Assessing the Effectiveness of Telepresence for Business Meetings

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Abstract

Business meetings conducted using fully-immersive telepresence systems provide participants with the lifelike-experience of a face-to-face meeting and offer the cost- and time-saving advantages of computer-mediated communication. However, telepresence systems are still much more expensive than simpler computer-mediated meeting modes, which makes the choice of this technology for business meetings a non-trivial decision problem. In this study, drawing upon the literature on social presence, media richness, and media appropriateness that relate media choice to task characteristics and objectives, we identify 19 objectives for business meetings. We then present hypotheses on the effectiveness of various meeting modes for achieving these objectives, focusing on the social presence dimension of four meeting modes (audio-conferencing, video-conferencing, telepresence, and face-to-face). We test these hypotheses using survey data from a large company in which all the technologies are available on a relatively broad basis.

1. Introduction

Increasingly, managers in organizations have access to multiple computer-mediated systems to organize business meetings. Such meetings typically have various objectives and the choice of meeting mode is considered important in effectively accomplishing these objectives. Prior research has focused on the relationship between characteristics of the meeting mode and communication tasks [4, 12, 19, 22], and in these studies, face-to-face (FTF) is generally considered to be more appropriate and effective than computer-mediated communication (CMC). However, fully-immersive telepresence systems are increasingly being adopted by a variety of organizations across the world for conducting distributed business meetings. Telepresence has been defined as “the use of technology to establish a sense of shared presence or shared space among geographically separated members of a group” [3]. In telepresence meetings, the rooms are set up in a manner that closely resembles the setting of a FTF meeting, participants at different locations see each other in true life size, can look each other in the eye, and the direction of speaking is accounted for (spatial audio). In addition, lighting in the rooms is adjusted, furniture is similar across locations and colors are matched for a seamless look and feel. As such, the technology combines the cost- and time-saving advantages of CMC with the lifelike experience of a FTF meeting.

However, telepresence capability comes at a significant cost. For instance, anecdotal evidence suggests that full-fledged immersive telepresence rooms, built using Cisco TelePresenceTM, cost about USD 300,000, and the operating costs run into several hundred USD per hour during meetings. Therefore, the operating cost is invariably much more expensive than other CMC meeting modes, while still being less costly than FTF meetings that require expensive travel.

The increasing deployment of telepresence systems raises questions on their role and relevance for business meetings. In particular, it is of interest to both practitioners and researchers to assess the effectiveness of telepresence for business meetings. To our knowledge, no prior studies have examined meeting objectives for which the added social presence of a telepresence meeting is more effective than other CMC meetings, and for what meeting objectives telepresence is as effective as FTF.

In this study, we draw upon the literature on social presence, media richness, and media appropriateness, which relates media choice for collaborative tasks to task characteristics. Based on our review of the literature, we identify a set of 19 objectives for business meetings, and formulate hypotheses on the effectiveness of different meeting modes for achieving these objectives. We then empirically validate these hypotheses using survey data from a large multinational corporation.

In the following section, we review three literature streams that provide the theoretical foundation for our study. In section 3, we develop our hypotheses, based on the literature review. In sections 4 and 5, we discuss
the empirical study and results. In a final section, we address the implications and limitations of our study, and suggest avenues for further research.

2. Theoretical foundation

In this section, we review research on social presence, media richness, and media appropriateness. These streams of literature are considered key for our study as they focus on media choice and consider it a function of the match between characteristics of the communication media and requirements of the communication task.

2.1. Social presence

Social presence is defined as the extent to which a medium enables the experience of communication partners to be present physically and/or psychologically [6, 22]. Social presence of a medium is comprised of several factors such as capacity to transmit information about tone of voice, gestures, facial expression, direction of looking, posture, touch, and nonverbal cues. These factors determine the level of presence, which involves the extent to which a medium is perceived as sociable, warm, sensitive, personal, and/or intimate when it is used to interact with other people. To communicate effectively, the requirements for social presence of the communication tasks should be matched with the social presence of the medium [22].

2.2. Media richness

The literature on media richness states that media differ in the extent to which they enable the transmission of rich information. Richness consists of four criteria: feedback, multiple cues, language variety, and personal focus [4]. Based on these attributes, every communication medium possesses distinct, objective richness capacities and media can be arrayed along a continuum. A medium is considered to be richer if it has the capacity to convey multiple verbal and nonverbal cues, allows for immediate feedback, uses natural language, and has personal focus. FTF communication is regarded as the richest way to interact and is therefore the standard relative to which CMC is deficient [4]. Furthermore, oral media are generally believed to be richer than written media, and synchronous media are believed to be richer than asynchronous media [15]. The central proposition in this literature stream is that ambiguous (or equivocal) messages are open to interpretation, and therefore richer media are needed to communicate effectively [4].

2.3. Media appropriateness

Appropriate media choice, which consists of a match between the characteristics of the communication media and the communication tasks at hand, enhances personal and organizational effectiveness [4, 22].

Short et al. [22] identified a set of tasks that are likely to be affected by the social presence of the meeting mode and found that a teleconferencing system is most satisfactory for exchanging information and least satisfactory for getting to know someone. Rice [19] and King and Xia [12] empirically investigated the appropriateness of media (face-to-face, desktop video and videoconferencing, telephone, voice mail, text, e-mail, and written media) for the set of tasks identified by Short et al. [22]. They found that high social presence media are most appropriate for negotiating and bargaining, getting to know someone, generating ideas, resolving disagreements, making decisions and exchanging confidential information. Conversely, low social presence media were found to be more appropriate for exchanging information, asking questions, staying in touch, and exchanging time-sensitive information.

In addition, Trevino et al. [23] conducted an exploratory field study and identified three categories of reasons for media selection: content-related, symbolic-cue, and situational-determinant reasons. Based on these three categories, Markus [15] investigated the usage of e-mail in an organizational setting and found results in line with predictions based on media richness.

Finally, Watson-Manheim and Bélanger [26, 27] adopted a multiple case study approach and found that face-to-face was preferred for relationship development, complex coordination, and conflict resolution. Conversely, e-mail and telephone were used for information gathering and simple coordination.

The media richness literature shows the significance of media richness in collaborative settings. The media appropriateness literature provides a complementary perspective, by identifying various factors, including task type, that influence choice of specific media. We build upon this foundation in two ways. First, we add to the traditional mix of media/meeting modes by explicitly considering fully-immersive telepresence systems. And second, we formulate and test a set of hypotheses that relate the meeting mode needs for various meeting objectives to the social presence capabilities of meeting modes.
### Table 1: Meeting objectives categories

<table>
<thead>
<tr>
<th>Categories</th>
<th>Meeting objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To exchange information</td>
<td>a) A routine exchange of information [12, 23, 26, 27]</td>
</tr>
<tr>
<td></td>
<td>b) A non-routine exchange of information [12, 23]</td>
</tr>
<tr>
<td></td>
<td>c) Clarify a concept, issue or idea [12]</td>
</tr>
<tr>
<td></td>
<td>d) Giving or receiving feedback [23]</td>
</tr>
<tr>
<td></td>
<td>e) Giving or receiving orders [22]</td>
</tr>
<tr>
<td>2. To have an interactive</td>
<td>a) Exchange/share different opinions or views of a topic or issue [22, 23]</td>
</tr>
<tr>
<td>discussion</td>
<td>b) Generate ideas on products, projects or initiatives [12, 19, 22]</td>
</tr>
<tr>
<td></td>
<td>c) Negotiate or bargain on a deal or contract [12, 19, 22]</td>
</tr>
<tr>
<td></td>
<td>d) Resolve conflicts and disagreements within a group [12, 19, 22, 26, 27]</td>
</tr>
<tr>
<td>3. To discuss sensitive/</td>
<td>a) Exchange confidential, private or sensitive information [12, 15, 19]</td>
</tr>
<tr>
<td>confidential issues</td>
<td>b) Communicate positive or negative feelings or emotions on a topic or issue [15, 23]</td>
</tr>
<tr>
<td></td>
<td>c) Show personal concern about or interest in a particular issue or situation [15, 23]</td>
</tr>
<tr>
<td>4. To build relationships and</td>
<td>a) Build trust and relationships with one or more individuals [12, 19, 22, 23, 26, 27]</td>
</tr>
<tr>
<td>trust</td>
<td>b) Maintain relationships with one or more other people and stay in touch [12, 19, 22]</td>
</tr>
<tr>
<td></td>
<td>c) Assert and/or reinforce your authority, status, position to your team or others [15, 23]</td>
</tr>
<tr>
<td></td>
<td>d) Assemble a team and/or motivate teamwork on a project [23]</td>
</tr>
<tr>
<td>5. To make decisions</td>
<td>a) Make a decision [12, 19, 22]</td>
</tr>
<tr>
<td></td>
<td>b) Find a solution to a problem that has arisen [22]</td>
</tr>
<tr>
<td></td>
<td>c) Generate buy-in or consensus on an idea [15, 22]</td>
</tr>
</tbody>
</table>

#### 3. Hypotheses development

We start this section by identifying a set of 19 business objectives that have been discussed in the literature. These business meeting objectives are listed in Table 1. For ease of exposition, these 19 business meeting objectives have been organized in five broader categories.

Next, we characterize four business meeting modes (three technology-mediated distributed meeting modes and FTF) in terms of their social presence and their cost. As shown in Figure 4, telepresence provides the highest level of social presence among technology-mediated meeting modes, although FTF remains the “gold standard” in this regard. Note that the positioning of the business meeting modes is not to scale for both dimensions. The meeting modes can be arrayed along a continuum, ranging from low to high levels of social presence. The cost of a meeting mode refers to travel-related expenditures, time investment, the depreciation cost of the hardware, and software usage. The cost of a FTF meeting can thus be higher or lower than the cost of a telepresence meeting, as it varies significantly by the location of the participants.

In the remainder of this section, we present a set of hypotheses that relate specific meeting objectives (grouped as in Table 1) to meeting modes that are effective for achieving those objectives (where effectiveness refers to the extent to which the objectives set for the meeting are met [10, 28]). In formulating the hypotheses, we focus on the social presence dimension of the meeting modes.

#### 3.1. To exchange information

A common objective for a business meeting is to exchange information. Therefore, the effectiveness of using telepresence can be considered to depend on the nature of the information exchange, which can be routine versus non-routine.

Low social presence media are generally preferred by managers for exchanging unambiguous and routine messages [4, 23]. Lengel and Daft [13] argue that routine communications (for which there is a common frame of reference), should be matched with low media richness to communicate effectively. Likewise, King and Xia [12] found that for exchanging routine information, low social presence media are appropriate. In addition, research on CMC indicates
that a high level of social presence or media richness is not desirable for every business meeting, as too many cues may overcomplicate the communication and distract communicating partners’ attention [4, 5]. Video-mediated communication (VMC), for instance, is associated with a higher cognitive load compared to other CMC because of higher social presence, in which case the latter may even become a distraction [21, 29]. Consequently, VMC is expected to lead to inferior outcomes compared to other CMC modes with regards to simple tasks, between people that already know each other. Hence, we hypothesize the following:

Hypothesis 1a: Lower social presence modes are more effective for exchanging routine information.

Conversely, for ambiguous, non-routine messages rich media tend to be preferred by managers [4, 15] and therefore non-routine communications should be matched with rich media to overcome the differing frames of reference and communicate effectively [13]. In a similar vein, King and Xia [12] found media high in social presence to be preferred to clarify confusing viewpoints, and Trevino et al. [23] found that rich media are preferred to provide feedback and obtain mutual understanding. Finally, Short et al. [22] concluded that for giving or receiving orders, high social presence modes are most satisfactory and Watson-Manheim and Bélanger [26, 27] found that high social presence modes were used for complex coordination. Therefore, we postulate:

Hypothesis 1b: Higher social presence modes are more effective for exchanging non-routine information.
Hypothesis 1c: Higher social presence modes are more effective for clarifying a concept, issue or idea.
Hypothesis 1d: Higher social presence modes are more effective for giving or receiving feedback.
Hypothesis 1e: Higher social presence modes are more effective for exchanging routine information.

3.2. To have an interactive discussion

In some business meetings, active participation by all meeting attendees is important [18]. Previous research has indicated that social presence is a vital element influencing interaction in CMC environments [8, 25]. It is generally believed that higher social presence leads to higher social pressure and normative influence on message recipients [14, 16], leading to increased interaction. Bordia [2] synthesized published experimental studies and concluded that in CMC, there is reduced normative pressure and poorer comprehension of the discussion compared to FTF.

In media appropriateness studies, researchers concluded that activities such as resolving disagreements, generating ideas, and negotiating and bargaining, require high social presence, attention and involvement from all communication parties to be effective [12, 19]. Moreover, Trevino et al. [23] found that if there is a desire for participation and involvement, FTF is the only viable option and that for discussions and spontaneous exchanges, FTF is by far the most selected medium. Also, Watson-Manheim and Bélanger [26, 27] found that for conflict resolution, FTF was preferred.

Finally, the choice for a medium carries symbolic meaning in a social setting [23, 24]. A letter, for instance, signals formality while an e-mail may signal unimportance. To the extent that individuals are conscious of such symbolic meaning, they can influence media choice [24]. Because of the high cost of a telepresence meeting, selecting this mode signals importance to the participants. To conclude this reasoning, we formulate the following hypotheses:

Hypothesis 2a: Higher social presence modes are more effective for exchanging/sharing opinions or views.
Hypothesis 2b: Higher social presence modes are more effective for generating ideas.
Hypothesis 2c: Higher social presence modes are more effective for negotiating or bargaining.
Hypothesis 2d: Higher social presence modes are more effective for resolving conflicts and disagreements.

3.3. To discuss sensitive/confidential issues

Discussions in business meetings often involve sensitive topics and information that is confidential to the attendees. Previous research indicates that low social presence media are not well suited for the transmission of sensitive messages. Daft et al. [4] stated that emotion-laden messages, which are personal and subjective, are open to misinterpretation, and therefore media with low media richness are not well suited for transmission of such messages as they can “filter the emotional intensity of a deeply held view” [13, p. 231]. Several studies found that to convey a confidential, private, or sensitive message, only high social presence is appropriate [12, 19, 23]. In addition, Trevino et al. [23] found that to show personal concern and to express feelings or emotions, rich media were chosen. Likewise, Markus [15] found e-mail was deemed appropriate for all work-related communication, except for personnel matters, which are regarded as either confidential, or as requiring delicate handling of the other person’s emotions.
Also, Bordia [2] found support in experimental research for the idea that CMC groups perform better in tasks requiring less social-emotional interaction, while FTF groups perform better in tasks involving more social-emotional interaction. Finally, Watson-Manheim and Bélanger [26, 27] found FTF and the telephone to be more appropriate than e-mail to transmit sensitive information. Therefore, we formulate the following:

Hypothesis 3a: Higher social presence modes are more effective for exchanging confidential, private or sensitive information.
Hypothesis 3b: Higher social presence modes are more effective for communicating feelings or emotions.
Hypothesis 3c: Higher social presence modes are more effective for showing personal concern about or interest in a particular issue or situation.

3.4. To build relationships and trust

Another important purpose in meetings is to initiate and develop relationships and cultivate trust between individuals in teams and in business relationships. Building trust is one of the major challenges in distributed work groups [30], because of the lack of social cues CMC media provide [11]. Indeed, FTF encounters are considered irreplaceable for both building trust and repairing shattered trust. Therefore, there has been an ongoing debate on the notion that “trust needs touch” [11], and whether trust engendered by the FTF encounter can be accomplished by video instead of FTF communication [17].

Riordan and Kreuz [20] examined channel choice for building and maintaining relationships through asynchronous email, synchronous instant messaging (IM), or FTF communication. They associate the development of social ties with the transmission of socio-emotional communication and hypothesized that emotion valence of the message may play a role in selecting a channel. The main reason for choosing FTF over email or IM was the ability to convey nonverbal cues, making the communication more effective. These cues are also available in CMC (emoticons, underlining, punctuation, etc.), but the authors argue that users are less acquainted with them. In addition, Watson-Manheim and Bélanger [26, 27] found that for the purposes of relationship development, FTF was preferred within work groups, although telephone conversations were also considered a possibility.

Trevino et al. [23] found that to build trust and express a desire for teamwork, FTF is the preferred medium. However, to show authority, position, and status, FTF as well as written media were selected [15, 23]. In addition, Rice [19] and King and Xia [12] found that getting to know someone and to a lesser extent staying in touch, require high social presence.

Finally, as previous research indicated that more social presence is associated with more trust building capabilities [1, 7, 9, 14, 25], we postulate that telepresence enables “the type of communication cues that individuals use to convey trust, warmth, attentiveness, and other interpersonal affections” [11, p. 793]. Therefore, we hypothesize:

Hypothesis 4a: Higher social presence modes are more effective for building trust and relationships.
Hypothesis 4b: Higher social presence modes are more effective for maintaining relationships and staying in touch.
Hypothesis 4c: Higher social presence modes are more effective for asserting or reinforcing authority, status, position to others.
Hypothesis 4d: Higher social presence modes are more effective for assembling a team or motivating teamwork.

3.5. To make decisions

Many business meetings are intended to make specific decisions. In other words, the goal of the meeting is to complete a task or reach closure with respect to a specific issue or problem. Previous research indicates that for making decisions, high social presence is required [12, 19, 22]. Furthermore, Short et al. [22] found that for problem solving, high social presence modes are most satisfactory. Likewise, to influence or persuade communication partners, rich media are preferred [15, 23]. Therefore, we postulate:

Hypothesis 5a: Higher social presence modes are more effective for making a decision.
Hypothesis 5b: Higher social presence modes are more effective for finding a solution to a problem.
Hypothesis 5c: Higher social presence modes are more effective for generating buy-in or consensus.

4. Empirical study

In this section, we describe our approach to empirically testing the above hypotheses. For this study we collaborated with a large publicly traded company, in which all the technologies are available on a relatively broad basis, to observe the use of the technologies for business meetings by its employees. While the company is headquartered in the United States, it employs over 60,000 people worldwide, and
the nature of the business requires frequent interaction between employees across the globe, as well as between employees and diverse customers. We examined the use of the technologies for business meeting by the employees of the company. Using an online survey instrument, we collected data from participants in a variety of business meetings in a regional division of the company, in which 701 people of more than 30 nationalities work. The respondents were identified using the company’s online calendaring and meeting scheduling system, as well as through email solicitations endorsed by company management.

In total, data was gathered from 248 business meeting participants, between April and June, 2012. An overview of the number of meetings in each mode and the number of respondents, is provided in Table 2.

Table 2. Number of meetings and respondents in each mode

<table>
<thead>
<tr>
<th>Meeting Mode</th>
<th>Number of meetings</th>
<th>Number of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio-conferencing (AC)</td>
<td>40</td>
<td>83</td>
</tr>
<tr>
<td>Video-conferencing (VC)</td>
<td>21</td>
<td>47</td>
</tr>
<tr>
<td>Telepresence (TP)</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>Face-to-face (FTF)</td>
<td>27</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>248</td>
</tr>
</tbody>
</table>

In order to collect the data, we constructed a brief online survey instrument that requested the respondent to indicate:
- what meeting mode was used for the meeting,
- what he/she perceived to be the relevant objectives for the meeting,
- for each relevant objective, how effective the meeting mode was for achieving that objective.

The list of potential objectives was identified from the literature, as presented in Table 1. Five-point scales were used to measure the perceived effectiveness of the meeting mode, ranging from 1: “Not at all effective” to 5: “Very effective” [28].

Following an introduction e-mail message by a senior executive at the company, employees could opt-in and allow the research team to monitor their online calendar. At some later point, after a meeting occurred, meeting participants received an e-mail message with an invitation from the research team to fill out the brief online questionnaire.

The data were analyzed using IBM SPSS Statistics 20. We used one-way ANOVA to determine the effect of the business meeting mode on the mean effectiveness scores of the meeting objectives. Using contrasts, we determined which mean effectiveness scores differed significantly (see Table 3).

5. Discussion of results

In this section, we compare the mean effectiveness scores for each meeting objective surveyed across the different meeting modes. The means for these objectives as well as the statistically significant differences that were found through contrast tests, are shown in Table 3. In Figure 2 through Figure 6, the means are also displayed for each meeting objective category, note that the displayed range is limited from 3 to 5 for compactness of presentation.

5.1. To exchange information

Table 3 shows that hypothesis 1a is not supported, although lower social presence meeting modes seem to be more effective for exchanging routine information, as can be seen from Figure 2. There is partial support for hypotheses 1b, 1c and 1d: for exchanging nonroutine information, to clarify a concept, issue or idea, give or receive feedback, more social presence seems to be more effective (statistically significant differences are indicated in Table 3). An interesting observation is that the mean scores for TP are highest for giving or receiving feedback and for giving or receiving orders. One possible explanation for this is that the use of TP signals importance or status, which has a social/emotional benefit in addition to the functional benefits of social presence. We discuss this further in section 6. Finally, no support was found for hypothesis 1e.
Table 3: Support for hypotheses

<table>
<thead>
<tr>
<th>Meeting objectives</th>
<th>Mean Effectiveness Scores</th>
<th>Hypotheses testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC</td>
<td>VC</td>
</tr>
<tr>
<td>A routine exchange of information</td>
<td>4.17</td>
<td>4.15</td>
</tr>
<tr>
<td>A non routine exchange of information</td>
<td>3.88</td>
<td>3.92</td>
</tr>
<tr>
<td>Clarify a concept, issue or idea</td>
<td>4.06</td>
<td>4.07</td>
</tr>
<tr>
<td>Giving or receiving feedback</td>
<td>4.02</td>
<td>4.06</td>
</tr>
<tr>
<td>Giving or receiving orders</td>
<td>3.52</td>
<td>3.40</td>
</tr>
<tr>
<td>Exchange/share different opinions or views of a topic or issue</td>
<td>3.95</td>
<td>4.21</td>
</tr>
<tr>
<td>Generate ideas on products, projects or initiatives</td>
<td>3.89</td>
<td>3.90</td>
</tr>
<tr>
<td>Negotiate or bargain on a deal or contract</td>
<td>3.25</td>
<td>4.00</td>
</tr>
<tr>
<td>Resolve conflicts and disagreements within a group</td>
<td>3.33</td>
<td>3.64</td>
</tr>
<tr>
<td>Exchange confidential, private or sensitive information</td>
<td>3.50</td>
<td>4.06</td>
</tr>
<tr>
<td>Communicate positive or negative feelings or emotions on a topic or issue</td>
<td>3.57</td>
<td>4.04</td>
</tr>
<tr>
<td>Show personal concern about or interest in a particular issue or situation</td>
<td>3.63</td>
<td>4.00</td>
</tr>
<tr>
<td>Build trust and relationships with one or more individuals</td>
<td>3.64</td>
<td>3.97</td>
</tr>
<tr>
<td>Maintain relationships with one or more other people and stay in touch</td>
<td>4.00</td>
<td>4.07</td>
</tr>
<tr>
<td>Assert and/or reinforce your authority, status, position to your team or others</td>
<td>3.83</td>
<td>3.64</td>
</tr>
<tr>
<td>Assemble a team and/or motivate teamwork on a project</td>
<td>3.58</td>
<td>4.12</td>
</tr>
<tr>
<td>Make a decision</td>
<td>3.79</td>
<td>3.73</td>
</tr>
<tr>
<td>Find a solution to a problem that has arisen</td>
<td>3.79</td>
<td>3.95</td>
</tr>
<tr>
<td>Generate buy-in or consensus on an idea</td>
<td>3.94</td>
<td>3.88</td>
</tr>
</tbody>
</table>

5.2. To have an interactive discussion

Partial support was found for hypotheses 2a, 2b and 2d, as shown in Table 3. A surprising finding is that TP appears to be significantly less effective than FTF for generating ideas. A possible confounding factor that might play a role here is the limited capability of TP to support interaction for large group sizes, especially if multiple sites are involved. Further study controlling for meeting size could provide useful insight on this.

As can be seen from Figure 3, the mean effectiveness scores tend to increase with the social presence of the meeting mode, except for negotiating or bargaining. It should be noted that this graph is based on very limited data and that we found no support for hypothesis 2c.

5.3. To discuss sensitive/confidential issues

Partial support for hypotheses 3a, 3b, and 3c was found, significant differences are indicated in Table 3. Although the difference is not significant, it is counter to hypothesis 3a that TP is evaluated to be less effective than VC for exchanging confidential, private or sensitive information (see Figure 4). Again, this
might be related to the group size of the meeting. Anecdotal evidence suggests that TP meetings rarely involve only two participants, the setting in which personal matters are most likely to be discussed.

To assert and/or reinforce authority, status, position (hypothesis 4c), there are no significant differences between the different meeting modes. However, anecdotal evidence suggests that meeting attendees (especially from other organizations) perceive the selection of TP by meeting organizers as a means to make an impression. This refers to another manifestation of the social signaling effect of using telepresence that was mentioned earlier, and which we discuss further in section 6.

Finally, partial support was found for hypothesis 4d, as VC, TP and FTF are significantly more effective than AC to assemble a team and motivate teamwork.

5.5. To make decisions

The data provide partial support for hypotheses 5a, 5b, and 5c. Higher social presence seems to be useful in meetings intended to arrive at decisions, consensus or buy-in as multiple cues may add value for participants. As can be seen in Figure 6 and Table 3, the effectiveness scores for FTF are significantly higher than the other meeting mode scores for each objective. In addition, in meetings assembled to find a solution to a problem that has arisen, TP’s mean effectiveness score is lower than the score for AC and
VC (although not significant). A possible explanation for this is that the use of an expensive and relatively scarce technology like TP may put pressure on participants to achieve closure or consensus prematurely, before adequate information has been obtained and examined, or before due diligence has been completed. Although our data does not address this concern, it would be an interesting question for further study.

6. Implications, limitations and further research

For practitioners, our research calls attention to a novel technology with distinct characteristics, the introduction of which raises questions on its appropriateness for business meetings. Our results provide guidance on when distributed groups should consider telepresence-based meetings, rather than either lower social presence modes on the one hand and possibly expensive travel for FTF meetings on the other. In particular, the social presence provided by telepresence is significantly more effective than the social presence provided by video-conferencing for giving or receiving feedback and for building relationships and trust. However, for generating ideas, exchanging confidential/sensitive information, communicating emotions or feelings, making a decision, finding a solution, and generating buy-in the social presence a FTF meeting provides seems to be still more effective.

This research has implications for the future study of communication media, e-collaboration, and business meeting modes. Our study highlights the importance of considering the business meeting objective when selecting a meeting mode. Our hypotheses further serve as a starting point for exploring the role and relevance of telepresence as a business meeting mode and for the development of usage norms for the technology in e-collaboration.

In terms of limitations, telepresence is not widespread within organizations yet, and thus our empirical study was limited to a relatively atypical organization. Hence, the external validity of our findings still has to be established, and an important next step will be to study telepresence usage across a variety of organizational settings. In addition, as adoption of this technology increases and interoperability between systems enhances, it will be interesting to investigate further how telepresence is deployed in inter-organizational collaboration.

In future research we will set up a multilevel research design in which we investigate the effectiveness of meeting modes for the various types of business objectives, and also incorporate both the role of the respondent in the meeting (organizer versus attendee) and the number of meeting participants. Another potentially interesting direction for inquiry is a longitudinal study to investigate the sequence of meeting mode selection for a particular group. And yet another interesting context is that of business meetings with mixed meeting modes, which is often the case when telepresence is used.

An interesting observation from our empirical analysis is that user perceptions about the use of telepresence seem to be driven not only by functional considerations, but also social and emotional factors. The high cost and novelty of the technology appears to color user impressions. Even in the company we studied, in which the technology is widely available, it is still perceived as far more expensive and scarce than traditional audio- and video-conferencing technologies. Thus, the choice of a telepresence mode for a business meeting appears to signal situational characteristics that color users’ reactions to it and to its effectiveness. Validation of this presents an interesting question for further research.

7. Conclusion

Recent advances in fully-immersive telepresence technology have led a number of companies to adopt these systems for distributed meetings. Telepresence is a novel technology that enables communication partners to feel mutual physical presence, even across vast geographical distances. However, there is little guidance in the research literature on the effective use of such systems. In this paper we address this problem by examining the relationships between the relevant objective(s) for a business meeting and the choice of a meeting mode for it (face-to-face vs. different computer-mediated distributed modes). We present and empirically test hypotheses related to this issue. Our results provide support for a number of our hypotheses, and less definitive support for others. These results suggest that in planning a business meeting, careful consideration of the intended objectives for the event can be helpful in choosing a mode for the meeting that facilitates achievement of those objectives. While more extensive study is needed to reinforce our findings, this study is an important first step in understanding the appropriateness and justification of telepresence as a business meeting mode.
8. References


