencing co-location), relative to audio- and video-conferencing, seemed to increase effectiveness, yet the additional capabilities of face-to-face relative to telepresence (e.g., examining physical objects) did not seem to be significant. More than half of the meeting objectives fell into this category. These ten objectives are diverse and do not seem to have a clear commonality. In particular, some objectives in this category are emotion-laden (e.g., *Communicate positive or negative feelings or emotions*, *Show personal concern*) and others involve high equivocality (e.g., *Exchange/share different opinions or views*, *Non-routine exchange of information*). The observation that higher capability meeting modes are more effective for achieving objectives, is consistent with prior research (King and Xia, 1997; Markus, 1994; Rice, 1993). The analysis adds to prior research by suggesting the distinguishing capabilities are those provided in telepresence and face-to-face meetings.

For objectives in a third category in Study 2, the additional capabilities of telepresence and face-to-face, relative to audio- and video-conferencing, again seemed to increase effectiveness, yet the additional capabilities of face-to-face relative to telepresence were also significant ((AC, VC) < TP < FTF). The five objectives in this category are emotion-laden: *Build trust and relationships*, *Negotiate or bargain on a deal or contract*, *Resolve conflicts and disagreements*, *Exchange confidential, private or sensitive information*, and *Assemble a team and/or motivate teamwork*. The observation that face-to-face was more effective than telepresence for achieving such objectives is unlike the findings in Study 1. Potential explanations for this dissimilarity across the two companies are discussed below.

Finally, a fourth category was identified in Study 2, for which the capabilities of all technology-enabled meeting modes were deficient relative to face-to-face interaction ((AC, VC, TP) < FTF). This category contains one objective, *Find a solution to a problem that has arisen*, and this finding is consistent with prior research that pointed to the importance of a shared physical environment for this objective (Whittaker, 2003).

The emergence of such categories of business meeting objectives serves as a starting point for exploring the role of the capabilities of the business meeting modes. In particular, the question arises which specific capabilities are important for which objective? In addition, when a significant difference is found between two meeting modes (e.g., between video-conferencing and telepresence), the question arises which specific capabilities may explain such a difference (e.g., having eye contact, observing what attendees are looking at, or experiencing co-location). To address these questions, Research Question 2 was formulated (see Introduction Chapter on p. 7, and Chapter 6).

Finally, there were notable differences in the findings across both studies. For example, in Study 1, audio-conferencing was found to be less effective than video-conferencing for seven objectives, while there were no differences between the effectiveness scores of these two meeting modes in Study 2. Furthermore, the scores for audio- and video-conferencing were generally quite low in Study 2, especially relative to the scores in Study 1 for these modes. On the other hand, face-to-face was not found to be more effective than telepresence for any objective in Study 1, while significant differences were found between these two modes in Study 2 for six objectives. These dissimilarities across companies can be attributed to a host of factors, such as the experience, skill, and training of employees (Carlson and Zmud, 1999; Warkentin and Beranek, 1999). In particular, while almost all video-conferencing and telepresence meeting organizers in Study 1 had used the selected mode more than 10 times before, only half of video-conferencing meeting organizers and less than half of telepresence meeting organizers had used the selected meeting mode more than 10 times before in Study 2 (see Table 5.15). The limited prior use of these technologies by meeting organizers in Study 2 potentially had a negative influence on their effective use (Carlson and Zmud, 1999). In addition, other company-specific factors may play a role, such as (meeting) cultures and norms, features specific to the technology and software used, and support provided by the company (Carlson and Zmud, 1999; Kock, 2001; Lowry et al., 2010; Rice, 1993; Venkatesh and Bala, 2008).

Table 5.15. Number of Times the Organizer had previously used the Selected Meeting Mode

	Number of meeting organizers in Study 1				Number of meeting organizers in Study 2			
How often have you used the selected meeting mode before within the current organization?	AC	VC	TP	FTF	AC	VC	TP	FTF
First time user	0	0	0	0	3	5	11	3
1-5 times used before	2	3	2	2	14	20	16	6
6-10 times used before	1	0	3	2	11	11	12	2
> 10 times used before	56	31	25	28	61	36	31	86
Total (N)	59	34	30	32	89	72	70	97

4.3 The Effectiveness of Hybrid Meeting Modes

Hybrid meetings were found to be quite prevalent in Study 2, more specifically, 61 % of video-conferencing, 47 % of telepresence, and 22 % of face-to-face meetings involved one or more attendees in a lower capability meeting mode. The high frequencies of hybrid meetings are at odds with prior research on virtual teams, which argues that in a situation of unequal access to technology within a team, the “lowest common denominator” is used such that no member is excluded from participation for technology reasons (Zigurs and Khazanchi, 2008). While this pragmatic choice “reduces overhead such as tracking the media through which partners can be reached or using multiple media to convey a single message to different parties” (Markus, 1994, p. 508), it may also dilute the communication and reduce communication effectiveness, as the data seems to suggest.

In particular, the effectiveness of hybrid meeting modes was found to be lower for the majority of objectives, which is consistent with an observation by Kydd and Ferry (1994). These authors noted that, in a video-conferencing meeting, participants with an audio connection only “were perceived by other sites as ‘left out of the meeting’: the meeting leader had to work extremely hard to keep them involved” (p. 373). In the analysis, the data were aggregated across the meeting modes. However, it would be of interest to examine whether the influence of the hybrid nature of meetings differs across different meeting modes. For example, in prior research, the addition of text-based interaction influenced effectiveness and social presence perceptions differently for audio-conferencing and face-to-face communication (Chidambaram and Jones, 1993). Also, it is important to note that while the hybrid nature of meetings seems to negatively impact meeting mode effectiveness, it may

have a positive impact on overall meeting effectiveness. For example, if a participant attending in the lower capability meeting mode contributes specific expertise or has a high level of decision authority, the meeting outcome may still be better than if this person would not have been able to participate. Since little prior research has investigated hybrid meetings, this study provides initial insight on how it influences meeting mode effectiveness. However, further research on the hybrid nature of meetings is needed, and interesting directions are presented in the final chapter of this dissertation.

Further limitations and future research directions are discussed in the general conclusion section of this dissertation.

THE INFLUENCE OF BUSINESS MEETING MODE CAPABILITIES

CHAPTER VI: THE INFLUENCE OF BUSINESS MEETING MODE CAPABILITIES

In this chapter, the second research question is addressed: *How do different capabilities of meeting modes influence the effectiveness of the modes?* To address this research question, two field studies were conducted, referred to as Study 3 and Study 4 in Chapter 4 (see p. 59). First, the statistical analysis is presented that is used to evaluate the influence of meeting mode capabilities, and then, the findings on the importance of meeting mode capabilities for achieving business meeting objectives are presented. The results are discussed in the second section of this chapter.

1. ANALYSIS

The respondents in Study 3 and Study 4 were asked to indicate how important each of the business meeting mode capabilities were for achieving the key objectives of a specific meeting they organized recently (see Chapter 4, section 2.2 on p. 59). Since respondents could select multiple objectives as key to the meeting, the capability importance scores do not represent evaluations for a single objective. In other words, it is uncertain whether the scores represent the mean importance of the capabilities across all of the key objectives, or rather the importance of the capabilities for one of the key objectives (the single key/lead objective). However, the assumption is made that the data samples are large enough, such that the potential effect of the importance score not being related to all of the key objectives, is cancelled out across the responses.

In a first stage, the mean importance scores of the capabilities are computed for each objective. Meeting mode capability importance was measured on a scale of 1: ‘Not at all important’ to 5: ‘Very important.’ The median importance score is used as a cut-off score, to describe whether a capability is generally important for achieving an objective (MacCallum et al., 2002). However, due to the responses not being specific to one objective, these general importance scores need to be interpreted cautiously. In particular, the mean capability importance score may be above the cut-off value for a specific objective, while the capability is relatively less important for that objective. Instead, the mean capability importance score

may be below the cut-off value for a specific objective, while it is relatively more important for that objective.

Therefore, to examine the relative importance of the meeting mode capabilities, the relationships between meeting mode capabilities and meeting objectives are analyzed through a multivariate regression analysis, in a second stage. In particular, a multivariate linear regression model is built, in which dichotomous, independent variables indicate for each business meeting objective whether it was key to a specific meeting. The dependent variables are the importance scores of the meeting mode capabilities for that specific meeting. This model is visually represented in Figure 6.1. Positive/negative significant relationships in this regression model indicate that the capability is more/less important for meetings in which the specific objective is key. Since multiple objectives can be key for a single meeting, covariances between the independent variables are accounted for in this model. Also, since multiple regression weights are assessed at the same time, a correction is applied on the critical p-value to evaluate them: $0.0004 (= 0.10/(19 \times 13))$ (Neter et al., 1996). In addition to the critical p-values, the 0.05 and 0.01 significance levels are reported.

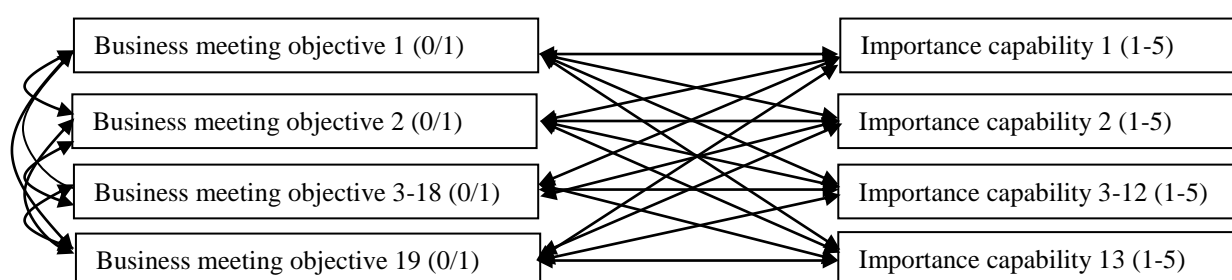


Figure 6.1. Multivariate Regression Model

1.1 Analysis of Study 3

Table 6.1 shows the mean importance scores of the 13 business meeting mode capabilities (columns) for achieving the 19 business meeting objectives (rows)¹², based on the responses of 359 meeting organizers in Study 3. The median importance value is 3.05, above which the importance can be considered high. Considering this cut-off, nine capabilities are evaluated as important for achieving different business meeting objectives (scores of 3.05 or above are shown in bold in Table 6.1). It is of interest to note that the means for the two objectives at the bottom of the table (*Assert and/or reinforce your authority* and *Negotiate or bargain on a*

¹² The objectives are ordered in decreasing order of their frequency in Study 3.

deal or contract) are based on a limited number of observations (N = 19 and N = 13 respectively), as these objectives were infrequently key to meetings.

Table 6.1 furthermore shows that seven capabilities are important for achieving most meeting objectives. In particular, while two capabilities (“Hear attendees’ voices” and “Use shared computer screens”) are important for achieving all 19 meeting objectives, three capabilities (“See attendees’ body language and gestures,” “Have eye contact,” and “Discern attendees’ facial expressions”) are important for achieving 16 objectives. Furthermore, “Experience co-location” is important for achieving 14 objectives, and “Observe what attendees are looking at” for 13 objectives. On the other hand, “Have ancillary interaction before or after the formal meeting” is important for achieving 7 objectives, and “Have side conversations,” is important for 2 objectives (*Exchange confidential, private or sensitive information* and *Negotiate or bargain on a deal or contract*). Finally, four of the thirteen capabilities (“Observe appearance of attendees,” “Do side-tasks,” “Use ancillary resources,” and “Examine and/or manipulate specific physical objects”) are not found to be important for achieving any of the 19 objectives.

The results of the multivariate linear regression model are shown in Appendix G, and summarized in Table 6.2. This table shows the significant positive or negative relationships with business meeting mode capabilities, for each business meeting objective, along with the significance levels. Significant relationships are found for 12 out of the 19 objectives.

Table 6.1. Mean Business Meeting Mode Capability Importance Scores for Achieving Business Meeting Objectives (Study 3)

	Business Meeting Mode Capabilities												
Business Meeting Objectives	1	2	3	4	5	6	7	8	9	10	11	12	13
Clarify a concept, issue or idea	4.65	4.41	3.21	3.21	3.16	3.05	3.07	3.02	2.75	2.61	2.49	2.25	2.11
Exchange/share different opinions or views of a topic or issue	4.59	4.47	3.23	3.19	3.15	3.11	3.05	3.00	2.70	2.57	2.46	2.40	2.13
Make a decision	4.62	4.47	3.39	3.39	3.34	3.14	3.20	3.05	2.66	2.73	2.35	2.29	2.16
Generate ideas on products, projects or initiatives	4.65	4.41	3.33	3.33	3.24	3.10	3.11	3.13	2.76	2.65	2.44	2.35	2.19
Routine exchange of information	4.61	4.24	3.09	3.14	3.03	2.92	2.84	2.83	2.58	2.54	2.40	2.10	1.99
Find a solution to a problem that has arisen	4.60	4.50	3.29	3.27	3.12	3.05	3.19	3.02	2.92	2.65	2.57	2.53	2.38
Build trust and relationships with one or more individuals	4.60	4.30	3.59	3.53	3.49	3.30	3.18	3.05	2.64	2.83	2.40	2.32	2.25
Give or receive feedback	4.60	4.34	3.31	3.28	3.21	3.07	3.09	2.95	2.56	2.58	2.39	2.19	2.15
Assemble a team and/or motivate teamwork on a project	4.63	4.31	3.29	3.31	3.27	3.09	2.98	2.87	2.41	2.47	2.26	2.19	2.02
Generate buy-in or consensus on an idea	4.64	4.42	3.28	3.22	3.35	2.97	3.02	3.03	2.74	2.72	2.34	2.19	2.06
Maintain relationships and stay in touch	4.63	4.30	3.32	3.33	3.28	3.17	2.97	2.83	2.64	2.58	2.38	2.31	2.16
Show personal concern about or interest in a particular issue	4.65	4.41	3.52	3.41	3.42	3.21	3.36	3.15	2.86	2.65	2.59	2.42	2.42
Exchange confidential, private or sensitive information	4.75	4.50	3.27	3.25	3.27	3.10	3.10	3.03	3.13	2.83	2.40	2.42	2.17
Communicate positive or negative feelings or emotions	4.72	4.39	3.35	3.44	3.30	3.14	3.18	2.88	2.68	2.70	2.44	2.33	2.33
Non-routine exchange of information	4.56	4.24	2.65	2.62	2.64	2.58	2.75	2.55	2.76	2.07	2.53	2.24	1.87
Resolve conflicts and disagreements within a group	4.66	4.42	3.43	3.49	3.38	3.21	3.32	3.11	2.91	2.89	2.51	2.49	2.49
Give or receive orders	4.69	4.26	3.18	2.95	3.08	2.74	2.74	2.72	2.13	2.51	2.38	2.13	1.87
Assert and/or reinforce your authority, status, position	4.58	4.00	3.16	2.79	3.21	2.79	3.16	3.05	2.74	2.74	2.63	2.68	2.74
Negotiate or bargain on a deal or contract	4.62	4.23	3.62	3.54	3.31	3.38	3.69	3.31	3.08	2.92	2.46	2.31	2.69

1	Hear attendees' voices (speech and vocal tone)	8	Have ancillary interaction before or after the formal meeting
2	Use shared computer screens and/or work spaces	9	Have side conversations with one or more attendees
3	See attendees' body language and gestures	10	Observe appearance (posture, clothing, etc.) of attendees
4	Have eye contact with other attendees	11	Do side-tasks that other attendees are unaware of
5	Discern attendees' facial expressions	12	Use ancillary resources such as a flip-chart
6	Experience co-location (the sense of being in the same physical location)	13	Examine and/or manipulate specific physical objects (e.g. prototypes or samples)
7	Observe what attendees are looking at		

Table 6.2. Significant Relationships between Business Meeting Objectives and Meeting Mode Capabilities (Study 3)

Business meeting objective	Business meeting mode capability	
	Positive relationship	Negative relationship
Clarify a concept, issue or idea	Hear attendees' voices*	
Exchange/share different opinions	Use shared computer screens and/or work spaces*	
Generate ideas	Have ancillary interaction before or after the formal meeting*	
Routine exchange of information		See attendees' body language and gestures*
		Discern attendees' facial expressions*
		Observe what attendees are looking at*
Find a solution to a problem	Use shared computer screens and/or work spaces*	
	Have side conversations with one or more attendees**	
	Do side-tasks that other attendees are unaware of*	
	Use ancillary resources**	
	Examine and/or manipulate specific physical objects***	
Build relationships and trust	See attendees' body language and gestures**	
	Have eye contact with other attendees**	
	Discern attendees' facial expressions**	
	Experience co-location*	
	Observe appearance of attendees**	
Assemble a team and/or motivate teamwork		Have side conversations with one or more attendees**
Generate buy-in or consensus on an idea		Examine and/or manipulate specific physical objects*
Exchange confidential, private or sensitive information	Have side conversations with one or more attendees***	
	Observe appearance of attendees*	
Non-routine exchange of information		See attendees' body language and gestures***
		Have eye contact with other attendees***
		Discern attendees' facial expressions***
		Experience co-location**
		Observe what attendees are looking at*
		Have ancillary interaction before or after the formal meeting**
		Observe appearance of attendees**
Give or receive orders		Have side conversations with one or more attendees**
		Examine and/or manipulate specific physical objects**
Assert and/or reinforce your authority, status, position	Examine and/or manipulate specific physical objects*	

* p < 0.05; ** p < 0.01; *** p < 0.0004

This analysis shows how each meeting objective is related to different meeting mode capabilities. The results provide additional insight into the relative importance of the capabilities. For example, for *Build trust and relationships*, a positive relationship is found with multiple capabilities (“See attendees’ body language and gestures,” “Have eye contact with other attendees,” “Discern attendees’ facial expressions,” and “Experience co-location”), which is in accordance with the mean capability importance scores found to be higher than the cut-off value (see Table 6.1). However, for this objective, a positive relationship is also found with “Observe appearance of attendees,” although the mean importance score of this capability is found to be below 3.05. Likewise, *Exchange confidential, private or sensitive information* is found to be positively related to the capability “Observe appearance of attendees,” while the mean importance score is below 3.05 (see Table 6.1). Moreover, *Find a solution to a problem* is positively related to “Have side conversations with one or more attendees,” “Do side-tasks that other attendees are unaware of,” “Use ancillary resources,” and “Examine and/or manipulate specific physical objects,” although the mean importance scores for all of these capabilities are below the cut-off value. On the other hand, *Routine exchange of information* is found to be negatively related to “See attendees’ body language and gestures” and “Discern attendees’ facial expressions,” although their mean importance scores for this objective are above 3.05 (see Table 6.1).

1.2 Analysis of Study 4

Table 6.3 shows the mean importance scores of the 13 business meeting mode capabilities (columns) for achieving the 19 business meeting objectives (rows)¹³, based on the responses of 925 meeting organizers in Study 4. The median importance value is 2.94, above which the importance can be considered high. Considering this cut-off, eleven capabilities are evaluated as important for achieving different business meeting objectives (scores of 2.94 or above are shown in bold in Table 6.3). It is of interest to note that the means for the two objectives at the bottom of the table (*Negotiate or bargain on a deal or contract* and *Assert and/or reinforce your authority*) are based on a limited number of responses (N = 44 and N = 27 respectively), since these objectives were infrequently key to meetings.

The table indicates that six capabilities have scores above the cut-off value for most objectives. In particular, three capabilities (“Hear attendees’ voices,” “Use shared computer screens,” and “Experience co-location”) are important for achieving every meeting objective,

¹³ The objectives are ordered in decreasing order of their frequency in Study 4.

two additional capabilities (“See attendees’ body language and gestures” and “Have eye contact with other attendees”) are important for achieving all but one objective (*Routine-exchange of information*), and “Discern attendees’ facial expressions” is important for achieving 15 objectives. On the other hand, “Observe what attendees are looking at” is found to be important for achieving 7 objectives, and to “Have ancillary interaction before or after the formal meeting” for 5 objectives. Three capabilities (“Have side conversations with one or more attendees,” “Observe appearance of attendees,” and “Examine and/or manipulate specific physical objects”) are only important to *Negotiate or bargain on a deal or contract*. Finally, two capabilities are not important for any objective: “Do side-tasks that other attendees are unaware of” and “Use ancillary resources.”

The results of the multivariate linear regression model for this data set are shown in Appendix H, and summarized in Table 6.4. This table shows the significant positive and/or negative relationships with business meeting mode capabilities, for each business meeting objective, along with the significance levels. Significant relationships are found for 14 out of the 19 objectives.

Table 6.3. Mean Business Meeting Mode Capability Importance Scores for Achieving Business Meeting Objectives (Study 4)

Business Meeting Objectives	Business Meeting Mode Capabilities												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Clarify a concept, issue or idea	4.13	4.13	3.08	3.05	2.88	3.09	2.84	2.79	2.44	2.30	2.10	2.37	2.71
Exchange/share different opinions or views of a topic or issue	4.21	4.05	3.08	3.09	2.96	3.14	2.74	2.79	2.48	2.28	2.06	2.38	2.53
Find a solution to a problem that has arisen	4.10	4.05	3.02	3.08	2.88	3.10	2.74	2.83	2.55	2.32	2.14	2.41	2.66
Make a decision	4.14	4.08	3.13	3.24	2.98	3.20	2.83	2.84	2.60	2.37	2.12	2.48	2.69
Give or receive feedback	4.15	4.09	3.13	3.15	2.99	3.17	2.74	2.78	2.46	2.35	2.02	2.42	2.68
Routine exchange of information	4.14	4.25	2.79	2.84	2.69	3.05	2.60	2.64	2.33	2.11	2.02	2.19	2.39
Generate ideas on products, projects or initiatives	4.15	4.09	3.18	3.27	3.00	3.31	2.85	2.89	2.67	2.33	2.18	2.52	2.85
Assemble a team and/or motivate teamwork on a project	4.16	4.15	3.22	3.22	3.09	3.31	2.83	2.86	2.55	2.42	2.15	2.48	2.64
Build trust and relationships with one or more individuals	4.14	3.98	3.54	3.52	3.39	3.54	3.10	2.87	2.53	2.72	2.06	2.44	2.75
Maintain relationships and stay in touch	4.12	3.97	3.40	3.39	3.28	3.52	2.86	2.83	2.60	2.66	2.14	2.39	2.63
Generate buy-in or consensus on an idea	4.19	4.03	3.13	3.12	3.01	3.18	2.73	2.77	2.31	2.35	1.96	2.19	2.39
Resolve conflicts and disagreements within a group	4.18	3.90	3.40	3.44	3.27	3.38	3.13	3.12	2.79	2.61	2.43	2.64	2.84
Non-routine exchange of information	4.30	3.87	3.14	3.14	3.11	3.12	2.75	2.72	2.35	2.25	2.06	2.28	2.43
Show personal concern or interest	4.25	3.94	3.30	3.25	3.20	3.37	2.96	2.95	2.61	2.51	2.12	2.49	2.77
Exchange confidential, private or sensitive information	4.23	3.78	3.27	3.31	3.16	3.41	2.79	2.94	2.53	2.47	2.18	2.20	2.60
Communicate positive or negative feelings or emotions	4.36	3.76	3.63	3.64	3.36	3.51	3.25	2.84	2.65	2.74	2.27	2.47	2.92
Give or receive orders	4.09	4.04	3.26	3.17	2.92	3.21	3.07	3.00	2.46	2.33	2.07	2.42	2.82
Negotiate or bargain on a deal or contract	4.25	3.77	3.73	3.59	3.39	3.36	3.27	3.43	3.00	3.07	2.50	2.77	3.36
Assert and/or reinforce your authority, status, position	4.22	3.89	3.56	3.74	3.44	3.63	3.41	3.00	2.37	2.59	2.00	2.52	2.52

1	Hear attendees' voices (speech and vocal tone)	8	Have ancillary interaction before or after the formal meeting
2	Use shared computer screens and/or work spaces	9	Have side conversations with one or more attendees
3	See attendees' body language and gestures	10	Observe appearance (posture, clothing, etc.) of attendees
4	Have eye contact with other attendees	11	Do side-tasks that other attendees are unaware of
5	Discern attendees' facial expressions	12	Use ancillary resources such as a flip-chart
6	Experience co-location (the sense of being in the same physical location)	13	Examine and/or manipulate specific physical objects (e.g. prototypes or samples)
7	Observe what attendees are looking at		

Table 6.4. Significant Relationships between Business Meeting Objectives and Meeting Mode Capabilities (Study 4)

Business meeting objective	Business meeting mode capability	
	Positive relationship	Negative relationship
Clarify a concept issue or idea	Use shared computer screens and/or work spaces**	Have eye contact with other attendees*
	Examine and/or manipulate specific physical objects**	Discern attendees' facial expressions*
		Experience co-location*
Exchange/share different opinions		Examine and/or manipulate specific physical objects*
Make a decision	Use ancillary resources*	
Generate ideas	Experience co-location*	
	Have side conversations with one or more attendees**	
	Do side-tasks that other attendees are unaware of*	
	Use ancillary resources**	
	Examine and/or manipulate specific physical objects***	
Routine exchange of information	Use shared computer screens and/or work spaces***	See attendees' body language and gestures***
		Have eye contact with other attendees***
		Discern attendees' facial expressions***
		Experience co-location*
		Observe what attendees are looking at**
		Have ancillary interaction before or after the formal meeting*
		Have side conversations with one or more attendees**
		Observe appearance of attendees***
		Use ancillary resources*
Assemble a team and/or motivate teamwork	Use shared computer screens and/or work spaces*	
	Use ancillary resources*	
Build trust and relationships	See attendees' body language and gestures***	
	Have eye contact with other attendees***	
	Discern attendees' facial expressions***	
	Experience co-location**	
	Observe what attendees are looking at***	
	Observe appearance of attendees***	
Maintain relationships and stay in touch	See attendees' body language and gestures*	
	Discern attendees' facial expressions**	
	Experience co-location**	
	Observe appearance of attendees**	

Generate buy-in		Observe what attendees are looking at*
		Have side conversations with one or more attendees**
		Do side-tasks that other attendees are unaware of**
		Use ancillary resources***
		Examine and/or manipulate specific physical objects***
Non-routine exchange of information	Hear attendees' voices*	
Resolve conflicts and disagreements	Discern attendees' facial expressions*	
	Observe what attendees are looking at*	
	Have ancillary interaction before or after the formal meeting**	
	Have side conversations with one or more attendees*	
	Do side-tasks that other attendees are unaware of***	
	Use ancillary resources*	
Exchange confidential, private or sensitive information		Use shared computer screens and/or work spaces*
Communicate positive or negative feelings or emotions	Hear attendees' voices*	Use shared computer screens and/or work spaces*
	See attendees' body language and gestures**	
	Have eye contact with other attendees*	
	Observe what attendees are looking at*	
	Observe appearance of attendees*	
Negotiate or bargain on a deal or contract	Have ancillary interaction before or after the formal meeting**	
	Have side conversations with one or more attendees*	
	Observe appearance of attendees**	
	Examine and/or manipulate specific physical objects**	

* p < 0.05; ** p < 0.01; *** p < 0.0004

This analysis shows how each meeting objective is related to different meeting mode capabilities. The results provide additional insight into the relative importance of the capabilities. For example, Table 6.4 shows that, for *Clarify a concept, issue or idea*, a significant relationship is found with “Use shared computer screens,” which is in accordance with the mean importance score found to be above 2.94 (see Table 6.3). However, this objective is also found to have a positive relationship with “Examine and/or manipulate specific physical objects,” for which the mean importance score is found to be below 2.94. Moreover, this same objective is negatively related to “Have eye contact with other attendees” and “Experience co-location,” although the importance scores for these capabilities are above 2.94. Likewise, the objectives *Exchange confidential, private or sensitive information* and *Communicate positive or negative feelings or emotions* are found to be negatively related to the capability “Use shared computer screens and/or work spaces,” although the importance scores are above 2.94.

2. DISCUSSION

In this chapter, the second research question of this dissertation was addressed: *How do different capabilities of meeting modes influence the effectiveness of the modes?* First, the general importance of each of the meeting mode capabilities is discussed, and then the findings are used to explain the meeting mode effectiveness patterns found across meeting objectives in Chapter 5. A final subsection discusses capabilities beyond the current set of meeting modes studied.

2.1 Importance of Business Meeting Mode Capabilities

This section discusses the importance of business meeting mode capabilities, in terms of the number of meeting objectives they were found to be important for, in both studies. Two meeting mode capabilities were found to be important for achieving all of the business meeting objectives: “Hear attendees’ voices” and “Use shared computer screens and/or work spaces.” For “Hear attendees’ voices” all mean importance scores were above 4 on a scale of 1-5 and this capability was not negatively related to any objective. This finding is consistent with the literature, which highlights speech as the primary basis for interpersonal communication (Daft et al., 1987; Dennis et al., 2008; Short et al., 1976; Whittaker, 2003). For example, Kock (2004, p. 334) stated that “the ability of a medium to support the use of speech, is likely to be significantly more important than all of the other naturalness elements.”

Furthermore, for the capability “Use shared computer screens and/or work spaces,” the mean importance scores for each objective were above 4 in Study 3, and above 3.75 in Study 4. While this has been recognized as an important capability in prior research on synchronous group interactions (Buxton, 1991; Daft et al., 1987), this finding strongly suggests that using shared computer screens and/or work spaces is fundamental for supporting business meetings.

The significance of this capability for achieving meeting objectives involving multiplicity of views and different frames of reference is consistent with prior research (Whittaker, 2003). However, its high importance for objectives involving emotions and interpersonal relationships is surprising. A possible explanation is that meeting organizers evaluated the importance of this capability across all the key meeting objectives, which may include both kinds of objectives. More specifically, the findings suggest a lower importance of this capability in meetings for achieving emotion-laden objectives, as negative relationships were found for the following two objectives: *Exchange confidential, private or sensitive information* and *Communicate positive or negative feelings or emotions*. In addition, exchanging confidential information requires low surveillance of outside parties (Barry and Fulmer, 2004), and screen sharing can therefore be considered detrimental.

Furthermore, “Experience co-location” was found to be important for achieving every objective in Study 4 (all mean scores were above the median 2.94) and for achieving fourteen objectives in Study 3 (all mean scores were above 2.58). The broad importance of this capability is surprising, as it is regarded to be most significant for communication in which interpersonal relationships are important (Kock, 2004; Short et al., 1976). Again, a possible explanation is that respondents simultaneously rated the importance of this capability for both objectives that are emotion-laden and objectives that are not, in their meetings. Indeed, while this objective was found to be positively related to *Build trust and relationships* and *Maintain relationships and stay in touch*, it was negatively related to both *Routine* and *Non-routine exchange of information*.

Visual capabilities (“See attendees’ body language and gestures,” “Have eye contact,” “Discern attendees’ facial expressions,” “Observe what attendees are looking at,” and “Observe appearance of attendees”) were also found to be important for multiple objectives (all mean scores were above 2.60). The analysis of the significant relationships reveals the relative importance of visual capabilities, which were relatively less important for achieving objectives that do not involve emotions and interpersonal relationships (*Clarify a concept, issue or idea*, *Routine* and *Non-routine exchange of information*) and relatively more

important for achieving objectives that do involve emotions and relationships (*Build trust and relationships* and *Communicate positive or negative feelings or emotions*).

The capabilities that are related to face-to-face interaction (“Have ancillary interaction before or after the formal meeting,” “Use ancillary resources such as a flip-chart” and “Examine and/or manipulate specific physical objects”) were each found to be of importance for a limited number of objectives. The capability (“Have ancillary interaction before or after the formal meeting”) was relatively more important for *Resolve conflicts and disagreements* and for *Negotiate or bargain on a deal or contract*. This finding is consistent with the assertion that ancillary interaction is crucial for “the perpetuation of the social relations that underlie collaboration, and, in general, any situation that requires communication to resolve ambiguity” (Fish et al., 1992, p. 37). Interestingly, this finding suggests that formal meetings with a pre-arranged agenda are not well suited for achieving these objectives (Whittaker et al., 1994). As to the latter two capabilities, referring to the use of ancillary resources or the examination of physical objects, they were both found to be relatively more important for *Find a solution to a problem*. This is consistent with the notion of shared environments being important for this objective (Whittaker, 2003).

Finally, “Do side-tasks that other attendees are unaware of” was generally not found to be important for achieving objectives in business meetings. This finding can be considered logical, since the analysis is based on responses from meeting organizers. As the meeting organizer delineates the meeting objectives and invites the other meeting attendees, he or she would expect everyone’s attention to be with the objectives during the meeting. An interesting avenue for future research would therefore be to study the other attendees’ perceptions of the importance of this capability in meetings. Similarly, “Have side conversations with one or more attendees” was generally not important in business meetings. While a similar argument applies for this capability, since the organizer would probably want everyone to be engaged in the overall meeting conversation, this capability could be of value for achieving specific objectives. In particular, to *Negotiate or bargain on a deal or contract*, side conversations could be useful among allied participants (Wainfan and Davis, 2004). Consistent with this notion, the importance score of this capability was found to be above the cut-off value for this objective, in both studies. In addition, for objectives such as *Generate ideas* and *Find a solution to a problem* it could also be valuable to prepare in smaller groups through side conversations, before discussing a matter plenary (Tung and Turban, 1998). Consistent with this, “Have side conversations with one or more attendees” was found to be relatively more important for *Find a solution to a problem*.

It is of interest to note that the results were fairly consistent across both studies. While not all significant relationships found in Study 3 were replicated in Study 4 (and vice versa), opposite significant relationships were not found.

2.2 Explaining Meeting Mode Effectiveness Categories

The findings on the importance of meeting mode capabilities help clarify the meeting mode effectiveness categories found in Chapter 5. The categories identified in Study 1 are discussed, as well as divergent findings in Study 2.

First, a striking observation is that two meeting mode capabilities (“Hear attendees’ voices” and “Use shared computer screens and/or work spaces”) were consistently found to be the two utmost important capabilities for achieving all of the meeting objectives, in both studies. Since these two capabilities can be supported by all the meeting modes examined in this dissertation, even the lowest capability meeting mode (audio-conferencing) can be expected to be fairly effective for achieving all meeting objectives. While this assertion is consistent with the effectiveness scores found for audio-conferencing in Study 1 (all above 3.55 on a scale of 1-5), it is inconsistent with the low mean scores found in Study 2 (as low as 1.91). As discussed in Chapter 5, the differences in findings across Study 1 and 2 can potentially be attributed to company-specific factors (see section 4.2 on p. 82).

In a first category, no differences in meeting mode effectiveness were found (AC, VC, TP, FTF). The lack of an increase in meeting mode effectiveness for two objectives in this category (*Routine exchange of information* and *Non-routine exchange of information*) is consistent with the observation that visual capabilities and capabilities related to face-to-face interaction were negatively related to them. Hence, although video-conferencing, telepresence, and face-to-face seem to provide surplus capabilities for achieving these objectives, they are not found to be lower in effectiveness, which is consistent with prior research findings (Markus, 1994; Rice, 1992). However, the finding that visual capabilities and capabilities related to face-to-face interaction are negatively related to *Non-routine exchange of information* is surprising. In particular, prior research indicates that this objective involves high equivocality and that therefore more capabilities are beneficial (Lengel and Daft, 1989). Hence, further research is needed to explain this finding.

Two additional objectives fell into this category: *Make a decision* and *Find a solution to a problem*. For *Make a decision*, the importance scores for visual capabilities were found to be above the cut-off value, yet there were no significant relationships with these capabilities, and the importance scores for capabilities related to face-to-face interaction were below the

cut-off value. Hence, visual capabilities and capabilities related to face-to-face interaction did not seem to be essential, which explains why no differences in effectiveness were found. For *Find a solution to a problem*, the importance scores for visual capabilities were found to be above the cut-off value, yet there were no significant relationships with these capabilities, and the importance scores for capabilities related to face-to-face interaction were below the cut-off value, yet two of these capabilities were relatively more important for achieving this objective: “Use ancillary resources such as a flip-chart” and “Examine and/or manipulate specific physical objects.” Hence, visual capabilities do not seem to increase effectiveness, while face-to-face would actually be expected to be more effective. Consistent with this notion, face-to-face was more effective than all technology-enabled modes in Study 2 ((AC, VC, TP) < FTF) for achieving this objective.

For a second category of objectives, audio-conferencing was found to be lower in effectiveness than all other meeting modes (AC < (VC, TP, FTF)). Hence, one would expect visual capabilities to be important for achieving the objectives in this category. Indeed, the importance scores for visual capabilities were above the cut-off value for these objectives, and the significant relationships provided further insight. For *Exchange/share different opinions or views* and *Assemble a team and/or motivate teamwork*, no significant relationships were found with visual capabilities. Instead, for *Exchange confidential, private or sensitive information*, a positive relationship was found with “Observe appearance of attendees.” In addition, “Have side conversations with one or more attendees” was also relatively more important for this objective, which explains why in Study 2, face-to-face was found to be more effective than all technology-enabled meeting modes for achieving this objective. Likewise, for *Resolve conflicts and disagreements*, a positive relationship was found with visual capabilities such as “Discern attendees’ facial expressions” and “Observe appearance of attendees,” yet also with capabilities related to face-to-face interaction (“Have ancillary interaction before or after the formal meeting” and “Use ancillary resources”). The importance of the latter capabilities clarifies why face-to-face was found to be more important than technology-enabled meeting modes for this objective in Study 2.

For a third category of objectives, audio-conferencing was found to be lower in effectiveness than all the other meeting modes, and video-conferencing was found to be lower in effectiveness than telepresence and face-to-face (AC < VC < (TP, FTF)). The two objectives in this category (*Build trust and relationships* and *Communicate positive or negative feelings or emotions*) were found to be positively related to visual capabilities, such as “See attendees’ body language and gestures” and “Have eye contact with other attendees.”

In addition, the capability “Experience co-location” was found to be positively related to these objectives. The finding on the importance of these capabilities helps to explain why telepresence and face-to-face were found to be more effective than audio- and video-conferencing meetings for achieving these objectives.

2.3 Beyond Current Meeting Mode Configurations

By characterizing meetings in terms of objectives and decomposing meeting modes into capabilities, specific design and use guidelines for communication technologies in business meetings can be developed (Te’eni, 2001). In particular, technologies can be regarded as bundles of capabilities, which users can pick and choose from, in order to achieve objectives (DeSanctis and Poole, 1994; Zigurs and Khazanchi, 2008). For example, current Web-conferencing software enables the dynamic use of capabilities in meetings: users can choose whether or not to share video, computer screens, or applications. Therefore, with voice transmissions as the default for interaction in Web-conferencing, video could be enabled for achieving objectives involving emotions, and screen sharing for objectives involving the exchange of information. The flexible use of capabilities was not examined in this study, yet it is an interesting topic for further research.

Also, prior research prototypes have been developed to enable specific meeting mode capabilities. For example, technologies such as CRUISER, VideoWindow, and FreeWalk (Fish et al., 1990; Nakanishi et al., 1999; Root, 1988), were designed to enable spontaneous, informal interaction on the work floor, while others focused on capabilities such as gaze awareness, eye contact, spatial faithfulness, and shared collaboration spaces (Ishii et al., 1993; Nguyen and Canny, 2007; Vertegaal, 1999). The results of the current study can thus be used to inform on the usefulness of further technological developments in support of specific capabilities, as well as on the value of combining sets of capabilities in future technologies.

Another important avenue for future research is to study the use of business meeting modes in combination with support systems such as software applications and e-collaboration tools, which could also be employed dynamically in the meeting for achieving specific objectives. Moreover, capabilities can be envisioned that further augment meetings, such as the provisioning of contextual information on prior interactions between meeting participants on the subject at hand (Te’eni, 2001).

The limitations and further future research directions are discussed in the general conclusion section of this dissertation.

THE INFLUENCE OF THE
NUMBER OF MEETING
PARTICIPANTS AND OF THE
MEETING DURATION

CHAPTER VII: THE INFLUENCE OF THE NUMBER OF MEETING PARTICIPANTS AND OF THE MEETING DURATION

In this chapter, the third research question is addressed: *How do the number of meeting participants and the duration of the meeting influence the effectiveness of business meeting modes?* The analysis is based on three of the four field studies presented in Chapter 4 (see p. 61). In particular, in Study 1, data on the number of meeting participants and on the scheduled meeting duration was collected for 154 meetings, from the online calendaring and meeting scheduling system. In Study 2 and Study 4, the respondents were requested to indicate how many people attended the specific meeting and what the approximate duration of the specific meeting was (the questionnaires are shown in Appendix D and F respectively). In the following sections, the influence of the number of meeting participants and of the meeting duration is explored. In a final section, the findings are discussed.

1. ANALYSIS OF THE INFLUENCE OF THE NUMBER OF MEETING PARTICIPANTS

In this section, the datasets of Study 1, 2, and 4 are first described in terms of the number of participants across meeting modes. In addition, the significance of the differences across meeting modes is evaluated. In a next step, the influence of the number of meeting participants on the effectiveness of business meeting modes is examined. Toward that end, a correlational analysis is conducted on the data collected in Study 1 and Study 2. After applying a correction for multiple testing (19 objectives, overall effectiveness and for each of the 4 modes), the critical p-value for the correlations becomes 0.001 ($= 0.10/(19 \times 5)$) (Neter et al., 1996). Furthermore, the relationships between the number of meeting participants and the importance of the meeting mode capabilities are examined, based on the data collected in Study 4, by means of a Pearson correlational analysis. After applying a correction for multiple testing (13 capabilities, overall importance and for each of the 19 objectives), the critical p-value for the correlations becomes 0.0004 ($= 0.10/(20 \times 13)$) (Neter et al., 1996). In addition to the critical p-values, the 0.05 significance level is reported.

Table 7.1 shows the average number of meeting participants, across the four modes (audio-conferencing (AC), video-conferencing (VC), telepresence (TP), and face-to-face (FTF)) for the data gathered in Study 1, 2, and 4. The table shows that in each study, face-to-

face meetings have the lowest number of participants on average, ranging from 4.25 in Study 1 to 6.99 in Study 4.

Table 7.1. Average Number of Meeting Participants across Business Meeting Modes

	Study 1		Study 2		Study 4	
Meeting mode	Average meeting size (and s.d.)	N	Average meeting size (and s.d.)	N	Average meeting size (and s.d.)	N
AC	5.37 (4.46)	59	6.62 (2.75)	89	7.67 (7.51)	266
VC	5.21 (4.41)	34	8.51 (4.55)	70	7.92 (9.16)	206
TP	4.90 (2.83)	30	8.83 (3.56)	70	9.04 (6.91)	134
FTF	4.25 (3.99)	32	4.56 (2.94)	96	6.99 (8.17)	241
Total		154		325		847

The average number of meeting participants is not found to differ significantly in Study 1 (ANOVA: $F(3, 150) = 0.56; p > 0.05$) and Study 4 (ANOVA: $F(3, 843) = 1.91; p > 0.05$), yet in Study 2, the ANOVA ($F(3, 321) = 27.41; p < 0.001$) indicates there are significant differences in the number of meeting participants across the modes, and post-hoc tests reveal that all of the pairwise tests on the differences in the number of meeting participants are significant ($p < 0.05$), except for the difference between video-conferencing and telepresence meetings.

The following subsections present the findings on the influence of the number of meeting participants for Study 1, 2, and 4.

1.1 Analysis of Study 1

Table 7.2 shows the overall correlation coefficients, as well as the correlation coefficients for each of the four meeting modes. Given the small sample sizes for each mode, the reported correlations are Kendall's tau-b values. No significant relationships are found at the 0.001 significance level. The analysis indicates that, overall, the number of meeting participants is not related to meeting mode effectiveness at the 0.05 significance level either. However, for one objective (*Make a decision*), the number of participants is positively related to effectiveness in audio-conferencing ($p < 0.05$). Instead, for three objectives, the number of participants is negatively related to effectiveness in telepresence meetings ($p < 0.05$) – in other words, telepresence meetings intended to *Exchange/share different opinions*, *Generate ideas* or *Communicate positive or negative feelings or emotions*, are less effective when there are more participants.

Table 7.2. Correlations between Meeting Mode Effectiveness and the Number of Meeting Participants (Study 1)

Business Meeting Objectives	Business Meeting Modes				
	Overall N=154	AC N=59	VC N=33	TP N=30	FTF N=32
Clarify a concept, issue or idea	-0.05	0.00	-0.24	-0.09	0.13
Exchange/share different opinions or views of a topic or issue	-0.08	0.24	-0.34	-0.37*	-0.01
Build trust and relationships with one or more individuals	-0.10	-0.04	-0.11	-0.13	-0.05
Maintain relationships with one or more other people and stay in touch	-0.07	0.05	-0.37	-0.19	0.30
Generate buy-in or consensus on an idea	-0.02	0.02	-0.27	0.07	0.25
Give or receive feedback	-0.13	-0.03	-0.28	-0.35	0.11
Generate ideas on products, projects or initiatives	-0.12	0.15	-0.28	-0.38*	0.00
Make a decision	0.03	0.32*	0.09	-0.34	-0.10
Non-routine exchange of information	-0.13	-0.14	-0.27	-0.25	-0.02
Routine exchange of information	0.17	0.22	0.34	-0.14	0.25
Communicate positive or negative feelings or emotions on a topic or issue	-0.18	0.03	-0.23	-0.51*	-0.11
Find a solution to a problem that has arisen	0.01	0.16	-0.41	-0.18	0.34
Show personal concern about or interest in a particular issue or situation	-0.03	0.14	-0.01	-0.10	-0.05
Exchange confidential, private or sensitive information	0.03	0.08	0.29	-0.23	-0.09
Assemble a team and/or motivate teamwork on a project	-0.16	-0.11	-0.13	-0.41	0.40
Give or receive orders	-0.03	0.13	0.00	-0.29	0.05
Resolve conflicts and disagreements within a group	-0.24	0.12	-0.46	-0.38	-0.14
Assert and/or reinforce your authority, status, position to your team or others	-0.14	0.20	-0.32	-0.31	-0.66
Negotiate or bargain on a deal or contract	0.03	0.18	0.76	-0.27	0.53

* $p < 0.05$; ** $p < 0.001$

1.2 Analysis of Study 2

Table 7.3 shows the Pearson correlations between the number of meeting participants and meeting mode effectiveness overall, and for each of the meeting modes. No significant relationships are found at the 0.001 significance level. Overall, more participants are negatively related to meeting mode effectiveness for six objectives, at the 0.05 significance level. In addition, a larger number of participants is negatively related to the effectiveness of audio-conferencing for three objectives: *Exchange/share different opinions or views*, *Communicate feelings or emotions*, and *Generate buy-in*. Instead, the effectiveness of video-conferencing is found to be positively related to the number of meeting participants for two

objectives ($p < 0.05$): *Assemble a team and/or motivate teamwork* and *Resolve conflicts and disagreements*.

Table 7.3. Correlations between Meeting Mode Effectiveness and the Number of Meeting Participants (Study 2)

Business Meeting Objectives	Business Meeting Modes				
	Overall N=325	AC N=89	VC N=70	TP N=70	FTF N=96
Exchange/share different opinions or views of a topic or issue	-0.03	-0.23*	0.17	-0.01	0.09
Clarify a concept, issue or idea	0.01	0.02	0.16	0.09	0.17
Make a decision	0.02	-0.21	0.25	0.24	0.05
Give or receive feedback	-0.14*	-0.22	0.09	-0.03	-0.13
Find a solution to a problem that has arisen	-0.13*	-0.17	0.20	-0.08	0.04
Communicate positive or negative feelings or emotions on a topic or issue	-0.19*	-0.24*	0.02	0.03	-0.12
Maintain relationships with one or more other people and stay in touch	-0.16*	-0.09	-0.23	-0.16	0.10
Routine exchange of information	0.07	0.12	0.16	-0.13	-0.05
Build trust and relationships with one or more individuals	-0.16*	-0.08	0.04	-0.05	-0.06
Generate buy-in or consensus on an idea	-0.13	-0.26*	0.10	0.08	0.05
Show personal concern about or interest in a particular issue or situation	-0.09	-0.01	0.22	-0.11	0.05
Non-routine exchange of information	-0.05	0.01	0.22	0.01	-0.13
Generate ideas on products, projects or initiatives	-0.08	-0.12	0.09	0.10	0.16
Assemble a team and/or motivate teamwork on a project	-0.03	0.00	0.31*	0.02	0.13
Give or receive orders	-0.05	-0.09	0.19	0.24	-0.10
Resolve conflicts and disagreements within a group	-0.09	-0.08	0.29*	-0.14	0.22
Exchange confidential, private or sensitive	-0.14*	-0.17	0.26	-0.05	-0.04
Assert and/or reinforce your authority, status, position to your team or others	-0.04	-0.05	0.24	0.09	0.12
Negotiate or bargain on a deal or contract	-0.11	-0.15	0.26	-0.16	0.24

* $p < 0.05$; ** $p < 0.001$

1.3 Analysis of Study 4

Table 7.4 shows the Pearson correlations between the number of meeting participants and meeting mode capability importance overall, and for each of the meeting objectives. The table shows that no significant relationships are found at the 0.0004 significance level between the number of meeting participants and capability importance. However, at the 0.05 significance level, the number of meeting participants is positively related to the importance of three

business meeting mode capabilities: “Use shared computer screens and/or work spaces,” “Experience co-location,” and “Do side-tasks that other attendees are unaware of.” While “Use shared computer screens and/or work spaces” is more important in larger meetings overall, the relationship is not found to be significant for any of the specific objectives. On the other hand, “Experience co-location” is significantly more important in larger meetings for achieving six objectives (*Build trust and relationships with one or more individuals, Make a decision, Find a solution to a problem that has arisen, Assemble a team and/or motivate teamwork on a project, Exchange/share different opinions or views of a topic or issue, Exchange confidential, private or sensitive information*).

In addition, the importance of “Do side tasks that others are unaware of” is positively and significantly related to the number of meeting participants for five objectives ($p < 0.05$) (*Make a decision, Find a solution to a problem that has arisen, Assemble a team and/or motivate teamwork on a project, Non-routine exchange of information, Communicate positive or negative feelings or emotions*). Furthermore, “Observe what attendees are looking at” is more important in larger meetings for two objectives: *Non-routine exchange of information* and *Exchange confidential, private or sensitive information*. Also, “Have ancillary interaction before or after the formal meeting” is more important in larger meetings ($p < 0.05$) for *Non-routine exchange of information*, yet less important in larger meetings ($p < 0.05$) for *Assert and/or reinforce your authority, status, or position*. Finally, “Hear attendees’ voices” is also less important in larger meetings ($p < 0.05$) to *Resolve conflicts and disagreements*.

Table 7.4. Correlations between the Importance of Meeting Mode Capabilities and the Number of Meeting Participants (Study 4)

	Business Meeting Mode Capabilities												
Business meeting objectives	1	2	3	4	5	6	7	8	9	10	11	12	13
Overall	-0.01	0.08*	0.01	0.04	0.01	0.08*	0.06	0.04	0.07	0.03	0.08*	0.01	0.01
Clarify a concept, issue or idea	0.01	0.06	-0.01	0.02	-0.02	0.09	-0.01	0.07	0.04	0.02	0.10	0.00	-0.02
Exchange/share different opinions or views of a topic or issue	-0.09	0.03	0.01	0.06	0.02	0.15*	-0.01	0.06	0.06	0.06	0.03	0.01	0.02
Find a solution to a problem that has arisen	-0.05	0.05	0.00	0.00	0.03	0.12*	0.05	0.06	0.02	0.04	0.10*	0.06	0.00
Make a decision	0.01	0.03	0.04	0.05	0.04	0.11*	0.06	0.09	0.10	0.05	0.11*	0.01	0.06
Give or receive feedback	-0.05	0.07	-0.07	-0.04	-0.06	0.06	0.06	-0.03	0.03	0.02	0.04	-0.04	-0.03
Routine exchange of information	0.04	0.03	0.04	0.08	0.03	0.09	-0.03	0.03	0.05	0.06	0.05	0.05	-0.01
Generate ideas on products, projects or initiatives	-0.05	0.06	0.03	0.07	0.04	0.10	0.02	-0.03	0.07	0.07	0.07	-0.02	0.05
Assemble a team and/or motivate teamwork on a project	0.08	0.08	0.02	0.06	0.01	0.18*	0.02	0.06	-0.01	0.06	0.14*	0.02	0.00
Build trust and relationships with one or more individuals	-0.02	0.08	-0.02	0.09	0.02	0.16*	0.01	0.03	0.10	0.02	0.11	0.05	0.05
Maintain relationships with one or more other people	0.01	0.07	-0.05	0.04	-0.04	0.10	-0.01	-0.02	0.06	0.01	0.03	0.02	0.08
Generate buy-in or consensus on an idea	-0.03	0.04	-0.03	0.01	-0.06	0.03	0.03	0.03	0.00	-0.01	0.08	-0.08	0.01
Resolve conflicts and disagreements within a group	-0.21*	0.05	-0.05	0.03	-0.04	0.05	0.09	0.08	0.12	-0.06	0.02	0.04	-0.04
Non-routine exchange of information	-0.02	0.13	0.12	0.09	0.05	0.12	0.18*	0.26*	0.05	0.07	0.17*	-0.06	-0.08
Show personal concern or interest	-0.02	0.06	-0.01	0.08	-0.02	0.12	0.09	-0.01	0.10	0.06	0.09	0.04	0.09
Exchange confidential, private or sensitive information	0.09	0.16	0.10	0.17	0.15	0.22*	0.22*	0.18	0.10	0.06	0.14	0.12	0.17
Communicate positive or negative feelings or emotions	0.00	0.09	-0.12	-0.05	-0.04	0.20	-0.03	0.09	0.11	-0.05	0.26*	0.12	0.12
Give or receive orders	-0.08	-0.04	-0.15	-0.06	-0.15	-0.12	-0.14	-0.17	0.04	-0.11	-0.12	-0.03	0.03
Negotiate or bargain on a deal or contract	-0.05	0.18	0.09	-0.08	-0.01	0.28	0.04	0.19	0.21	0.00	0.26	0.28	0.14
Assert and/or reinforce your authority, status, position	0.10	-0.15	-0.12	-0.10	-0.20	-0.12	-0.38	-0.46*	-0.13	-0.08	0.31	0.14	0.04

* $p < 0.05$; ** $p < 0.0004$

1	Hear attendees' voices (speech and vocal tone)	8	Have ancillary interaction before or after the formal meeting
2	Use shared computer screens and/or work spaces	9	Have side conversations with one or more attendees
3	See attendees' body language and gestures	10	Observe appearance (posture, clothing, etc.) of attendees
4	Have eye contact with other attendees	11	Do side-tasks that other attendees are unaware of
5	Discern attendees' facial expressions	12	Use ancillary resources such as a flip-chart
6	Experience co-location (the sense of being in the same physical location)	13	Examine and/or manipulate specific physical objects (e.g. prototypes or samples)
7	Observe what attendees are looking at		

2. ANALYSIS OF THE INFLUENCE OF THE MEETING DURATION

In this section, the datasets of Study 1, 2, and 4 are first described in terms of the meeting duration across meeting modes. In addition, the significance of the differences in duration across meeting modes is evaluated. In a next step, the relationship between the duration of the meeting and the effectiveness of the meeting modes is examined, through a correlational analysis based on Study 1 and 2. After applying a correction for multiple testing (19 objectives, overall effectiveness and for each of the 4 modes), the critical p-value becomes 0.001 ($= 0.10/(19 \times 5)$) (Neter et al., 1996). Finally, to examine the relationship between the meeting duration and the importance of the meeting mode capabilities, a Spearman Rank-order correlational analysis is conducted. The overall correlation coefficients, as well as the correlation coefficient for each of the 19 business meeting objectives, are evaluated. After applying a correction for multiple testing (13 capabilities, overall importance and for each of the 19 objectives), the critical p-value becomes 0.0004 ($= 0.10/(20 \times 13)$) (Neter et al., 1996). In addition to the critical p-values, the 0.05 significance level is reported in the analyses.

Table 7.5 shows the average meeting duration (in minutes), across the four modes for the data gathered in Study 1, Table 7.6 shows the distribution of meeting duration across the meeting modes in Study 2, and Table 7.7 shows the distribution of meeting duration across the meeting modes in Study 4. It is worth noting that the observed meeting durations cannot be interpreted as being related to any inherent characteristics of the meeting modes themselves, since most telepresence meeting rooms had very high utilization levels, and therefore had to be reserved for specific durations for meetings. It is possible that these meetings could have been longer if the facilities were more freely available.

Table 7.5. Average Meeting Duration across Business Meeting Modes (Study 1)

Meeting mode	Average duration in minutes (and s.d.)	N
AC	56.69 (23.32)	59
VC	61.82 (24.52)	33
TP	85.50 (49.38)	30
FTF	96.88 (67.75)	32
Total		154

Table 7.6. Meeting Duration Distribution across Business Meeting Modes (Study 2)

Meeting mode	Less than 15 minutes	15 to 30 minutes	30 to 60 minutes	1 to 2 hours	Over 2 hours	Total
AC	2	22	47	18	0	89
VC	0	2	36	29	5	72
TP	0	0	30	38	2	70
FTF	3	18	45	28	3	97
Total	5	42	158	113	10	328

Table 7.7. Meeting Duration Distribution across Business Meeting Modes (Study 4)

Meeting mode	Less than 15 minutes	15 to 30 minutes	30 to 60 minutes	1 to 2 hours	Over 2 hours	Total
AC	5	43	176	41	1	266
VC	8	43	103	46	6	206
TP	1	5	64	51	13	134
FTF	3	40	110	57	31	241
Total	17	131	453	195	51	847

The meeting duration differs significantly across the modes in all studies (Study 1 (ANOVA $F(3, 150) = 8.06$; $p < 0.001$), Study 2 (Kruskal-Wallis ($F(3, 324) = 42.70$; $p < 0.001$), Study 4 (Kruskal-Wallis ($F(3, 843) = 54.57$; $p < 0.001$)). In Study 1, post-hoc tests indicate that audio-conferencing meetings are significantly shorter in duration than both telepresence and face-to-face meetings ($p < 0.05$). In Study 2, the mean rank duration scores are as follows: AC (126.41), VC (191.98), TP (205.69), FTF (149.33). Post-hoc tests reveal that each pairwise comparison of meeting duration is significant ($p < 0.05$), except for the difference between audio-conferencing and face-to-face, and between video-conferencing and telepresence. In Study 4, the mean rank duration scores are as follows: AC (372.54), VC (385.20), TP (528.05), FTF (456.11). Post-hoc tests reveal that each pairwise comparison of meeting duration is significant ($p < 0.05$), except for the difference between audio- and video-conferencing.

2.1 Analysis of Study 1

Table 7.8 shows the overall correlation coefficients, as well as the correlation coefficients for each of the four meeting modes, along with their significance levels. Given the small sample sizes in the groups, the reported correlations are Kendall's tau-b values.

No significant relationships are found at the 0.001 significance level. In addition, the table shows that, overall there is one relationship between the duration of the meeting and meeting mode effectiveness that is significant at the 0.05 level, namely a positive relationship

for *Resolve conflicts and disagreements*. In addition, the analysis reveals that particularly in face-to-face meetings this positive relationship is present. However, for *Give and receive feedback* in video-conferencing and for *Non-routine exchange of information* in audio-conferencing meetings, longer meetings are negatively related to meeting mode effectiveness.

Table 7.8. Correlations between Meeting Mode Effectiveness and the Meeting Duration (Study 1)

Business Meeting Objectives	Business Meeting Modes				
	Overall N=154	AC N=59	VC N=33	TP N=30	FTF N=32
Clarify a concept, issue or idea	0.10	-0.09	-0.19	0.05	0.22
Exchange/share different opinions or views of a topic or issue	0.01	0.06	-0.30	-0.20	0.19
Build trust and relationships with one or more individuals	0.06	0.01	-0.08	-0.31	-0.14
Maintain relationships with one or more other people and stay in touch	-0.12	-0.07	-0.30	-0.31	0.05
Generate buy-in or consensus on an idea	0.12	0.17	-0.01	-0.16	0.08
Give or receive feedback	-0.07	0.05	-0.42*	-0.01	-0.16
Generate ideas on products, projects or initiatives	0.09	-0.03	-0.18	0.05	0.22
Make a decision	0.17	0.24	0.17	-0.21	0.26
Non-routine exchange of information	-0.09	-0.34*	-0.41	-0.37	0.14
Routine exchange of information	-0.04	0.13	-0.05	-0.26	-0.03
Communicate positive or negative feelings or emotions on a topic or issue	0.04	-0.03	-0.42	-0.29	0.42
Find a solution to a problem that has arisen	0.00	-0.13	-0.09	-0.21	0.22
Show personal concern about or interest in a particular issue or situation	-0.05	0.00	-0.40	-0.26	0.16
Exchange confidential, private or sensitive information	-0.02	-0.30	0.05	-0.36	0.06
Assemble a team and/or motivate teamwork on a project	-0.07	-0.03	-0.36	-0.26	-0.02
Give or receive orders	0.20	0.18	-0.20	0.47	-0.06
Resolve conflicts and disagreements within a group	0.38*	0.25	.	0.14	0.62*
Assert and/or reinforce your authority, status, position to your team or others	0.03	0.36	-0.18	-0.21	0.00
Negotiate or bargain on a deal or contract	-0.08	-0.26	-0.25	-0.27	0.18

* $p < 0.05$; ** $p < 0.001$

2.2 Analysis of Study 2

Given the data on meeting duration in Study 2 is categorical, a Spearman Rank-order correlation is used. The table of correlations (Table 7.9) shows that there are two positive, overall relationships at the 0.05 significance level, namely for *Assert and/or reinforce your*

authority and *Give or receive orders*. For the latter objective, the relationship for telepresence is found to be highly significant ($p < 0.001$). In addition, a positive relationship is found between the effectiveness of face-to-face meetings and meeting duration for *Negotiate or bargain on a deal or contract* ($p < 0.05$).

Table 7.9. Correlations between Meeting Mode Effectiveness and the Meeting Duration (Study 2)

Business Meeting Objectives	Business Meeting Modes				
	Overall N=328	AC N=89	VC N=72	TP N=70	FTF N=97
Exchange/share different opinions or views of a topic or issue	0.09	-0.07	0.24	0.06	0.05
Clarify a concept, issue or idea	0.06	-0.01	0.06	-0.03	0.03
Make a decision	0.10	0.10	0.01	0.24	0.04
Give or receive feedback	-0.04	-0.04	-0.16	0.14	-0.09
Find a solution to a problem that has arisen	-0.05	-0.02	0.19	-0.18	-0.12
Communicate positive or negative feelings or emotions on a topic or issue	0.02	-0.11	-0.11	-0.01	-0.14
Maintain relationships with one or more other people and stay in touch	0.00	-0.05	-0.04	-0.09	0.09
Routine exchange of information	0.05	0.09	0.19	0.16	-0.05
Build trust and relationships with one or more individuals	-0.02	-0.11	-0.06	0.16	-0.20
Generate buy-in or consensus on an idea	0.02	-0.10	0.05	0.00	0.03
Show personal concern about or interest in a particular issue or situation	0.01	0.00	0.11	-0.09	-0.03
Non-routine exchange of information	0.00	0.02	-0.08	0.03	-0.01
Generate ideas on products, projects or initiatives	0.03	-0.11	0.17	0.17	-0.05
Assemble a team and/or motivate teamwork on a project	0.04	-0.16	-0.13	0.19	-0.01
Give or receive orders	0.14*	0.12	0.13	0.63**	0.01
Resolve conflicts and disagreements within a group	0.04	-0.05	0.03	-0.16	0.01
Exchange confidential, private or sensitive information	0.02	0.02	0.04	0.01	-0.11
Assert and/or reinforce your authority, status, position to your team or others	0.15*	-0.10	0.24	0.15	0.12
Negotiate or bargain on a deal or contract	0.07	-0.21	-0.06	0.01	0.37*

* $p < 0.05$; ** $p < 0.001$

2.3 Analysis of Study 4

Table 7.10 shows the Spearman Rank-order correlation between the duration of the meeting and meeting mode capability importance overall, and for each of the meeting objectives. As

the table shows, nine meeting mode capabilities become more important for longer meetings overall: “See attendees' body language and gestures,” “Have eye contact with other attendees,” “Discern attendees' facial expressions,” “Experience co-location,” “Observe what attendees are looking at,” “Have ancillary interaction before or after the formal meeting,” “Observe appearance of attendees,” “Use ancillary resources,” and “Examine and/or manipulate specific physical objects.” In addition, positive relationships are found between meeting duration and the importance of these capabilities, for multiple objectives. Also, “Hear attendees' voices” is more important for longer meetings for two objectives (*Assemble a team and/or motivate teamwork* and *Generate buy-in or consensus on an idea*) and “Do side-tasks that other attendees are unaware of” is less important in longer meetings for two other objectives (*Generate ideas on products, projects or initiatives* and *Non-routine exchange of information*).

Table 7.10. Correlations between the Importance of Meeting Mode Capabilities and the Meeting Duration (Study 4)

	Business Meeting Mode Capabilities												
Business meeting objectives	1	2	3	4	5	6	7	8	9	10	11	12	13
Overall	0.04	0.03	0.22**	0.24**	0.24**	0.21**	0.18**	0.09*	0.03	0.18**	-0.06	0.10*	0.08*
Clarify a concept, issue or idea	0.08	-0.05	0.28**	0.29**	0.30**	0.23**	0.23**	0.17*	0.07	0.22**	-0.06	0.17*	0.13*
Exchange/share different opinions or views	0.03	-0.02	0.20**	0.23**	0.24**	0.25**	0.16*	0.05	0.02	0.19**	-0.08	0.10	0.02
Find a solution to a problem that has arisen	0.04	0.02	0.20**	0.18*	0.18*	0.13*	0.17*	0.16*	0.01	0.14*	0.00	0.15*	0.12*
Make a decision	0.03	0.02	0.22**	0.23**	0.25**	0.18*	0.20**	0.10	0.06	0.19*	0.00	0.13*	0.07
Give or receive feedback	0.04	0.05	0.19*	0.24**	0.25**	0.18*	0.18*	0.13*	0.00	0.22**	-0.03	0.11*	0.06
Routine exchange of information	0.00	-0.03	0.23**	0.25**	0.23**	0.24**	0.16*	0.14*	0.02	0.29**	-0.05	0.16*	0.12*
Generate ideas on products, projects or initiatives	0.01	0.01	0.19*	0.18*	0.22**	0.20**	0.11*	0.04	-0.06	0.09	-0.15*	0.11	0.06
Assemble a team and/or motivate teamwork on a project	0.16*	0.00	0.25**	0.28**	0.29**	0.22**	0.21*	0.09	0.02	0.18*	-0.04	0.22**	0.09
Build trust and relationships with one or more individuals	0.00	-0.01	0.23*	0.32**	0.29**	0.21*	0.10	0.09	0.04	0.20*	-0.15*	0.15*	0.08
Maintain relationships and stay in touch	-0.01	-0.04	0.25**	0.34**	0.26**	0.22*	0.19*	0.07	0.04	0.15*	-0.07	0.16*	0.15*
Generate buy-in or consensus on an idea	0.15*	0.11	0.27**	0.30**	0.31**	0.20*	0.19*	0.01	0.06	0.19*	-0.08	0.10	0.05
Resolve conflicts and disagreements within a group	-0.03	0.02	0.22*	0.21*	0.15	0.17*	0.25*	0.01	0.01	0.14	-0.16	0.02	-0.14
Non-routine exchange of information	0.06	-0.01	0.23*	0.32**	0.28*	0.24*	0.15	0.18*	0.04	0.10	-0.19*	0.04	-0.01
Show personal concern or interest	0.06	0.03	0.28*	0.33**	0.24*	0.13	0.23*	0.06	0.02	0.29*	-0.10	0.20*	0.06
Exchange confidential, private or sensitive information	0.00	0.01	0.16	0.26*	0.25*	0.10	0.17	0.23*	0.11	0.10	-0.07	0.17	0.16
Communicate positive or negative feelings or emotions	0.17	-0.04	0.23*	0.15	0.32*	0.29*	0.12	0.14	0.14	0.15	-0.02	0.19	0.10
Give or receive orders	-0.04	0.06	0.12	0.17	0.17	0.14	0.22	0.18	0.03	0.08	-0.24	0.05	0.04
Negotiate or bargain on a deal or contract	0.12	0.07	0.26	0.22	0.16	0.27	0.25	0.04	-0.02	0.09	-0.14	0.12	0.17
Assert and/or reinforce your authority, status, position	0.11	-0.29	0.35	0.38	0.13	0.01	-0.02	0.04	0.07	0.44*	-0.10	0.20	0.12

* $p < 0.05$; ** $p < 0.0004$

1	Hear attendees' voices (speech and vocal tone)	8	Have ancillary interaction before or after the formal meeting
2	Use shared computer screens and/or work spaces	9	Have side conversations with one or more attendees
3	See attendees' body language and gestures	10	Observe appearance (posture, clothing, etc.) of attendees
4	Have eye contact with other attendees	11	Do side-tasks that other attendees are unaware of
5	Discern attendees' facial expressions	12	Use ancillary resources such as a flip-chart
6	Experience co-location (the sense of being in the same physical location)	13	Examine and/or manipulate specific physical objects (e.g. prototypes or samples)
7	Observe what attendees are looking at		

3. DISCUSSION

In this chapter, the third research question of this dissertation was addressed: *How do the number of meeting participants and the duration of the meeting influence the effectiveness of business meeting modes?*

3.1 The Influence of the Number of Meeting Participants

The findings extend prior research on the number of meeting participants that did not consider differences across meeting modes (Monge et al., 1989; Panko and Kinney, 1995; Romano and Nunamaker, 2001). In particular, face-to-face meetings were found to have the lowest number of participants, in each study. A closer look at the data collected in Study 2 and 4 reveals that the hybrid nature of the meeting seems to be related to the number of meeting participants. In particular, as Table 7.11 shows, hybrid meetings involve more participants than non-hybrid meetings. This finding provides further evidence that technology easily enables the inclusion of individuals who would otherwise not participate in the meeting (Dutton et al., 1982).

Table 7.11. Average Number of Meeting Participants in Hybrid and Non-Hybrid Meetings

	Study 2				Study 4			
	Hybrid		Non-Hybrid		Hybrid		Non-Hybrid	
Meeting mode	Average meeting size (and s.d.)	N	Average meeting size (and s.d.)	N	Average meeting size (and s.d.)	N	Average meeting size (and s.d.)	N
VC	9.21 (5.14)	42	7.56 (3.31)	27	8.23 (7.26)	137	7.30 (12.13)	69
TP	9.39 (3.71)	33	8.47 (3.40)	36	11.17 (7.91)	76	6.24 (3.89)	58
FTF	6.15 (2.91)	20	4.14 (2.82)	76	8.28 (10.70)	124	5.61 (3.59)	117

In addition, across the three studies, the findings of the correlational analyses suggest that the number of meeting participants had a limited influence on the effectiveness of business meeting modes. This finding is consistent with Leach et al. (2009), who found no significant relationships between the number of meeting participants and perceived meeting effectiveness in their exploratory analysis. It is important to note that at the conservative p-

value, no relationships were found to be significant, yet several significant correlations were found at the 0.05 level, which should thus be interpreted with caution.

In Study 1 and 2, most of the significant relationships between number of meeting participants and meeting mode effectiveness, were negative. For example, for *Exchange/share different opinions and views*, a negative relationship was found for the effectiveness of audio-conferencing in Study 2 and of telepresence in Study 1. Likewise, negative relationships were found for *Communicate feelings and emotions* for video-conferencing in Study 2 and for telepresence in Study 1. Also, the number of meeting participants was found to be negatively related to the effectiveness of audio-conferencing to *Generate buy-in* in Study 2. Hence, a meeting organizer should be careful not to invite too many people for these objectives. Instead, the relationship was found to be positive for *Resolve conflicts and disagreements* and for *Assemble a team* for video-conferencing meetings in Study 2, and for *Make a decision* in audio-conferencing meetings in Study 1.

Consistent with the limited number of significant relationships between the number of meeting participants and the effectiveness of meeting modes, the number of significant relationships with the importance of meeting mode capabilities was limited. In general, the importance of “Use shared computer screens,” “Experience co-location,” and “Do side-tasks that other attendees are unaware of” were found to increase in larger meeting, albeit at the 0.05 significance level.

3.2 The Influence of the Meeting Duration

The exploratory analysis on the meeting duration also extends prior research on business meetings, which did not examine differences across multiple meeting modes (Monge et al., 1989; Panko and Kinney, 1995; Romano and Nunamaker, 2001). In line with prior research (Denstadli et al., 2011; Kydd and Ferry, 1994), face-to-face meetings were found to be longer in duration than technology-enabled meetings in Study 1. However, in Study 2 and 4, telepresence meetings seemed to have the longest duration. Also, the correlational analyses revealed that the meeting duration had a limited influence on the effectiveness scores. This finding is consistent with Leach et al. (2009), who found no significant relationships between meeting duration and perceived meeting effectiveness in their exploratory analysis.

However, in Study 1, negative relationships between meeting duration and the effectiveness of meeting modes were found for audio-conferencing (*Non-routine exchange of information*) and video-conferencing (*Give or receive feedback*) (see Table 7.8). Hence, a

meeting organizer may want to be careful when determining the duration of an audio- or video-conferencing meeting. One significant positive relationship was found for telepresence in Study 2 (for *Give or receive orders*), and two strong positive relationships were found for face-to-face meetings: *Resolve conflicts and disagreements* (Study 1) and *Negotiate or bargain* (Study 2). In sum, while the significant relationships between meeting mode effectiveness and duration were negative for audio- and video-conferencing meetings, they were positive for telepresence and face-to-face meetings.

Furthermore, duration was found to have a profound influence on capability importance. All capabilities, except for three, were found to become more important for longer meetings across different objectives. This finding supports the notion that longer telepresence and face-to-face meetings can be more effective, while the effectiveness of audio- and video-conferencing meetings does not increase for longer meetings. For two capabilities, no significant relationships were found (“Use shared computer screens and/or work spaces” and “Have side conversations with one or more attendees”) and for one capability (“Do side-tasks that other attendees are unaware of”), the importance decreased in longer meetings.

Finally, the findings on the capabilities can be used to explain some of the significant relationships found between duration and meeting mode effectiveness. For example, for *Non-routine exchange of information*, the negative relationship found between meeting duration and the effectiveness of audio-conferencing, can be explained by the finding that visual capabilities become more important in longer meetings for achieving this objective. Likewise, for *Give or receive feedback*, longer video-conferencing meetings were found to be less effective, which can be related to the increasing importance of “Have ancillary interaction” and “Use ancillary resources” in longer meetings for this objective.

3.3 Meeting Effectiveness

It is important to note that this chapter focused on the influence of the number of meeting participants and of the duration of the meeting on meeting mode effectiveness, and did not consider their influence on the broader notion of meeting effectiveness. In particular, although there may be no relationship between these factors and meeting mode effectiveness, they may still be related to meeting effectiveness (and vice versa). Therefore, an important avenue for future research is to consider the influence of these factors on both meeting and meeting mode effectiveness.

In addition, the relationships between the number of meeting participants and meeting mode effectiveness and between the duration of the meeting and meeting mode effectiveness are explored under the assumption of linearity. However, these relationships could be curvilinear, with an optimum number of participants and duration for each combination of meeting objective and mode (Patrashkova-Volzdoska et al., 2003). The presence of such relationships in the current datasets was explored, yet no evidence was found for them.

Further limitations and future research directions are discussed in the general conclusion section of this dissertation.

CONCLUSION AND FUTURE RESEARCH

CHAPTER VIII: CONCLUSION AND FUTURE RESEARCH

The research in this dissertation is motivated by the evolution of multiple technologies for distributed business meetings, combined with a gap in the literature on criteria for effectively selecting a business meeting mode. In other words, the availability of communication technologies for business meetings, as less costly and more environmentally friendly alternatives to the traditional face-to-face setting, causes a non-trivial choice problem for meeting organizers. Since business meetings are an important and expensive component of many business operations, this choice problem is a significant one.

To address this problem, this dissertation started from a critical review of the organizational communication literature, and formulated three research questions. The first question concerned the comparative effectiveness of four business meeting modes (audio-conferencing, video-conferencing, telepresence, face-to-face) for achieving a comprehensive set of meeting objectives. The second question sought to explain differences in effectiveness across meeting modes, by looking at the influence of different meeting mode capabilities. Finally, the influence of two important business meeting variables on meeting mode effectiveness was explored in a third research question: the number of meeting participants and the meeting duration.

To address these research questions, a list of business meeting objectives and a list of meeting mode capabilities were developed in a first phase, based on a literature review and a relevance check with managers. In a second phase, four field studies across three companies were conducted. In total, input was obtained from more than 2,000 participating business meeting organizers, who completed an online questionnaire in which they referred to a business meeting they organized recently using one of the four meeting modes.

With respect to the first research question, the results showed that the effectiveness of a meeting mode increased monotonically with the capabilities it provides. However, the meeting mode effectiveness relationships were not found to be uniform across objectives. In particular, across two field studies, six categories of meeting objectives emerged, for which a similar meeting mode effectiveness ordering applied (see Table 8.1). A first category of objectives was identified, for which all meeting modes were equally effective. For a second category, audio-conferencing meetings were found to be less effective than all other meeting modes. For a third category, audio- and video-conferencing meetings were found to be less effective than telepresence and face-to-face meetings. Two additional categories involved

small refinements to the effectiveness ordering of the latter category, as audio-conferencing was additionally found to be less effective than video-conferencing in category 4, and telepresence was additionally found to be less effective than face-to-face in category 5. In a sixth and final category, all technology-enabled meeting modes were found to be less effective than face-to-face interaction. In addition, hybrid meetings, in which one or more meeting attendees participate through a lower capability meeting mode, were found to be quite prevalent. This is surprising, since the hybrid nature of meetings seems to lower their effectiveness.

Table 8.1. Categories of Business Meeting Mode Effectiveness Orderings

1	(AC, VC, TP, FTF)
2	$AC < (VC, TP, FTF)$
3	$(AC, VC) < (TP, FTF)$
4	$AC < VC < (TP, FTF)$
5	$(AC, VC) < TP < FTF$
6	$(AC, VC, TP) < FTF$

With respect to the second research question, the results showed that three capabilities were important for achieving most of the meeting objectives: “Hear attendees’ voices,” “Use shared computer screens and/or work spaces,” and “Experience co-location.” For “Hear attendees’ voices, this finding is consistent with prior research, in which this capability has been frequently considered to be the most important capability of media. However, the importance of the two other capabilities for achieving most of the meeting objectives is surprising. Further research is needed to determine whether this is due to the respondent evaluating the importance of the meeting mode capabilities for different objectives simultaneously. Visual capabilities (“See attendees’ body language and gestures,” “Have eye contact,” “Discern attendees’ facial expressions,” “Observe what attendees are looking at,” and “Observe appearance of attendees”) were also important for achieving multiple objectives and especially for emotion-laden objectives. Furthermore, capabilities such as “Use ancillary resources,” “Examine physical objects,” and “Have ancillary interaction,” were important for achieving specific objectives only. Finally, capabilities such as “Have side conversations” and “Do side-tasks” were generally not found to be important to achieve objectives. The findings on the importance of business meeting mode capabilities help to explain the meeting mode effectiveness categories that were observed in the first two studies (see Table 8.1). For instance, for objectives that fell into category 2 of Table 8.1 above ($AC < (VC, TP, FTF)$), visual capabilities were found to be important.

The results of the studies addressing the third research question showed that the number of meeting participants had a limited influence, and that more participants were rarely positively related to meeting mode effectiveness. In addition, the influence of the duration of the meeting seemed to depend on the meeting mode used. In particular, while negative relationships with effectiveness were found for longer audio- and video-conferencing meetings, positive relationships were found for longer telepresence and face-to-face meetings.

Collectively, the results of this dissertation can serve as a foundation for further investigations seeking to address the business meeting mode selection problem. In the following sections of this chapter, the theoretical and managerial implications of the dissertation are discussed and then the limitations and future research directions are presented.

1. THEORETICAL IMPLICATIONS

While prior research on business meetings has focused on various elements such as meeting expenses, attitudes, satisfaction, duration, size, composition, and support systems (Briggs et al., 2003; Dennis et al., 1988; DeSanctis and Gallupe, 1987; Nunamaker et al., 1991b; Romano and Nunamaker, 2001; Trevino et al., 2000), there is a paucity of research on how to select a meeting mode. To address this problem, this dissertation focused on meeting mode effectiveness considerations, while acknowledging that additional factors, such as convenience and cost, influence the ultimate mode selection (as elaborated on in the limitations section of this chapter). Therefore, this dissertation makes key theoretical contributions in terms of its compilation and analysis of lists of business meeting objectives and of meeting mode capabilities, the findings on the comparative effectiveness of meeting modes, and study of the effective use of telepresence.

1.1 Business Meeting Objectives

In this dissertation, a list of business meeting objectives was compiled, based on a literature review and relevance check with managers. The list is broad and was found to be adequate to characterize business meetings. Furthermore, the ordering of frequencies of objectives was found to be reasonably consistent across the studies. As Table 8.2 shows, two objectives were found to be in the top three of overall frequent objectives: *Clarify a concept, issue or idea* and *Exchange/share opinions or views on a topic or issue*. In addition, *Make a decision* is the third most frequent objective in two studies (Study 2 and 3), and the fourth most frequent objective in another study (Study 4). Moreover, the two least frequent objectives in each

study, shown at the bottom of Table 8.2, are *Assert and/or reinforce your authority, status, position to your team or others* and *Negotiate or bargain on a deal or contract*. In addition, *Give or receive orders*, *Resolve conflicts and disagreements within a group*, and *Exchange confidential, private or sensitive information* are also found to be relatively infrequent in each study. It is of interest to note that, although these objectives seem to be infrequent in meetings, they may have a large impact on the need for meeting mode capabilities.

The consistency of the frequency ordering of objectives across the three companies, operating in different industries, is striking. The list of business meeting objectives can therefore serve as a basis for future research, which may include comparisons of the frequencies of meeting objectives in additional industries, and across job levels (A. Allen et al., 2014).

Table 8.2. Frequency Ordering of Business Meeting Objective across the 4 Field Studies

Business Meeting Objectives	Study 1	Study 2	Study 3	Study 4
Clarify a concept, issue or idea	1	2	1	1
Exchange/share different opinions or views of a topic or issue	2	1	2	2
Maintain relationships with one or more other people and stay in touch	3	7	11	10
Build trust and relationships with one or more individuals	4	9	7	9
Generate buy-in or consensus on an idea	5	10	10	11
Give or receive feedback	6	4	8	5
Generate ideas on products, projects or initiatives	7	13	4	7
Make a decision	8	3	3	4
Routine exchange of information	9	8	5	6
Show personal concern about or interest in a particular issue or situation	10	11	12	14
Find a solution to a problem that has arisen	11	5	6	3
Non-routine exchange of information	12	12	15	13
Assemble a team and/or motivate teamwork on a project	13	14	9	8
Communicate positive or negative feelings or emotions on a topic or issue	14	6	14	16
Exchange confidential, private or sensitive information	15	17	13	15
Resolve conflicts and disagreements within a group	16	16	16	12
Give or receive orders	17	15	17	17
Assert and/or reinforce your authority, status, position to your team or others	18	18	18	19
Negotiate or bargain on a deal or contract	19	19	19	18

The literature does not provide a canonical basis for classifying these meeting objectives. Therefore, the objectives are presented and analyzed individually in this dissertation. However, in the analysis of the empirical studies, categories of meeting objectives are identified, based on the meeting mode effectiveness orderings observed (see Table 8.1). Meeting objectives within a category seem to have similar characteristics, as discussed in Chapter 5 (see section 4.2 on p. 82). However, the extent to which the objectives involve different dimensions, such as reciprocity and complexity (King and Xia, 1997; Te'eni, 2001), was not empirically studied. In future research, the perceptions of, for instance, cognitive and affective complexity of each business meeting objective can be measured, and a factor analysis can then be conducted to reveal similarities among objectives.

1.2 Meeting Mode Effectiveness

This dissertation provides novel insight into the effectiveness of different communication technologies for distributed business meetings. The results of this research support the key principle of social presence and media richness theory, which is that for a medium to be used effectively, the requirements of the communication objective have to be considered (Daft et al., 1987; Short et al., 1976). Therefore, the field study findings provide guidance in the effective utilization of meeting modes and serve as a starting point for the development of usage norms for different technology-enabled communication media in distributed meetings.

Meeting mode effectiveness was found to increase monotonically with the capabilities of the mode, which is in line with previous qualifications of social presence and media richness theory (Kock, 2004; Rice, 1992). Moreover, some capabilities were found to be redundant for specific objectives, for example, visual capabilities were negatively related to *Routine exchange of information*. This is consistent with the notion that “multiple cues can overcomplicate the communication and distract the receiver's attention” (Daft et al., 1987, p. 359). However, higher capability meeting modes were not found to be lower in effectiveness for this objective. Furthermore, hybrid meetings, in which one or more attendees participate through a lower capability meeting mode, were found to lower meeting mode effectiveness. Future research directions on this topic are outlined below.

The list of business meeting mode capabilities developed in this dissertation, provides a useful basis to explain differences in effectiveness across communication technologies and face-to-face. The examination of meeting mode capabilities is in keeping with Te'eni's suggestion (2001) to resolve the inconclusive findings of media effects by

investigating what each capability affords separately. The list of meeting mode capabilities drew from prior communication media conceptualizations, and contains a comprehensive set of capabilities in the context of business meetings. An interesting avenue for future research is to explore the relationships between meeting mode capabilities. For example, a factor analysis could be conducted on the importance scores of capabilities to delineate groups of capabilities. As an initial indication of this, the highest correlations were found among visual capabilities (“Have eye contact,” “Discern attendees facial expressions,” and “See attendees’ body language and gestures”) for the data sets in this dissertation.

Also, while prior research has examined the number of meeting participants and the duration of the meeting, it has not systematically compared these factors across meeting modes and their influence on meeting mode effectiveness. Face-to-face meetings were found to have fewer meeting participants than technology-enabled meetings, yet they seemed to be longer in duration. Also, the hybrid nature of the meeting was found to be related to the number of meeting participants. The influence of these factors on meeting mode effectiveness was found to be limited, yet their relationship with the broader notion of meeting effectiveness requires further investigation.

1.3 Telepresence as a Business Meeting Mode

Telepresence systems are designed to closely resemble the face-to-face setting and to create the “perceptual illusion of non-mediation” (Lombard and Ditton, 1997). The immersive experience of telepresence is illustrated by the following comment from a user: “*The detail you can see is that high, that when a cup of coffee is spilled in the one room, you can see every drop on the table from the other room, and you feel the urge to go and clean it up. It is that lively.*” Although both practitioners and researchers have highlighted the importance of understanding how and why managers use new communication media (Ferran and Watts, 2008; Lee et al., 2009; Markus, 1994), this was the first study to examine the effectiveness of telepresence, relative to conventional meeting modes, to discern the meeting objectives it is suited for (Denstadli et al., 2013; Lengel and Daft, 1989; Rice, 1992). Therefore, this study offers initial insight on the value of telepresence and provides fertile ground for future inquiries (IJsselsteijn, 2001).

In particular, telepresence was found to be especially effective for *Build trust and relationships*, which is considered to be one of the major challenges in distributed work groups (Lin et al., 2008). In particular, it was found to be more effective than both audio- and

video-conferencing for this objective. In addition, telepresence was equally effective as face-to-face for this objective in Study 1, yet less effective in Study 2, which may be due to the high amount of hybrid telepresence meetings in that study. These findings suggest that the capabilities of telepresence meetings help participants transmit cues that have been identified to be important in virtual teams to “convey trust, warmth, attentiveness, and other interpersonal affections” (Jarvenpaa and Leidner, 1999, p. 793) and to transmit “emotion and strength of feeling” (Lengel and Daft, 1989, p. 229) in business communication. This study contributes to the ongoing debate on the notion that “trust needs touch” (Handy, 1995), and whether trust engendered by the face-to-face encounter can be accomplished by technology-enabled instead of face-to-face communication (Bos et al., 2002; Olson and Olson, 2000). In particular, the findings of this study suggest that meetings to build relationships can be effective even in distributed settings, and motivate telepresence as a viable mode for meetings with this objective, as compared to the gold standard of face-to-face meetings.

2. MANAGERIAL IMPLICATIONS

For managers, the results of this research provide guidance for organizing meetings. First, the list of meeting objectives can help managers in planning meetings and preparing meeting agendas. In addition, the findings of the field studies provide guidance in effectively selecting a meeting mode. In particular, categories of meeting objectives were identified, for which similar meeting mode effectiveness orderings apply. For example, for *Routine exchange of information* all meeting modes are equally effective. However, for *Build trust and relationships*, telepresence and face-to-face are found to be more effective than both audio- and video-conferencing. In addition, the empirical results indicate that hybrid meetings, in which one or more participants attend via a lower capability meeting mode, lower meeting mode effectiveness, and should therefore be avoided. Also, by combining the findings on effectiveness with the frequencies of objectives across meeting modes, an assessment can be made as to whether meeting organizers are generally making effective meeting mode choices.

Furthermore, examining the importance of meeting mode capabilities provides guidance on a higher level of granularity. For example, the results revealed that for objectives such as exchanging information, visual capabilities were not important, while they were important for objectives involving emotions and relationships. Hence, to effectively achieve multiple objectives in one meeting, an organizer can consider the capabilities that are important for each of the relevant objectives when selecting a meeting mode. Furthermore, if

there are objectives for which the capability importance is conflicting, the organizer may opt to organize separate meetings, using meeting modes with different capabilities. Instead of setting up multiple meetings, the capabilities of meeting modes can also be used dynamically, for example, using visual capabilities for *Build trust and relationships*, and using a shared computer screen for a *Routine exchange of information*.

The findings on the influence of the number of meeting participants and the meeting duration are also useful for managers. Overall, only a few significant relationships with meeting mode effectiveness were found, suggesting that the decisions on the number of meeting participants and duration have a limited impact on meeting mode effectiveness. Nevertheless, most of the significant relationships between the number of meeting participants and meeting mode effectiveness were negative, which implies that a meeting organizer should be careful not to invite too many people. Also, a meeting organizer should deliberately set the meeting duration, as several relationships with meeting mode effectiveness were found to be negative for audio- and video-conferencing meetings, yet positive for telepresence and face-to-face meetings. This is also in line with the finding that the importance of most meeting mode capabilities increases for longer meetings.

Drawing from the dissertation results, a company could provide training to its employees (Warkentin and Beranek, 1999), or build a tool that makes meeting mode and duration recommendations to organizers, based on what they are trying to achieve and how many people they want to invite (Te'eni, 2001). Moreover, an automatic meeting scheduling system could be developed, that optimizes the selection of meeting modes. Furthermore, this study provides preliminary insight into how organizations should equip different locations, divisions, teams, and employees with technologies for meetings. For example, as video-conferencing was not found to be more effective than audio-conferencing for any objective in Study 2, FinancialCo may decide to disinvest this technology.

Finally, since no prior research has examined the use of telepresence in organizations, this dissertation provides unique insight into when the use of this technology is justified from an effectiveness standpoint. In particular, telepresence was consistently found to be more effective than simpler/cheaper alternatives for *Build trust and relationships* and *Communicate feelings or emotions*. Moreover, telepresence is found to be an effective alternative for face-to-face meetings for the majority of objectives. This finding can have substantial implications for widely distributed organizations, and even widely distributed business eco-systems. In particular, investing in telepresence systems or gaining access to such facilities, may yield

significant operational cost savings. The findings can also be valuable for sellers/providers of telepresence capabilities and systems, in best positioning their services to clients.

3. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The scope of this dissertation is the analysis of the effectiveness of different meeting modes for achieving a broad set of meeting objectives. Therefore, the research study design involved meeting organizers referring to a specific meeting to answer questions about the meeting mode used and its effectiveness for achieving the relevant meeting objectives. While effectiveness considerations are an important determinant of meeting mode selection, the ultimate choice is also influenced by the cost of utilizing a meeting mode and other contingency factors. For instance, because of cost considerations, employees may be restricted to travel for a face-to-face meeting (Lu and Peeta, 2009), turning the use of technology-enabled meeting modes mandatory (Moore and Benbasat, 1991; Venkatesh and Bala, 2008). For example, at EngineeringCo, it often happened that by the end of a fiscal quarter, top management decided to restrict travel to control operating expenses. As a result, the utilization rates of telepresence increased and showed quarterly seasonality. Similarly, there was a prioritization rule for revenue-generating (customer) telepresence meetings at NetworkingCo. Furthermore, anecdotal interview evidence suggests ease of use (Davis, 1989b) is also an important consideration, as recurring meetings could be conveniently scheduled for video-conferencing meetings, but not for telepresence meetings at NetworkingCo. Likewise, urgency may impact meeting mode choice, as the high utilization rates of telepresence technology prohibit its use for impromptu meetings.

As this dissertation sought to examine meeting mode effectiveness, these additional factors are beyond the scope of the current studies. In particular, the questionnaires concerned effectiveness evaluations of the actual meeting mode used, for the relevant meeting objectives. Therefore, the assumption was made that meeting mode effectiveness evaluations are not significantly impacted by the reasons for selecting a mode, and that effectiveness can therefore be evaluated separately from selection. An alternative approach that would allow for testing whether the actual meeting mode used was the preferred mode, involves soliciting input from the organizer before and after the meeting. Before the meeting, the organizer could indicate what mode he or she is planning to use, and what the intended objectives of the upcoming meeting are. A comparison with post-hoc responses could then reveal dynamic relationships between meeting modes and objectives. In particular, the objectives are assumed

to drive the meeting mode selection in this dissertation, yet the actual meeting mode used could also drive the set of relevant meeting objectives. While Study 1 was originally designed to include a before and after questionnaire, the collection of personal data was not allowed, making it hard to link before and after responses. Also, the different studies were approved under the condition of requiring limited effort from the managers at the different companies. Therefore, the final designs involved post-hoc questionnaires only.

Second, this dissertation focuses mainly on the communication capabilities of meeting modes to explain meeting mode effectiveness. Therefore, the research study design involves meeting organizers referring to a specific meeting to answer questions about the importance of meeting mode capabilities to achieve the key objectives of the meeting. However, it is important to recognize that there are several other factors that may influence meeting mode effectiveness. While some of these, such as medium experience (Carlson and Zmud, 1999), group size (Miranda and Saunders, 2003), duration (Romano and Nunamaker, 2001), and accessibility (Culnan, 1984; Markus, 1987), were considered in this dissertation, there are still other factors such as the past experience of meeting participants with each other, with the task and with the organizational context (Carlson and Zmud, 1999), participants' preparation (Borges et al., 1999), the chair's leadership style (Jarvenpaa and Leidner, 1999), and meeting structure (Nunamaker et al., 1991b; Shim et al., 2002). For example, prior research points out that perceived medium capabilities are higher when communication partners are familiar with each other (Carlson and Zmud, 1999; Yoo and Alavi, 2001) and anecdotal interview evidence suggests that participants' preparations differ across meeting modes.

Furthermore, it is important to distinguish between meeting mode effectiveness, and the broader notion of meeting effectiveness. In particular, meeting effectiveness is not only influenced by the extent to which the meeting mode used facilitates achieving the objectives, but also by factors such as meeting preparations and the common history of and cohesion between the participants (Jarvenpaa and Leidner, 1999; Rogelberg et al., 2013; Yoo and Alavi, 2001). Hence, the effectiveness of two business meetings, conducted in the same mode and with the same objectives, may still differ because, for example, time pressure (Bartelt and Dennis, 2014; Miranda and Saunders, 1995), or because of the prior interactions within the group (Carlson and Zmud, 1999; Yoo and Alavi, 2001).

Given that the field studies are based on actual business meetings, it was not possible to control for other factors influencing meeting (mode) effectiveness. Also, the contractual agreements with the companies prohibited the collection of private data, such as the meeting subject or the management level of the respondent. Furthermore, in the interest of brevity, the

questionnaires were focused on the key elements under study. As a result, the lack of information about the influence of other factors may limit the explanatory power of the results.

Third, in Study 2, 3, and 4 in this dissertation, respondents were asked to choose a business meeting that they had organized recently, and to base their answers on this specific meeting. Since it is human nature to recall memorable events, the chosen meetings might be those that run particularly positively or particularly negatively (cf. Arnold et al., 2005), excluding random selection of meetings. Moreover, the sample of hybrid meetings in Study 2 is potentially incomplete, since it does not include data on meetings that were cancelled or postponed due to participants not being able to use the primary mode.

Fourth, only the meeting organizer was asked to evaluate the effectiveness of the business meeting mode used¹⁴, or the importance of the meeting mode capabilities. Using only the meeting organizers' perceptions has its limitations, as it is possible that organizers evaluated the selected meeting mode as effective, while other attendees felt it was ineffective, "consistent with the 'better than average effect' – the tendency for people to evaluate their own characteristics (e.g., abilities) more favorably than that of an average peer" (Leach et al., 2009, p. 70). However, because of the real-life setting, it was not feasible to have an independent observer attend the meetings or to consult recordings or minutes of the meetings in order to rate meeting outcomes. Therefore, having multiple attendees of a meeting respond would offer additional important insight into business meeting dynamics, especially if it concerns a hybrid meeting mode.

Fifth, the sequence in which the studies were conducted may have influenced the dissertation results. The reason for starting the research at NetworkingCo was the wide availability of all the technologies, and telepresence in particular, at this company (see Chapter 4 on p. 47). This mitigates the potential effects of mode availability and cost on employees' access to the meeting modes and their effectiveness evaluations. Next, research collaborations were established with companies for external validation of the findings at NetworkingCo. While these companies deployed fewer telepresence rooms, every employee had unrestricted access to them. Hence, switching the order would not have been logical, since the cost and availability of telepresence was more likely to be a concern at FinancialCo and EngineeringCo, than at NetworkingCo. In addition, there is a potential order effect for the development of the lists of objectives and capabilities. In particular, the lists, identified from

¹⁴ With the exception of 86 meetings in Study 1 for which data was also obtained from 139 attendees.

the literature, were checked for relevance and completeness at NetworkingCo and then truncated. However, to mitigate a potential bias, these truncated lists were checked for relevance and completeness at both FinancialCo and EngineeringCo, each time with a group of experts, before they were employed in the field studies.

These limitations may reduce the external validity of the results and further research is needed to establish the generalizability of the findings. In particular, future research needs to seek a broader understanding of meeting mode effectiveness and meeting mode choice, beyond the role of meeting mode capabilities. For example, in future field studies, questionnaires could include questions on additional factors that influence meeting mode effectiveness (e.g., participants' preparations) and choice (e.g., cost). Multiple samples could be used to obtain diversity in terms of management levels, functional departments, organizations, and industries. Also, a longitudinal field study to investigate the sequence of meeting mode selection and the evolution of meeting mode effectiveness for a particular group would constitute an interesting avenue for future research, especially to examine the role of the prior experience and relationships within the group. For example, Maznevski and Chudoba (2000) found that global virtual teams developed a rhythmic temporal pattern, defined by regular intensive face-to-face meetings to reinforce ongoing relationships. Hence, it would be interesting to examine further if and how the relevant objectives and the effectiveness perceptions of the meeting modes change over time, as relationships mature (A. Allen et al., 2014). Finally, laboratory experiments can be set up involving, for instance, four meeting mode conditions and two levels of meeting preparation (low-high), which would allow for obtaining specific insight on their relationships.

In addition to addressing the limitations of the current study, future research can draw from the results of this dissertation, and extend it in several ways.

First, three technology-enabled meeting modes were considered in this dissertation, in addition to the traditional face-to-face setting. However, other technologies can be used for distributed business meetings. For example, prior research indicated that while instant messaging is used in organizations mostly for single-purpose interactions (e.g., short questions and clarifications), for coordinating and planning communication interactions (e.g., scheduling a meeting), and for non-work related issues (e.g., arranging for lunch), it can also be used for complex discussions and collaborations (Isaacs et al., 2002; Nardi et al., 2000). Likewise, in virtual environments, which involve representations of people (avatars) and of

real world elements in two- or three-dimensional computer-generated shared environments (Kock, 2008; Nowak, 2015), companies can create virtual places for business meetings (Messinger et al., 2009). Interesting avenues for future research include investigating the effectiveness of these novel technologies for business meetings, as well as the importance of different (additional) capabilities they provide (Saunders et al., 2011).

Second, this dissertation characterizes business meetings in terms of the objectives they serve. Therefore, an interesting direction for future research is to validate the list of objectives in a broader communication context, including the use of additional (asynchronous) communication modes (e.g., memo, instant messaging, e-mail, wiki, video blog). For example, the question could be addressed if an objective that is highly frequent in business meetings, such as *Clarify a concept, issue, or idea*, is also frequently relevant to communication in other modes. Conversely, *Assert and/or reinforce your authority* was very infrequent in business meetings, which raises the question whether this objective is also infrequent in other modes of communication. Insight on the frequencies of objectives can be complemented with findings on the comparative effectiveness of communication modes, in order to develop usage norms and to optimize organizational investments in communication modes, and potentially reduce the number of meetings and their associated costs.

Third, the results of this dissertation reveal a dual impact of the use of technology-enabled modes on meeting cost. In particular, in comparing technology-enabled meetings with face-to-face meetings, the exploratory insights indicated technology-enabled meetings were shorter in duration, and therefore result in lower (employee wage) costs. However, technology-enabled meetings also involved more participants than face-to-face meetings, increasing costs. Also, technology-enabled meeting modes conveniently allow for fluidity in the meeting group composition (Faraj et al., 2011; Tannenbaum et al., 2012), inviting participants with specific expertise or knowledge on the spot. Therefore, examining both the effectiveness and cost of meetings with (dynamically) differing numbers of participants across multiple meeting modes, offers an interesting avenue for further research.

Fourth, in this dissertation meeting modes are considered in an intra-organizational setting. However, as interoperability between technology-enabled systems enhances, it will be important to investigate further how meeting modes are deployed for effective inter-organizational interaction (Rice, 1992). Similar to the literature on intra-organizational communication, prior research on inter-organizational communication has focused on communication medium selection (Ambrose et al., 2008; Kettinger and Grover, 1997) and

effectiveness (Lind and Zmud, 1995; MacDonald and Smith, 2004; Vickery et al., 2004), albeit not in the specific context of a business meeting.

Fifth, the topic of hybrid meetings emerged as fertile ground for future research. In particular, an important question is whether hybrid meetings are deliberately set up this way, or rather if they are the unintended consequence of some attendees' changing situations. Furthermore, although an attendee may have access to the primary meeting mode, he or she may choose not to use it for reasons of cost and convenience, or to avoid transmitting visual cues. As to the latter, anecdotal interview evidence indicates meeting participants avoid visual cues when they want to multi-task, or in order to feel less inhibited to ask sensitive questions. The preliminary insight on the number of meeting participants, which was found to be higher for hybrid meetings in every mode, seems to suggest that hybrid meetings involve participants that could not attend otherwise. Therefore, an interesting factor to study is the relative status of people in the lower capability meeting mode. Conversely, it would be of interest to study meetings that were cancelled, because some attendees could not participate through the primary meeting mode. Finally, prior research shows evidence of local coalitions in hybrid settings (Williams, 1975), in which people who are face-to-face together tend to agree more with each other than with people with whom they have mediated interaction. Further examining local coalitions in different hybrid meeting modes presents an interesting avenue for further research.

Sixth, more research is needed to fully understand the role of telepresence for organizational communication. First, the lack of significant differences between telepresence and face-to-face raises the question whether technology-enabled meetings could go "beyond being there". For example, technology-enabled interaction facilitates recordings of media and content during meetings (Hollan and Stornetta, 1992). Moreover, prior literature indicates that the additional functionality of face-to-face meetings may even impair effectiveness. For example, people interacting face-to-face have been reported to easily wander off topic (Bordia, 1997; Burke and Chidambaram, 1999). In addition, at each of the companies, access to this technology had to be scheduled for a specified time duration. Therefore, the duration could not be extended on the spot. Anecdotal interview evidence indicated that this phenomenon on the one hand led to better prepared meetings, yet on the other hand could also result in premature closure of the meeting. Furthermore, there seemed to be symbolic meaning associated with the use of telepresence (Trevino et al., 1987). In particular, a recurring theme in interviews with meeting organizers at NetworkingCo was the high importance of

telepresence meetings, relative to other technology-enabled meetings. In addition, besides for internal business meetings, telepresence technology is also used for interviewing job applicants, for training, and for broadcasting large company announcements. Furthermore, telepresence technology is currently deployed for interactions between representatives of companies (banks, insurance companies, etc.) and their customers, which raises the question on how best to leverage this technology in this setting. All these offer interesting avenues for further research.

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APPENDICES

APPENDIX A. PREVIOUS STUDIES ON MEDIA CHOICE AND EFFECTIVENESS

In the table below, a summary is provided of prior studies that examined communication media choice and/or effectiveness. The studies are reported chronologically. In addition to the study findings, the empirical method used, the communication media and task/objective/messages under study, and the outcomes measured, are described.

Reference	Empirical method	Communication Media	Tasks/objectives/messages	Outcome(s)	Findings
(Christie and Holloway, 1975)	Experiment involving 6 groups of 16 subjects.	Face-to-face, telecommunication systems.	16 different hypothetical discussions. Discussions varied in terms of (1) the person-orientation, (2) the level of acquaintance of the discussants, and (3) the travel time associated with holding the discussion face-to-face.	Media choice.	Choice to telecommunicate was higher when the discussion was given a non-person-oriented description, the discussion involved acquaintances rather than strangers, and when the travel time required for face-to-face interaction was long.
(Williams, 1975)	Experiment involving 45 groups of 4 persons.	Face-to-face, video-conferencing, audio-conferencing.	Brainstorming task: producing ideas for ameliorating the "Problems of Travelling in Britain."	Coalition formation.	In both video- and audio-conferencing, subjects showed a significant bias towards supporting the person at the same site, with whom they formed a coalition.
(Short et al., 1976)	Survey with 709 users of four different teleconferencing	Teleconferencing.	Giving or receiving information; Asking questions; Exchanging opinions; Decision making; Giving or receiving orders; Problem solving;	(Hypothetical) Satisfaction with the teleconferencing	Satisfaction varied across tasks.

	systems.		Generating ideas; Persuasion; Getting other on one's side in argument; Resolving disagreements; Maintaining friendly relations; Resolving conflicts; Bargaining; Getting to know someone.	system.	
(Pye and Williams, 1977)	Survey, see Short et al. (1976).	Video-conferencing, audio-conferencing.	Giving or receiving information; Asking questions; Exchanging opinions; Problem solving; Generating ideas; Persuasion; Bargaining; Getting to know someone.	Satisfaction.	If both audio- and video-conferencing were relatively unsatisfactory for the task, video-conferencing was better than audio only.
(Rosetti and Surynt, 1985)	Experiment involving 32 groups of 4 students.	Face-to-face, video-conferencing.	Complex problem-solving task, which requires a high degree of interpersonal communication. In particular, it involved the logical ranking of items needed for survival.	Performance.	For 20 of the 32 groups, the performance of groups in video-conferencing was superior to that of the groups in face-to-face.
(Sproull and Kiesler, 1986)	Survey with 96 employees of a Fortune 500 company.	Face-to-face, telephone, e-mail, hardcopy mail.	Hypothetical tasks: (1) Asking your boss/secretary to solve a problem and (2) Negotiating with your boss/secretary for more resources for a task you are working on.	Medium preference.	Face-to-face was most preferred for both tasks, preference for e-mail increased when sending messages up the hierarchy.
(Daft et al., 1987; Russ et al., 1990)	Survey with 95 managers.	Face-to-face, telephone, letters, fliers, memos, and public address system.	60 communication incidents, varying in equivocality. For example: "To give your immediate subordinate a set of five cost figures that he requested last week"; "To get an explanation from a peer in another department of a complicated technical matter in which you have little formal training or	Medium selection.	Managers preferred rich media for ambiguous communications and less rich media for unequivocal communications. In addition, high performing managers were more sensitive to the relationship between message ambiguity and media

			experience”;		richness than low performing managers.
(Trevino et al., 1987)	Exploratory study involving interviews with 65 managers from 11 organizations.	Face-to-face, telephone, e-mail, written media.	A recent incident in which managers used each medium as a communication initiator and as a receiver. This resulted in 47 communication reasons that could be categorized in three broad classifications: content-related, symbolic cue, and situational-determinant.	Reason for choosing a medium.	Three factors influenced managers’ media choices: ambiguity of the message content and richness of the communication medium; symbolic cues provided by the medium; and situational determinants such as time and distance.
(Reinsch and Beswick, 1990)	Survey with 1000 working professionals.	Face-to-face, telephone, voice mail, written communication.	Three types of messages: Answer to a question; Suggestion to solve a problem; Proposed resolution for a dispute.	Media preference.	Face-to-face was most preferred, followed by telephone, written communication, and voice mail. Task did not have an impact on preference, however cost did.
(Fish et al., 1992)	Field experiment/ trial involving 11 students (summer employees) and their 12 internship supervisors-mentors.	One-on-one face-to-face meetings, group face-to-face meetings, telephone, e-mail, answering machines, fax, handwritten notes, printed documents, desktop video-conferencing.	Exchanging confidential information; Explaining a difficult concept; Getting to know someone; Resolving disagreements; Negotiating, bargaining; Generating ideas; Making decisions; Making commitments; Scheduling meetings; Exchanging information; Asking questions; Staying in touch; Exchanging time-sensitive information; Checking project status.	Perceived appropriateness.	As the tasks became more socially sensitive or intellectually difficult, both desktop video-conferencing and telephone media were judged less adequate, while face-to-face was judged more adequate.
(Rice, 1992)	Questionnaire administered at five sites, involving	Video-conferencing, voice mail, e-mail.	Different tasks were rated in terms of analyzability, including: Sending electronic memos; Coordinating	Perceived effectiveness.	Showed modest evidence for the relationship between task analyzability

	different sample sizes.		responses to complaints; Responding to a request about the names of participants in upcoming meetings; Delegating responsibilities; Assembling a multi-department proposal; Request for clarification of points in a report; Discussions of national marketing plans; Making decisions; Increasing visibility.		and media performance. In addition, the results were generally monotonic and asymmetric.
(Chidambaram and Jones, 1993)	Experiment involving 6 groups of 3 or 4 students.	Face-to-face (with or without electronic meeting support (EMS)), audio-conferencing (with or without EMS).	A decision-making task with no a priori right or wrong answer. In particular, groups simulated a board of directors meeting of an American winery, to discuss problems of global expansion.	Media perceptions, group performance (evaluated by raters).	Media perception differences were large between face-to-face and audio-conferencing without EMS. In particular, the performance was higher for face-to-face than for audio-conferencing. However, the difference became smaller when there was EMS for both, as EMS increased the performance of audio-conferencing more than the performance of face-to-face.
(Hollingshead et al., 1993)	Experiment involving 22 groups of 3 persons.	Face-to-face, text-based computer interaction.	Generating ideas and plans,; Intellective Task (Choosing correct answer), Judgment Task (Choosing preferred answer). Negotiating conflicts of interests.	Performance and satisfaction.	The relationship between technology and task performance appeared to be more dependent on the experience with the technology and with group membership than on the type of task on which the group was working.

(Rice, 1993)	Questionnaire administered at six sites, involving different sample sizes.	Face-to-face (one-on-one), group meeting, desktop video-conferencing, telephone, voice mail, e-mail, text.	Exchanging information; Negotiating and bargaining; Getting to know someone, Asking questions; Staying in touch; Exchanging timely information; Generating new ideas; Resolving disagreements; Make decisions; Exchanging confidential information.	Perceived (media) appropriateness.	Face-to-face appeared most appropriate for getting to know someone and generating ideas, whereas the new media appear most appropriate for exchanging information, particularly time-sensitive information, asking questions, and staying in touch, similar to the appropriateness of the telephone.
(Zack, 1994, 1993)	In-depth, multi-method case study.	Face-to-face, e-mail.	Mode of discourse: alternation versus interactive discussion; Context-building and context-using communication.	Media choice and media effectiveness.	Face-to-face communication was more effective to build a shared interpretive context, while e-mail is more effective for communicating within an established context. Hence, this is how media should be selected.
(Markus, 1994)	Survey with 375 managers.	Face-to-face, telephone, e-mail, memo.	Hypothetical communication tasks: Content reasons (To convey confidential, private, or delicate information; To describe a complicated situation or proposal; To influence, persuade, or sell an idea; To express feelings or emotions; To keep someone informed; To follow-up earlier communication); Situational reasons (To respond to a straightforward telephone message; To respond to a complicated e-mail message; To communicate something	Media selection (selecting the single best medium for performing each hypothetical task).	Managers were found to perceive various media in ways that were relatively consistent with information richness theory, but to use e-mail more and differently than the theory predicted. In particular, effective senior managers were found to use e-mail heavily and even for equivocal communications tasks, suggesting that the

			of little importance to someone close by/far away; To use the communication medium you prefer best; To communicate the same thing to many people); Symbolic reasons (When you want to: be casual, informal/ convey urgency/ personal concern or interest/ obtain an immediate response, action/ show authority, status, position/ show that your communication is official).		adoption, use, and consequences of media in organizations can be powerfully shaped by social processes.
(Radford and Morganstern, 1994)	Experiment involving 51 groups of 4 students.	Face-to-face, video-conferencing, audio-conferencing, text-based computer interaction.	Information exchange task with a criterion solution.	Efficiency and quality of group decision making.	Text-based computer interaction was found to be significantly worse in terms of efficiency and decision quality than the three other media.
(Straus and McGrath, 1994)	Experiment involving 72 groups of 3 students	Face-to-face, text-based computer interaction.	Idea-generation task, Intellective task, Judgment task.	Performance (evaluated by raters): overall effectiveness, productivity, and average quality.	Results showed few differences between computer-mediated and face-to-face groups in the quality of the work completed but large differences in effectiveness and productivity, favoring face-to-face groups.
(Marshall and Novick, 1995)	Experiment involving 18 groups of 2 people.	Face-to-face, video-conferencing, audio-conferencing.	1. Tangram construction task: constructor creates the figure shown in the drawing held by the director; 2. Subarctic survival task: rank a list of 15 items in order of importance to survival.	Task performance, subjective satisfaction and subjective communication quality.	Mediated communication can be enhanced by adding a visual channel, particularly when visual context is relevant to the task. Also, mediated communication may allow

					users more control over the social “distance” or “presence” during an interaction, which may be useful.
(Walther, 1995)	Experiment involving 32 student groups of 3 students.	Face-to-face, computer-mediated communication.	Three loosely-structured decision-making tasks, including scenarios of faculty hiring strategies, use of writing-assistance software for college papers, and mandatory student ownership of personal computers.	Relational communication (rated by observers).	In no case did computer-mediated communication groups express less intimacy or more task-orientation than face-to-face groups.
(Webster and Trevino, 1995)	Questionnaire that included multiple scenarios (policy capturing).	Face-to-face, telephone, e-mail, memo, letter.	Messages varying in terms of symbolic cues: communicate desire for teamwork and involvement; communicate sense of urgency or immediacy; communicate that the message is casual or informal; communicate that the message is formal or official; communicate no other symbolic cues.	Likelihood of media choice.	Media richness and social influence theories were found to be complementary rather than competing. The relative importance of choice factors depended on the medium.
(Chidambaram, 1996)	Experiment involving 28 groups of 5 people.	Face-to-face, text-based computer interaction (Group Support System).	Simulating a board of directors meeting of a multinational winery, involving making a decision about a specific problem facing the firm; the problems had no a priori right or wrong answers, only answers of varying quality.	(Group) Cohesiveness, perceptions of process, satisfaction with outcome.	While groups using a GSS did find the media to be constraining initially, with increased use and greater opportunity to exchange interpersonal information, they were able to reduce the relational distance among members.
(El-Shinnawy and Markus,	Questionnaire and structured	E-mail and voice mail.	Seven hypothetical communication situations involving equivocality or	Media preference.	E-mail was strongly preferred over voice mail

1997)	interviews with 31 employees of a large company.		uncertainty. Examples of equivocality situations included: to present some confusing changes in the employee benefit package to 20 subordinates; to explain a new rather sensitive employee that she mishandled a personnel conflict in her work group; to get clarification of an ambiguous directive from your boss. Examples of uncertainty situations included: to send a lengthy message informing your superior about the steps you undertook in solving a problem; to exchange technical reports and information; to exchange numerical information.		in almost all situations, providing partial support for media richness theory. The findings were consistent for situations involving uncertainty reduction, but not in situations involving equivocality reduction.
(King and Xia, 1997)	Longitudinal quasi-experimental study involving 295 MBA students.	Face-to-face (one-to-one); face-to-face (group); telephone; voice mail; handwritten note, formal letter, e-mail, electronic meeting system, fax.	Exchange routine information; Negotiate or bargain; Get to know someone; Clarify confusing viewpoints; Stay in touch; Exchange urgent/timely information; Generate ideas/brainstorm; Resolve disagreements; Make important decisions; Exchange confidential/sensitive information; Exchange important information.	Perceived (media) appropriateness.	Traditionally rich media such as face-to-face, group meetings, and telephone were perceived to be more appropriate than emerging new media, consistently over time.
(Dennis and Kinney, 1998)	Experiment with 66 dyads of students.	Video (with immediate or delayed feedback); text-based computer interaction (with immediate or delayed feedback).	Two decision making tasks, one with high equivocality (rank ordering for student admission) and one with low equivocality (set of four questions that provide a clear framework for problem resolution).	Time, consensus, decision quality, perceived communication satisfaction, richness, task equivocality and	Matching richness to task equivocality did not improve decision quality, decision time, consensus change, or communication satisfaction.

				complexity.	
(Rice et al., 1998)	Survey with 401 managers, taking a graduate course.	Face-to-face, phone, voice mail, e-mail, business memo.	Situations with varying equivocality. Example of high equivocality: "You need to discuss a problem in your department with your superior"; example of low equivocality: "You want to schedule a department meeting for 2 weeks from today."	Media preference.	Overall face-to-face is the preferred medium, followed by e-mail, telephone, memo, and voice mail. As equivocality decreased, the preference for face-to-face and telephone decreased, while the preference for e-mail, memo, and voice mail increased slightly.
(Straub and Karahanna, 1998)	(1) Exploratory study involving 100 knowledge workers. (2) Controlled factor study involving 257 knowledge workers.	(1): Face-to-face, telephone, e-mail, fax. (2): Face-to-face, telephone, e-mail, fax, voice mail.	Task scenarios with different levels of recipient availability, social presence of the task, urgency of the task, and proximity of the communication partners.	Rank ordering of media choice.	Social presence theory proved to be a good predictor of media choice, as did the recipient availability construct.
(Westmyer et al., 1998)	Study 1: survey with 79 students; Study 2: survey with 187 friends and family of students.	Face-to-face, telephone, voice mail, e-mail, letter, fax.	Interpersonal communication motives: Inclusion, Affection, Control, Relaxation; Escape; Pleasure.	Perceived media appropriateness and effectiveness.	People preferred the more personal (i.e., oral) media for interpersonal communication, and they were also perceived as more effective and appropriate.
(Burke and Chidambaram, 1999)	Experiment involving 33 groups of 4 students.	Face-to-face; text-based synchronous/asynchronous communication.	Complex project development task that required groups to coordinate sub-tasks for the project, then generate, assess, select, and develop ideas, and finally integrate the ideas	Perceptions of social presence, of communication interface dimensions, and of	An equivocal task could be better performed with synchronous text-based communication than with face-to-face interaction,

			into a policy manual.	communication effectiveness. Performance rated by a panel of 11 judges.	because it permitted less social interaction (which may sometimes be distracting). In addition, synchronous and asynchronous groups did not differ in their perceptions or performance.
(Rowe and Struck, 1999)	Diary method: 799 internal communications of 145 managers.	Telephone, voice mail, e-mail, fax.	<p>Low ambiguity: Being late or announcing a minor problem; Giving precise information or informing someone; Searching or obtaining precise information; Cancelling, modifying or making an appointment.</p> <p>Medium ambiguity: Suggesting solutions or making propositions; Unveiling an important problem; Getting news or getting to know someone; Discussing or exchanging information; Controlling or following a business activity.</p> <p>High ambiguity: Encouraging or sanctioning; Solving a problem or deciding together; Negotiating or persuading.</p>	Chosen medium.	The telephone was positively related to get precise information, resolve problem/decide, discuss/exchange information. Voice mail was positively related to discuss/exchange information, being late, announcing a minor problem. Fax and e-mail were positively related to transmitting information.
(Suh, 1999)	Experiment involving 158 dyads of students.	Face-to-face, video-conferencing, audio-conferencing, text.	Intellective and negotiation task.	Perception of task performance and task satisfaction.	No support for media richness theory; no task-medium interaction effects.

(Veinott et al., 1999)	Experiment involving 38 dyads of students.	Video-conferencing, audio-conferencing.	Explaining a map route to each other.	Performance.	Non-native speakers benefited from video, while native speakers did not.
(Mennecke et al., 2000)	Experiment involving 140 dyads of students.	Face-to-face, videophone, telephone, synchronous text-based computer interaction.	Intellective task, which involved sharing factual information; Negotiation task, which involved sharing preferences based on personal values, and reaching an agreement.	Objective performance (decision quality for intellective task, consensus change for negotiation task, and decision time for both).	For intellective tasks, videophone and telephone scored higher in performance than did text-based interaction. For negotiation tasks, dyads using either face-to-face or video outperformed dyads using audio or text.
(Trevino et al., 2000)	Survey administered to 1704 technical and low to middle-management employees.	Face-to-face meetings, e-mail, fax, letters.	Content of message was rated in terms of equivocality (open to multiple interpretations; emotional, such that different people could interpret the meaning differently; such that the meaning could depend on one's point of view) and in terms of symbolism (express a desire for teamwork, participation, involvement, or cooperation; express a sense of urgency or immediacy; low priority or not very important; formal, official or legitimate).	Media attitude and use.	Findings were generally consistent with media richness theory. Media choice in a particular situation was influenced primarily by objective and social factors related to the requirements of that situation.
(France et al., 2001)	Field study of 10 business meetings.	Face-to-face, audio-conferencing.	Meeting purposes: presentation of research projects, review meeting of work progress, information sharing.	Equality of participation; equality of influence on the flow of discussion; and freedom of	There was less equality of participation and influence in audio-conferencing versus face-to-face meetings, however there was no significant difference in the freedom

				interaction.	of interaction.
(Te'eni et al., 2001)	Content analysis on 252 messages from 50 members of an organizational unit.	Letter, memo, fax, e-mail.	Strategic versus operational tasks.	Preference for media, message form, and communication strategy used.	Relative to strategic tasks, operational tasks relied on more interactive media, and involved shorter messages and lower affectivity.
(Yoo and Alavi, 2001)	Experiment involving 45 groups of 3 students.	Desktop video-conferencing, audio-conferencing.	Decision-making task.	Group consensus.	Task participation played a more important role than social presence in determining the degree of consensus among group members.
(Bos et al., 2002)	Experiment involving 66 groups of 3 people.	Face-to-face, video-conferencing, audio-conferencing, text chat.	Social dilemma game.	Trust (measured through group payoff).	Text chat groups made significantly lower payoff than groups in each of the other media conditions.
(Burgoon et al., 2002)	Experiment involving 40 dyads of students.	Face-to-face, video-conferencing, audio-conferencing, synchronous text chat (with or without physical proximity).	Decision-making task (desert survival problem), which involves rank-ordering of items.	Interactivity, social judgment, task outcome.	Face-to-face was perceived as more receptive, expected, easy, and friendly, but produced less influence and poorer quality decisions than mediated conditions.
(Tidwell and Walther, 2002)	Experiment involving 79 dyads of students.	Face-to-face, text-based computer interaction.	Get to know one another; Decision-making problem.	Self-disclosure, question-asking, and uncertainty reduction.	Text-based computer interactants exhibited a greater proportion of more direct and intimate uncertainty reduction behaviors and demonstrated significantly

					greater gains in attributional confidence over the course of the conversations.
(Watson-Manheim and Bélanger, 2007, 2002)	Case study approach at 2 sales divisions of two Fortune 100 companies (18 interviews per site).	(Scheduled) Face-to-face meetings, (scheduled) teleconferences, telephone, voice mail, e-mail, chat/paging.	Coordination; Knowledge sharing; Information gathering; Relationship development; Conflict resolution.	(Multiple) media choice/ preference.	Task influenced the use of communication media repertoires, in addition to institutional and situational conditions.
(Miranda and Saunders, 2003)	Experiment involving 32 groups of five or six students.	Meeting environments: face-to-face only versus face-to-face with an electronic medium.	Decision-making involving solving a problem.	Decision quality.	There was a negative effect of low social presence media on interpretation in terms of depth of information sharing; a low social presence medium, however, promoted information sharing breadth. In addition, choosing to utilize an electronic medium facilitated closure and, therefore, favorable outcomes.
(Carlson and George, 2004)	Survey with university faculty and staff (155 as deceivers and 402 as receivers of a message).	Face-to-face, video-conference, telephone, voice mail, e-mail, letter, memo.	Business scenario in which a deceptive act occurred.	Media appropriateness and preferred medium selection.	Deceivers preferred highly synchronous and non-reprocessible media. Receivers of deceiving messages found rich media and prior experience with the deceiver important.
(Sheer and	Survey involving	Face-to-face,	Tasks with positive or negative	Media choice for	Media richness held when

Chen, 2004)	107 managers.	telephone, e-mail, fax, written documents.	valence, in increasing order of equivocality: bonus distribution; salary adjustment; performance evaluation; promotion and demotion, expansion and downsizing.	each task.	messages were positive; self-presentational goals were the most powerful predictor of media choice when messages were negative.
(Roberts et al., 2006)	Experiment involving 439 students in groups of three or six.	Face-to-face (with or without collaborative support), virtual interaction with collaborative software support.	Evaluate a number of web-based interfaces using a technique called heuristic evaluation.	Ability to voice opinions.	By using collaborative software, it was possible to lessen the negative impact of larger group size on the ability to voice opinions.
(Simon, 2006)	Experiment involving 75 dyads of students.	Face-to-face, video-conferencing, instant messaging.	Idea-generation task, Intellective task, Judgment task.	Task performance (evaluated by rater) and participant satisfaction with task, medium, and partner.	No difference in task performance, yet satisfaction with the medium was lower among dyads communication through instant-messaging than among dyads interacting face-to-face or through video-conferencing.
(Hung et al., 2007)	Experiment involving 34 dyads of students.	E-mail, instant messaging.	Resolving a business problem which involves discussing issues and generating problem-solving ideas, based on (Chidambaram, 1996).	Number of ideas, perceived task difficulty and success.	Groups using instant messaging generated more ideas and felt more success with the results of the task than e-mail-supported groups. No difference in perceived task difficulty was found.
(Ferran and	Quasi-experiment involving seminars	Face-to-face, video-	Seminar in which a method was taught, research was presented, or a	Information	Participants attending a seminar via

Watts, 2008)	with medical professionals, 143 questionnaires were collected.	conferencing.	medical technique was described and discussed.	adoption.	videoconference were influenced more by the likeability of the speaker than by the quality of the arguments presented, whereas the opposite was true for participants attending face-to-face. Differences in cognitive load explained these differences.
(Lo and Lie, 2008)	Questionnaire with scenarios involving 181 participants.	Online message boards, e-mail, instant messaging with text only, instant messaging with webcam, telephone.	High equivocal task: discussion regarding the implementation of a corporate plan; Low equivocal task: contact a colleague to make a computer equipment reservation for the upcoming presentation of the corporate plan.	Media choice.	Communicators chose a tool with high information richness when faced with a long-distance communication situation involving a highly equivocal task and a low degree of trust for the other party. However, media selection decisions for communication over short distances were not affected by either task equivocality or trust.
(Otondo et al., 2008)	Experiment involving 688 students, in groups of 20 to 50.	Video-conferencing, audio-conferencing, text.	Personally oriented (subjective) and fact-oriented (instrumental) messages.	Perceived effectiveness, satisfaction, and richness.	While video was found to be significantly more satisfactory than audio and text, text was found to have the highest effectiveness.
(Walther and Bazarova, 2008)	Experiment involving 25 groups of 4	Face-to-face, desktop video-conferencing, audio-conferencing,	Decision-making tasks, varying in difficulty, which involved adjudicating among requests for	Perceived propinquity and	There were no differences between ratings obtained as a result of chat, voice,

	students.	text-based chat.	government funding.	satisfaction.	video, or face-to-face communication among groups who used only one medium. The bandwidth of the channels interacted with the presence or absence of multiple communication media (i.e., media choice) on group members' levels of perceived propinquity.
(Nowak et al., 2009)	Experiment involving 39 groups of 3 or 4 students.	Face-to-face, (a)synchronous video-conferencing, (a)synchronous text chat.	Preparing a 12-15 min mock oral presentation to Congress about how to balance Internet privacy and national security.	Outcome success (evaluated by rater), perceived media satisfaction, perceived co-presence (involvement), perceived group effectiveness.	Media characteristics predicted co-presence (involvement), which increased perceptions of group effectiveness, which in turn predicted success.
(Lowry et al., 2010)	Experiment involving 183 groups of 4 students.	Face-to-face (with or without collaborative support), virtual interaction with collaborative software support.	Decision-making task (desert survival problem), which involved a rank-ordering of items.	Communication openness, task discussion effectiveness.	Communication openness and task discussion effectiveness were higher in face-to-face groups without collaborative software support than in both collaborative software supported groups. No differences were found between the latter two groups.
(Riordan and	Survey with 124	Face-to-face, e-mail,	Transmit negatively or positively	Reasons for choice.	Reason for choosing face-to-face over computer-

Kreuz, 2010)	participants.	instant messaging.	valenced emotional information.		mediated channels was the ability to use more nonverbal cues, the reason for choosing computer-mediate channels over face-to-face was the ability to shield oneself from the message recipient.
(George et al., 2013)	Scenario-based survey with 403 managers.	Face-to-face, video-conferencing, telephone, voice mail, e-mail, memo, letter.	Deceptive communication task. In particular, a scenario, in which the respondent was asked to assume the role of a manager in an automotive factory, and asked by their intermediate supervisor to deal with a business problem by not being completely honest.	Media choice and rationale behind choice.	Managerial media selection was thoughtful and intentional, both from a standpoint of how they plan the communication medium to use as well as more specifically how they plan to conduct communication to accomplish the task at hand. Although the predominantly verbal media selection outcomes found largely mirror earlier media selection studies, the rationales provided by respondents were often also driven by specific, task-related goals.

APPENDIX B. TELEPRESENCE SYSTEMS IN BUSINESS MEETINGS



Cisco



HP



Huawei



LifeSize



Polycom



Tandberg



TelePort



Teliris

APPENDIX C. QUESTIONNAIRE STUDY 1

This questionnaire is about the meeting you organized earlier. This will take less than 5 minutes to complete. Thank you for your cooperation!

Please copy the date and time of the meeting from the invitation e- mail here:

1. Please indicate what meeting mode you selected for this meeting?

- ☐ Audio-conferencing
(includes telephone interaction and WebEx Meeting Center with audio-only interaction)



- ☐ Video-conferencing
(includes WebEx Meeting Center with video-interaction, CTS¹⁵ MX(P)/EX Series, and CTS 500/1000/1100)



- ☐ Immersive TelePresence
(CTS 3000/3200, T Series)



- ☐ Face-to-face



¹⁵ CTS: Cisco TelePresence System

2. Which of the following objectives were relevant to this meeting, and how effective was <the selected meeting mode> for each of them.¹⁶ Effectiveness is defined as the extent to which the chosen meeting mode facilitated achievement of the meeting objective(s).

	Not relevant for this meeting	1: Not at all effective	2	3	4	5: Very effective
Exchange/share opinions or views on a topic or issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Make a decision	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Give or receive orders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Find a solution to a problem that has arisen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generate ideas on products, projects or initiatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generate buy-in or consensus on an idea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resolve conflicts and disagreements within a group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Build trust and relationships with one or more individuals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintain relationships with one or more other people and stay in touch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negotiate or bargain on a deal or contract	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Routine exchange of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-routine exchange of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communicate positive or negative feelings or emotions on a topic or issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Show personal concern about or interest in a particular issue or situation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assert and/or reinforce your authority, status, position to your team or others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Give or receive feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assemble a team and/or motivate teamwork on a project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clarify a concept, issue or idea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exchange confidential, private or sensitive information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

¹⁶ “Not relevant for this meeting” was the default indicated answer. Also, the list of business meeting objectives was presented in a randomized order for each respondent.

3. How often have you used audio-conferencing/video-conferencing/telepresence/face-to-face¹⁷ before within the current organization?

- ☐ First time user
- ☐ 1-5 times used before
- ☐ 6-10 times used before
- ☐ > 10 times used before

¹⁷ Only one option was shown here.

APPENDIX D. QUESTIONNAIRE STUDY 2

Thank you for cooperating in this research project on the use of technology-mediated business meetings. This survey will take less than 5 minutes to complete. To answer the questions below, please think of the last FinancialCo-internal meeting you organized using audio-conferencing/video-conferencing/telepresence/face-to-face¹⁸.

1. For each of the following objectives that was relevant to this meeting¹⁹, please indicate the extent to which audio-conferencing/video-conferencing/telepresence/face-to-face²⁰ facilitated the achievement of that objective:

	Not relevant for this meeting	1: Not at all effective	2	3	4	5: Very effective
Exchange/share opinions or views on a topic or issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Make a decision	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Give or receive orders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Find a solution to a problem that has arisen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generate ideas on products, projects or initiatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generate buy-in or consensus on an idea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resolve conflicts and disagreements within a group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Build trust and relationships with one or more individuals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintain relationships with one or more other people and stay in touch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negotiate or bargain on a deal or contract	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Routine exchange of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-routine exchange of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communicate positive or negative feelings or emotions on a topic or issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Show personal concern about or interest in a particular issue or situation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assert and/or reinforce your authority, status, position to your team or others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Give or receive feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assemble a team and/or motivate teamwork on a project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clarify a concept, issue or idea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exchange confidential, private or sensitive information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

¹⁸ Only one option was shown here.

¹⁹ "Not relevant for this meeting" was the default indicated answer. Also, the list of business meeting objectives was presented in a randomized order for each respondent.

²⁰ Only one option was shown here.

2. How often have you used audio-conferencing/video-conferencing/telepresence/face-to-face²¹ before within the current organization?

- ☐ First time user
- ☐ 1-5 times used before
- ☐ 6-10 times used before
- ☐ > 10 times used before

3. How many people attended this meeting?

4. What was the approximate duration of this meeting?

- ☐ Less than 15 minutes
- ☐ 15 to 30 minutes
- ☐ 30 to 60 minutes
- ☐ 1 to 2 hours
- ☐ over 2 hours

<the following question was included in the survey for video-conferencing meetings only>

5. Did one or more attendee(s) use audio-conferencing for this meeting?

- ☐ Yes
- ☐ No

<the following question was included in the survey for telepresence and face-to-face meetings only>

5. Did one or more attendee(s) use audio- or video-conferencing for this meeting?

- ☐ Yes
- ☐ No

²¹ Only one option was shown here.

APPENDIX E. QUESTIONNAIRE STUDY 3

Thank you for participating in this study on the use of collaboration technologies in business meetings. This survey consists of **4 questions** and will take **less than 5 minutes** to complete. To answer the questions below, please think of a **specific*** *NetworkingCo*-internal meeting you organized recently.

*if this meeting is an instance of a recurring meeting, please refer to the specific instance only

1. For this specific meeting, please select from the following list the key objectives of the meeting:²²

	Exchange/share opinions or views on a topic or issue
	Make a decision
	Give or receive orders
	Find a solution to a problem that has arisen
	Generate ideas on products, projects or initiatives
	Generate buy-in or consensus on an idea
	Resolve conflicts and disagreements within a group
	Build trust and relationships with one or more individuals
	Maintain relationships with one or more other people and stay in touch
	Negotiate or bargain on a deal or contract
	Routine exchange of information
	Non-routine exchange of information
	Communicate positive or negative feelings or emotions on a topic or issue
	Show personal concern about or interest in a particular issue or situation
	Assert and/or reinforce your authority, status, position to your team or others
	Give or receive feedback
	Assemble a team and/or motivate teamwork on a project
	Clarify a concept, issue or idea
	Exchange confidential, private or sensitive information

²² The list of business meeting objectives was presented in a randomized order for each respondent.

2. Please select how important the following capabilities were for achieving the key objectives of this specific meeting²³:

	1: Not at all important	2	3	4	5: Very important
Have side conversations with one or more attendees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discern attendees' facial expressions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Examine and/or manipulate specific physical objects (e.g. prototypes or samples)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experience co-location (the sense of being in the same physical location)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have ancillary interaction before or after the formal meeting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use shared computer screens and/or work spaces	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have eye contact with other attendees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observe appearance (posture, clothing, etc.) of attendees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use ancillary resources such as a flip-chart	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observe what attendees are looking at	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
See attendees' body language and gestures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do side-tasks that other attendees are unaware of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hear attendees' voices (speech and vocal tone)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

²³ The list of business meeting mode attributes was presented in a randomized order for each respondent.

3. Please indicate what meeting mode you selected for this meeting?

- Audio-conferencing
(includes telephone interaction and WebEx Meeting Center with audio-only interaction)



- Video-conferencing
(includes WebEx Meeting Center with video-interaction, CTS²⁴ MX(P)/EX Series, and CTS 500/1000/1100)



- Immersive TelePresence
(CTS 3000/3200, T Series)



- Face-to-face



²⁴ CTS: Cisco TelePresence System

APPENDIX F. QUESTIONNAIRE STUDY 4

Thank you for cooperating in this *EngineeringCo*-supported research project on the use of technology-mediated business meetings. This survey will take less than five minutes to complete. All data will be treated confidentially and anonymously, and presented in the aggregate only.

To answer the questions below, please think of a specific *EngineeringCo*-internal meeting you organized recently using audio-conferencing/video-conferencing/telepresence/face-to-face²⁵.

- 1. For this specific meeting, please select from the following list one or more key objectives of the meeting:** ²⁶

<input type="checkbox"/>	Exchange/share opinions or views on a topic or issue
<input type="checkbox"/>	Make a decision
<input type="checkbox"/>	Give or receive orders
<input type="checkbox"/>	Find a solution to a problem that has arisen
<input type="checkbox"/>	Generate ideas on products, projects or initiatives
<input type="checkbox"/>	Generate buy-in or consensus on an idea
<input type="checkbox"/>	Resolve conflicts and disagreements within a group
<input type="checkbox"/>	Build trust and relationships with one or more individuals
<input type="checkbox"/>	Maintain relationships with one or more other people and stay in touch
<input type="checkbox"/>	Negotiate or bargain on a deal or contract
<input type="checkbox"/>	Routine exchange of information
<input type="checkbox"/>	Non-routine exchange of information
<input type="checkbox"/>	Communicate positive or negative feelings or emotions on a topic or issue
<input type="checkbox"/>	Show personal concern about or interest in a particular issue or situation
<input type="checkbox"/>	Assert and/or reinforce your authority, status, position to your team or others
<input type="checkbox"/>	Give or receive feedback
<input type="checkbox"/>	Assemble a team and/or motivate teamwork on a project
<input type="checkbox"/>	Clarify a concept, issue or idea
<input type="checkbox"/>	Exchange confidential, private or sensitive information

²⁵ Only one option was shown here.

²⁶ The list of business meeting objectives was presented in a randomized order for each respondent.

2. Please select how important the following capabilities were for achieving the key objectives of this specific meeting²⁷:

	1: Not at all important	2	3	4	5: Very important
Have side conversations with one or more attendees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discern attendees' facial expressions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Examine and/or manipulate specific physical objects (e.g. prototypes or samples)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experience co-location (the sense of being in the same physical location)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have ancillary interaction before or after the formal meeting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use shared computer screens and/or work spaces	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have eye contact with other attendees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observe appearance (posture, clothing, etc.) of attendees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use ancillary resources such as a flip-chart	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observe what attendees are looking at	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
See attendees' body language and gestures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do side-tasks that other attendees are unaware of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hear attendees' voices (speech and vocal tone)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

²⁷ The list of business meeting mode attributes was presented in a randomized order for each respondent.

3. How many people attended this meeting?

4. What was the approximate duration of this meeting?

- ☐ Less than 15 minutes
- ☐ 15 to 30 minutes
- ☐ 30 to 60 minutes
- ☐ 1 to 2 hours
- ☐ over 2 hours

APPENDIX G. RELATIONSHIPS BETWEEN BUSINESS MEETING OBJECTIVES AND MEETING MODE CAPABILITIES
(REGRESSION WEIGHTS) (STUDY 3)

Business Meeting Objectives	Business Meeting Mode Capabilities												
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>
Clarify a concept, issue or idea	0.197*	0.090	-0.120	-0.112	-0.045	-0.001	0.057	0.198	0.182	0.111	0.236	-0.157	-0.047
Exchange/share different opinions or views	-0.022	0.286*	-0.198	-0.276	-0.199	0.023	-0.043	0.094	0.008	-0.129	0.118	0.219	-0.075
Make a decision	0.033	0.203	0.218	0.251	0.281	0.189	0.29	0.096	-0.120	0.203	-0.126	0.017	0.051
Generate ideas on products, projects or initiatives	0.119	0.069	0.064	0.081	0.028	0.020	0.105	0.386**	0.260	0.074	0.129	0.171	0.192
Routine exchange of information	0.049	-0.221	-0.372*	-0.261	-0.325*	-0.265	-0.326*	-0.161	-0.077	-0.108	0.055	-0.310	-0.184
Find a solution to a problem that has arisen	-0.001	0.244*	0.047	0.004	-0.169	-0.032	0.261	0.101	0.452**	0.073	0.318*	0.510**	0.542***
Build trust and relationships with one or more individuals	0.011	-0.117	0.608**	0.477**	0.514**	0.418*	0.249	0.188	-0.111	0.453**	0.032	-0.009	0.181
Give or receive feedback	-0.016	-0.052	-0.011	-0.040	-0.039	-0.055	0.019	-0.120	-0.210	-0.132	-0.041	-0.215	-0.001
Assemble a team and/or motivate teamwork	0.036	-0.072	0.045	0.126	0.113	0.114	-0.055	-0.123	-0.422**	-0.234	-0.256	-0.124	-0.123
Generate buy-in or consensus on an idea	0.04	0.100	-0.152	-0.233	0.127	-0.336	-0.245	0.046	0.085	0.110	-0.155	-0.286	-0.321*
Maintain relationships with one or more other people and stay in touch	0.026	-0.110	0.005	0.096	0.059	0.166	-0.120	-0.234	0.066	-0.108	-0.051	0.071	0.107
Show personal concern about or interest in a particular issue or situation	-0.030	-0.003	0.345	0.212	0.282	0.239	0.408	0.326	0.291	-0.077	0.227	0.158	0.303
Exchange confidential, private or sensitive information	0.191	0.215	0.150	0.148	0.238	0.157	0.079	0.179	0.528**	0.425*	-0.116	0.147	-0.015
Communicate positive or negative feelings or emotions on a topic or issue	0.082	0.094	0.012	0.265	0.029	0.052	0.107	-0.250	-0.051	0.121	-0.078	0.009	0.135
Non-routine exchange of information	-0.064	-0.195	-0.825***	-0.853***	-0.771***	-0.677**	-0.443*	-0.599**	-0.067	-0.750**	0.180	-0.194	-0.355
Resolve conflicts and disagreements	0.016	-0.091	-0.013	0.147	0.037	0.037	0.067	0.022	0.149	0.166	0.046	0.142	0.281
Give or receive orders	0.133	0.071	-0.145	-0.450	-0.219	-0.455	-0.486	-0.201	-0.658**	-0.058	-0.033	-0.319	-0.653**
Assert and/or reinforce your authority, status, position to your team or others	-0.292	-0.551	-0.202	-0.467	-0.100	-0.249	0.117	0.070	0.134	0.029	0.170	0.710	0.804*
Negotiate or bargain on a deal or contract	-0.014	-0.127	0.214	0.244	-0.125	0.368	0.441	0.311	0.300	0.065	0.039	-0.224	0.263

* p < 0.05; ** p < 0.01; *** p < 0.0004

1	<i>Hear attendees' voices (speech and vocal tone)</i>	8	<i>Have ancillary interaction before or after the formal meeting</i>
2	<i>Use shared computer screens and/or work spaces</i>	9	<i>Have side conversations with one or more attendees</i>
3	<i>See attendees' body language and gestures</i>	10	<i>Observe appearance (posture, clothing, etc.) of attendees</i>
4	<i>Have eye contact with other attendees</i>	11	<i>Do side-tasks that other attendees are unaware of</i>
5	<i>Discern attendees' facial expressions</i>	12	<i>Use ancillary resources such as a flip-chart</i>
6	<i>Experience co-location (the sense of being in the same physical location)</i>	13	<i>Examine and/or manipulate specific physical objects (e.g. prototypes or samples)</i>
7	<i>Observe what attendees are looking at</i>		

APPENDIX H. RELATIONSHIPS BETWEEN BUSINESS MEETING OBJECTIVES AND MEETING MODE CAPABILITIES
(REGRESSION WEIGHTS) (STUDY 4)

	Business Meeting Mode Capabilities												
Business Meeting Objectives	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>
Clarify a concept, issue or idea	-0.029	0.225**	-0.078	-0.212*	-0.210*	-0.207*	0.104	0.022	-0.074	-0.083	0.107	0.042	0.287**
Exchange/share different opinions or views	0.144	-0.006	-0.125	-0.178	-0.083	-0.142	-0.149	-0.019	-0.065	-0.175	-0.038	-0.016	-0.231*
Find a solution to a problem	-0.069	-0.024	-0.159	-0.128	-0.149	-0.12	-0.146	0.051	0.092	-0.016	0.121	0.057	0.068
Make a decision	-0.028	0.136	0.002	0.153	0.003	0.001	0.040	0.027	0.174	0.025	0.030	0.212*	0.144
Give or receive feedback	-0.002	0.094	-0.020	-0.039	0.005	-0.081	-0.176	-0.051	-0.098	-0.024	-0.152	0.074	0.071
Routine exchange of information	0.063	0.344***	-0.496***	-0.496***	-0.431***	-0.233*	-0.306**	-0.196*	-0.234**	-0.366***	-0.016	-0.227*	-0.264**
Generate ideas on products, projects or initiatives	-0.009	0.081	0.085	0.193	0.015	0.213*	0.088	0.160	0.300**	-0.044	0.180*	0.244**	0.433***
Assemble a team and/or motivate teamwork	0.022	0.217*	0.091	0.048	0.105	0.107	0	0.085	0.102	0.046	0.144	0.218*	0.064
Build trust and relationships	-0.059	0.016	0.474***	0.417***	0.431***	0.351**	0.400***	0.051	-0.019	0.394***	-0.094	0.09	0.211
Maintain relationships with one or more other people and stay in touch	-0.061	-0.136	0.244*	0.214	0.276**	0.330**	-0.042	0.038	0.155	0.327**	0.119	-0.003	-0.041
Generate buy-in or consensus on an idea	0.038	-0.02	-0.103	-0.141	-0.059	-0.096	-0.225*	-0.124	-0.354**	-0.063	-0.253**	-0.386***	-0.448***
Resolve conflicts and disagreements	0.029	-0.164	0.204	0.215	0.275*	0.14	0.289*	0.324**	0.292*	0.183	0.400***	0.260*	0.113
Non-routine exchange of information	0.192*	-0.1	-0.068	-0.097	0.08	-0.128	-0.112	-0.12	-0.175	-0.205	0.019	-0.067	-0.217
Show personal concern or interest	0.092	-0.073	-0.063	-0.132	0.033	0.007	0.028	0.116	0.112	-0.018	-0.016	0.093	0.125
Exchange confidential, private or sensitive information	0.086	-0.279*	0.093	0.102	0.115	0.21	-0.059	0.173	0.025	0.067	0.114	-0.21	-0.028
Communicate positive or negative feelings or emotions on a topic or issue	0.230*	-0.304*	0.395**	0.385*	0.223	0.191	0.355*	-0.107	0.094	0.294*	0.19	-0.016	0.24
Give or receive orders	-0.092	-0.069	0.171	0.023	-0.05	0.036	0.27	0.168	-0.076	-0.056	-0.075	-0.012	0.162
Negotiate or bargain on a deal or contract	0.076	-0.139	0.402	0.251	0.186	0.041	0.327	0.523**	0.421*	0.611**	0.333	0.298	0.715**
Assert and/or reinforce your authority, status, position to your team or others	0.005	-0.169	0.238	0.485	0.321	0.364	0.397	0.12	-0.161	0.094	-0.173	0.036	-0.295

* p < 0.05; ** p < 0.01; *** p < 0.0004

1	<i>Hear attendees' voices (speech and vocal tone)</i>	8	<i>Have ancillary interaction before or after the formal meeting</i>
2	<i>Use shared computer screens and/or work spaces</i>	9	<i>Have side conversations with one or more attendees</i>
3	<i>See attendees' body language and gestures</i>	10	<i>Observe appearance (posture, clothing, etc.) of attendees</i>
4	<i>Have eye contact with other attendees</i>	11	<i>Do side-tasks that other attendees are unaware of</i>
5	<i>Discern attendees' facial expressions</i>	12	<i>Use ancillary resources such as a flip-chart</i>
6	<i>Experience co-location (the sense of being in the same physical location)</i>	13	<i>Examine and/or manipulate specific physical objects (e.g. prototypes or samples)</i>
7	<i>Observe what attendees are looking at</i>		

SUMMARY – ENGLISH

Meetings are an important part of doing business. The number of meetings in firms keeps growing, and business meetings increasingly involve participants that are distributed across multiple geographical locations. For such distributed meetings, organizers can turn to various communication technologies as less costly and more environmentally friendly alternatives to the traditional face-to-face setting. Hence, the availability of multiple modes (technologies) for conducting business meetings causes a non-trivial choice problem for meeting organizers: what are the criteria for effectively selecting a business meeting mode.

To address this problem, this dissertation started from a critical review of the organizational communication literature, and formulated three research questions:

- 1. What is the comparative effectiveness of different business meeting modes?*
- 2. How do different capabilities of meeting modes influence the effectiveness of the modes?*
- 3. How do the number of meeting participants and the duration of the meeting influence the effectiveness of different business meeting modes?*

To address these research questions, research study collaborations were established with three Forbes Global 500-companies. In a first phase, a list of business meeting objectives and a list of meeting mode capabilities were developed, based on a literature review and a relevance check with managers at the three companies. In a second phase, four field studies across the three companies were conducted. In total, input was obtained from more than 2,000 participating business meeting organizers, who completed an online questionnaire in which they referred to a business meeting they organized recently using one of the four meeting modes.

With respect to the first research question, the results showed that the effectiveness of a meeting mode increased monotonically with the capabilities it provides. However, the meeting mode effectiveness relationships were not found to be uniform across objectives. In particular, across two field studies, six categories of meeting objectives emerged, for which a similar meeting mode effectiveness ordering applied. A first category of objectives was identified, for which all meeting modes were equally effective. For a second category, audio-

conferencing meetings were found to be less effective than all other meeting modes. For a third category, audio- and video-conferencing meetings were found to be less effective than telepresence and face-to-face meetings. Two additional categories involved small refinements to the effectiveness ordering of the latter category, as audio-conferencing was additionally found to be less effective than video-conferencing in category 4, and telepresence was additionally found to be less effective than face-to-face in category 5. In a sixth and final category, all technology-enabled meeting modes were found to be less effective than face-to-face interaction. In addition, hybrid meetings, in which one or more meeting attendees participate through a lower capability meeting mode, were found to be quite prevalent. This is surprising, since the hybrid nature of meetings seems to lower their effectiveness.

With respect to the second research question, the results showed that three capabilities were important for achieving most of the meeting objectives: “Hear attendees’ voices,” “Use shared computer screens and/or work spaces,” and “Experience co-location.” For “Hear attendees’ voices, this finding is consistent with prior research, in which this capability has been frequently considered to be the most important capability of media. However, the importance of the two other capabilities for achieving most of the meeting objectives is surprising. Further research is needed to determine whether this is due to the respondent evaluating the importance of the meeting mode capabilities for different objectives simultaneously. Visual capabilities (“See attendees’ body language and gestures,” “Have eye contact,” “Discern attendees’ facial expressions,” “Observe what attendees are looking at,” and “Observe appearance of attendees”) were also important for achieving multiple objectives and especially for emotion-laden objectives. Furthermore, capabilities such as “Use ancillary resources,” “Examine physical objects,” and “Have ancillary interaction,” were important for achieving specific objectives only. Finally, capabilities such as “Have side conversations” and “Do side-tasks” were generally not found to be important to achieve objectives. The findings on the importance of business meeting mode capabilities help to explain the meeting mode effectiveness categories that were observed in the first two studies (see Table 8.1). For instance, for objectives that fell into category 2 of Table 8.1 above (AC < (VC, TP, FTF)), visual capabilities were found to be important.

The results of the studies addressing the third research question showed that the number of meeting participants had a limited influence, and that more participants were rarely positively related to meeting mode effectiveness. In addition, the influence of the duration of the meeting seemed to depend on the meeting mode used. In particular, while negative

relationships with effectiveness were found for longer audio- and video-conferencing meetings, positive relationships were found for longer telepresence and face-to-face meetings.

The contributions of this dissertation follow from the focus on the business meeting context, in which the relationships between objectives, modes, and capabilities had not been studied before. Also, the empirical approach of using actual, real-life business meetings as a basis for data collection, was distinct from most prior research on organizational communication, in which hypothetical choices or perceived appropriateness of media were examined, or in which experiments were used. Finally, the set of meeting modes included telepresence, which had not been studied in prior research on organizational communication.

As to the academic implications of the dissertation, the list of meeting objectives was found to be adequate to characterize business meetings, and the ordering of frequencies of objectives was found to be reasonably consistent across the studies. In terms of meeting mode effectiveness, the results provide novel insight and can serve as a starting point for the development of technology-enabled meeting mode usage norms. The list of business meeting mode capabilities, which contains a comprehensive set of capabilities in the context of business meetings, provides a useful basis to explain differences in effectiveness across communication technologies and face-to-face. In addition, the influence of the number of meeting participants and of the duration of the meeting on meeting mode effectiveness was found to be limited, yet their relationships with the broader notion of meeting effectiveness require further investigation. Finally, this was the first study to examine the effectiveness of telepresence, relative to conventional meeting modes, to discern the meeting objectives it is suited for. It was found to be especially effective for *Build trust and relationships*, which is considered to be one of the major challenges in distributed work groups.

As to the managerial implications of this research, the list of meeting objectives can help managers in planning meetings and preparing meeting agendas. In addition, the findings of the field studies provide guidance in effectively selecting a meeting mode, based on the intended meeting objectives. The findings on the influence of the number of meeting participants and of the meeting duration are also useful for managers: a meeting organizer should be careful not to invite too many people and should deliberately set the meeting duration, depending on the meeting mode used. Drawing from the dissertation results, a company can provide training to its employees, or build a tool that makes meeting mode and duration recommendations to organizers, based on what they are trying to achieve and how many people they want to invite. Finally, the research results indicate investing in

telepresence systems or gaining access to such facilities may yield significant operational cost savings for widely distributed organizations.

This dissertation is subject to multiple limitations. In particular, it focuses on meeting mode effectiveness, which is one dimension of the broader notion of meeting effectiveness. Moreover, it focuses on meeting mode capabilities as the key driver of meeting mode effectiveness, yet there are many additional factors, such as participants' preparations and experience with each other. Also, while effectiveness considerations are assumed to be the main determinant of meeting mode selection, cost and convenience also have an impact. Finally, there is a potential effect on the study results, as a consequence of the sequence in which the studies were conducted. These limitations may reduce the external validity of the results and further research is needed to establish the generalizability of the findings.

In terms of future research directions, the use of additional technologies for distributed business meetings can be studied, for instance instant messaging and virtual environments. Moreover, as interoperability between technology-enabled systems enhances, it will be important to investigate how different modes are deployed for effective inter-organizational meetings. Furthermore, the topic of hybrid meetings emerged as fertile ground for future research. For example, future research can examine whether they are deliberately set up that way; when and why the hybrid nature may lead to cancellation/postponement of the meeting; and how their use relates to the formation of local coalitions. Finally, more research is needed to fully understand the role of telepresence for organizational communication. Besides for internal and external business meetings, telepresence technology is currently used for interviewing job applicants, for training, and for broadcasting large company announcements. Furthermore, telepresence technology is currently deployed for interactions between representatives of companies (banks, insurance companies, etc.) and their customers, which raises the question on how best to leverage this technology in this setting. All these offer interesting avenues for further research.

SUMMARY – DUTCH

Meetings zijn een belangrijk onderdeel van het bedrijfsleven. Het aantal meetings in bedrijven neemt toe en in steeds groter wordende mate zijn bij meetings deelnemers betrokken die zich op geografisch gespreide plaatsen bevinden. Voor zulke gedistribueerde meetings kunnen meeting organisatoren verscheidene communicatie technologieën aanwenden als alternatieven voor de traditionele face-to-face setting, op een goedkopere en milieuvriendelijkere manier. De beschikbaarheid van verschillende technologieën (modes) om business meetings te faciliteren veroorzaakt een niet-triviaal beslissingsprobleem voor meeting organisatoren: wat zijn de criteria om op een effectieve manier een business meeting mode te selecteren.

Om deze vraag te beantwoorden, start dit proefschrift met een kritische bespreking van de literatuur over communicatie in organisaties, en formuleert vervolgens drie onderzoeksvragen:

- 1. Wat is de relatieve effectiviteit van verschillende business meeting modes?*
- 2. Hoe beïnvloeden verschillende functionaliteiten van meeting modes de effectiviteit van de modes?*
- 3. Hoe beïnvloeden het aantal meeting deelnemers en de duur van de meeting de effectiviteit van verschillende business meeting modes?*

Om deze onderzoeksvragen te beantwoorden werd een onderzoekssamenwerking opgestart met drie Forbes Global 500-bedrijven. In een eerste fase werd een lijst van business meeting doelstellingen opgesteld, op basis van een literatuurstudie en een validatie bij managers van elk van de drie bedrijven. In een tweede fase werden vier veldstudies uitgevoerd, binnen deze drie bedrijven. In totaal werd input verkregen van meer dan 2.000 deelnemende business meeting organisatoren, die elk een online vragenlijst invulden. In deze vragenlijsten refereerden de respondenten naar een recent georganiseerde business meeting, waarin ze gebruik maakten van een van de vier meeting modes.

Wat betreft de eerste onderzoeksvraag tonen de resultaten dat de effectiviteit van meeting modes monotoon toeneemt met de functionaliteiten die het biedt. Echter, de meeting mode effectiviteit relaties waren niet uniform over de meeting doelstellingen heen. Meer specifiek werden er zes categorieën van meeting doelstellingen geïdentificeerd, over twee

studies heen, waarvoor een zelfde meeting mode effectiviteit ordening opgaat. Voor een eerste categorie van doelstellingen waren alle meeting modes even effectief. Voor een categorie was audio-conferencing minder effectief dan alle andere meeting modes. Voor een derde categorie waren audio- en video-conferencing meetings minder effectief dan telepresence en face-to-face meetings. Twee additionele categorieën betroffen kleine modificaties op de meeting mode effectiviteit ordening van voornoemde categorie. Audio-conferencing was namelijk additioneel minder effectief dan video-conferencing in categorie 4, en telepresence was additioneel minder effectief dan face-to-face in categorie 5. In een zesde en laatste categorie waren alle technologie-gebaseerde meeting modes minder effectief dan face-to-face interactie. Daarnaast werd vastgesteld dat hybride meetings, waarin één of meerdere meeting participanten deelnemen via een meeting mode met minder functionaliteit, vaak voorkwamen. Dit is een verrassende vaststelling, gezien de hybride aard van de meeting de effectiviteit leek te doen afnemen.

Wat betreft de tweede onderzoeksvraag toonden de resultaten dat drie meeting mode functionaliteiten belangrijk waren voor het bereiken van de meerderheid van de meeting doelstellingen: “De Stemmen van de deelnemers horen,” “Gedeelde computer schermen en/of werkruimtes gebruiken,” en “Het gevoel hebben in een gedeelde ruimte te zijn.” Voor de eerste functionaliteit (“De Stemmen van de deelnemers horen”) is deze bevinding consistent met eerder onderzoek. Echter, het aanzienlijke belang van de andere twee functionaliteiten is verrassend. Bijkomend onderzoek is dan ook nodig om te bepalen of dit komt doordat respondenten de belangrijkheid van meeting mode functionaliteiten beoordeelden voor verschillende doelstellingen terzelfdertijd. Visuele functionaliteiten (“Lichaamstaal en gebaren van deelnemers zien,” “Oog contact hebben,” “Zien waar deelnemers naar kijken,” en “Het voorkomen van deelnemers aanschouwen”) waren ook belangrijk voor het bereiken van meerdere doelstellingen, en in het bijzonder voor deze waarbij emoties betrokken zijn. Bovendien waren functionaliteiten zoals “Bijkomende middelen gebruiken,” “Fysieke objecten bekijken” en “Bijkomende interactie hebben,” enkel belangrijk voor het bereiken van enkele specifieke doelstellingen. Ten slotte, functionaliteiten zoals “Zij-gesprekken hebben” en “Zij-taken doen” werden niet als belangrijk bevonden voor het bereiken van doelstellingen. In het algemeen kunnen de bevindingen over het belang van business meeting mode functionaliteiten gebruikt worden om de categorieën van meeting mode effectiviteit, gevonden in de eerste onderzoeksvraag, te verhelderen.

De resultaten met betrekking tot de derde onderzoeksvraag toonden dat het aantal meeting deelnemers een beperkte invloed had, echter, meer deelnemers was zelden positief

gerelateerd aan meeting mode effectiviteit. Bovendien leek de invloed van de duur van de meeting af te hangen van de gebruikte meeting mode. Meer specifiek werden negatieve relaties gevonden met meeting mode effectiviteit voor audio- en video-conferencing, en positieve relaties voor telepresence en face-to-face meetings.

De contributie van dit proefschrift volgt uit de focus op de business meeting context, in dewelke de relaties tussen doelstellingen, modes, en functionaliteiten niet eerder werden onderzocht. Bovendien is de gebruikte empirische methode, waarin echte real-life business meetings werden gebruikt als de basis voor data verzameling, verschillend van het merendeel van eerder onderzoek over communicatie in organisaties, waarin hypothetische keuzes of gepercipieerde geschiktheid van media werden onderzocht, of experimenten werden opgezet. Ten slotte, de set van meeting modes bevatte telepresence, wat nog niet eerder in onderzoek over communicatie in organisaties werd onderzocht.

Wat betreft de academische implicaties van dit proefschrift, werd de lijst van meeting doelstellingen adequaat bevonden om business meetings te karakteriseren, en de ordening van de frequentie van doelstellingen werd relatief consistent bevonden over de studies heen. De resultaten met betrekking tot de meeting mode effectiviteit verschaften nieuw inzicht en kunnen dienen als een startpunt voor het ontwikkelen van gebruiksnormen voor technologie-gebaseerde meeting modes. De lijst van meeting mode functionaliteiten, die omvangrijk is in de context van business meetings, is bruikbaar om verschillen in effectiviteit over de meeting modes heen te verklaren. Daarnaast werd vastgesteld dat de invloed van het aantal deelnemers en van de duur van de meeting op meeting mode effectiviteit beperkt is, hun relatie met het bredere begrip van meeting effectiviteit dient echter verder onderzocht te worden. Ten slotte, dit was de eerste studie die de effectiviteit van telepresence onderzocht, in vergelijking met meer gebruikelijke meeting modes, om op die manier de meeting doelstellingen te bepalen waarvoor het geschikt is. Telepresence werd in het bijzonder effectief bevonden voor het opbouwen van vertrouwen en relaties, wat als één van de grote uitdagingen in gedistribueerde samenwerking wordt gezien.

Wat betreft de praktische implicaties van dit onderzoek, kan de lijst van meeting doelstellingen managers helpen bij het plannen van meetings en het voorbereiden van meeting agenda's. Daarnaast verschaften de resultaten een wegwijzer voor het effectief selecteren van een meeting mode, gebaseerd op de geplande meeting doelstellingen. De bevindingen met betrekking tot de invloed van het aantal meeting deelnemers en de duur van de meeting zijn ook bruikbaar voor managers: een meeting organisator moet zich behoeden om niet te veel mensen uit te nodigen en moet weloverwogen de meeting duur voorop stellen, afhankelijk van

de gebruikte meeting mode. Gebaseerd op de resultaten van het onderzoek kan een bedrijf training voorzien voor haar werknemers, of een tool bouwen die aanbevelingen maakt qua meeting mode en duur, gebaseerd op de doelstellingen en het aantal deelnemers. Ten slotte, de onderzoeksresultaten geven aan dat investeren in telepresence systemen, of toegang verkrijgen tot zulke faciliteiten, significante operationele kost besparingen kunnen opleveren voor bedrijven met een wijdverspreide werking.

Dit proefschrift heeft een aantal beperkingen. Vooreerst, het focust op meeting mode effectiviteit, wat één dimensie is van het bredere begrip meeting effectiviteit. Bovendien gaat het uit van de meeting mode functionaliteit als de belangrijkste determinant van meeting mode effectiviteit, terwijl er meerdere bijkomende factoren kunnen meespelen, zoals de voorbereiding van deelnemers en hun ervaring met elkaar. Daarnaast worden effectiviteitsoverwegingen geacht de belangrijkste determinant te zijn van meeting mode selectie, terwijl gebruiks-kost en -gemak ook een impact kunnen hebben. Ten slotte is er mogelijk een effect op de studie resultaten als gevolg van de volgorde waarin de studies werden uitgevoerd. Deze beperkingen reduceren mogelijk de externe validiteit van de resultaten en verder onderzoek is nodig om de generaliseerbaarheid van de bevindingen te bewerkstelligen.

In termen van toekomstig onderzoek kunnen bijkomende technologieën voor gedistribueerde business meetings onderzocht worden, zoals instant messaging en virtuele omgevingen. Daarnaast zal het belangrijk zijn, wanneer de interoperabiliteit tussen technologie-gebaseerde systemen toeneemt, te onderzoeken hoe verschillende meeting modes effectief kunnen gebruikt worden voor meetings tussen organisaties. Daarnaast bleek het onderwerp van hybride meetings een vruchtbare bodem voor toekomstig onderzoek te bieden. Er kan bijvoorbeeld onderzocht worden of deze met opzet als dusdanig worden opgezet; wanneer en waarom de hybride aard van de meeting kan leiden tot afgelasting/uitstellen van de meeting; en hoe het gebruik van hybride meetings leidt tot het vormen van lokale coalities. Ten slotte is er meer onderzoek nodig om de rol van telepresence voor communicatie in organisaties beter te begrijpen. Naast voor interne en externe business meetings wordt telepresence momenteel gebruikt voor job interviews, voor training, en voor het intern uitzenden van grote bedrijfsaankondigingen. Bovendien wordt telepresence technologie momenteel ingezet voor interacties tussen vertegenwoordigers van bedrijven (banken, verzekeringsbedrijven, etc.) en hun klanten, waarbij de vraag zich stelt hoe dit op de beste manier te doen. Al de bovenstaande voorstellen zijn interessante pistes voor toekomstig onderzoek.