



BI Norwegian Business School - campus Oslo

# GRA 19703

Master Thesis

Thesis Master of Science

Energizing the “Zoom-bie” Experience: Understanding virtual meetings through the influence of speaking times on perceived meeting satisfaction

Navn: Ingrid Bronken Jakobsson, Tucker Woodham Brock

Start: 15.01.2021 09.00

Finish: 01.07.2021 12.00

-Master of Science Thesis-

Energizing the “Zoom-*bie*” Experience:  
Understanding virtual meetings through  
the influence of speaking times on  
perceived meeting satisfaction

Ingrid Jakobsson and Tucker Brock  
MSc in Leadership and Organizational Psychology,  
BI Norwegian Business School

Supervisor: Jan Ketil Arnulf

---

## Table of Contents

<b>ACKNOWLEDGEMENTS.....</b>	<b>3</b>
<b>ABSTRACT .....</b>	<b>4</b>
<b>INTRODUCTION.....</b>	<b>5</b>
<b>THEORY AND LITERATURE REVIEW.....</b>	<b>8</b>
MEETING SATISFACTION .....	8
PARTICIPATION .....	10
<i>Meeting Energy &amp; Meeting Engagement</i> .....	10
MEETING CHARACTERISTICS .....	13
<i>Meeting Size</i> .....	13
<i>Meeting Length</i> .....	15
<i>Meeting Leader Presence</i> .....	16
<b>METHODS .....</b>	<b>18</b>
PARTICIPANTS AND PROCEDURE .....	19
<i>Response rate</i> .....	20
ANALYSIS OF VIDEO MATERIAL .....	20
VARIABLES AND MEASURES .....	21
VALIDITY .....	23
RELIABILITY.....	23
ETHICS .....	24
<b>RESULTS.....</b>	<b>24</b>
DESCRIPTIVE STATISTICS .....	24
<i>Participation</i> .....	26
<i>Meeting Size</i> .....	26
<i>Meeting Length</i> .....	26
<i>Meeting Leader Presence</i> .....	27
TESTING OF HYPOTHESES.....	28
ANALYSIS OF INDIVIDUAL, GROUP AND ORGANIZATION FACTORS .....	28
FACTOR ANALYSIS.....	29
<b>DISCUSSION .....</b>	<b>30</b>
MEETING SIZE & MEETING LENGTH.....	30
MEETING LEADER PRESENCE.....	31
MEETING ENERGY & MEETING ENGAGEMENT .....	32
PRACTICAL IMPLICATIONS .....	34
LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH .....	35
<b>CONCLUSION.....</b>	<b>36</b>
<b>REFERENCES.....</b>	<b>38</b>

---

<b>APPENDIX A: APPROVAL FROM NSD.....</b>	<b>45</b>
<b>APPENDIX B: SURVEY OUTLINE .....</b>	<b>48</b>
<b>APPENDIX C: FURTHER EXPLANATION OF ENGAGEMENT MEASURE .....</b>	<b>49</b>
<b>APPENDIX D: INITIAL AND REVISED MODEL.....</b>	<b>51</b>
<b>APPENDIX E: FACTOR ANALYSIS WITH PROMAX ROTATION .....</b>	<b>52</b>

## Acknowledgements

*“It’s an energy field created by all living things. It surrounds us and penetrates us; it binds the galaxy together.”*

*Obi-Wan Kenobi*

We would like to extend our greatest thanks to our supervisor, Jan Ketil Arnulf, whose enthusiasm for our topic, poignant Star Wars metaphors, and willingness to offer insight undoubtedly enabled us to navigate the intricacies of the thesis process.

In addition, we want to thank the organizational representatives for their collaboration. They gave us an incredible opportunity to learn and further understand the still nascent field of virtual meeting engagement. We hope our thesis can offer guidance to their organizations, as well as others.

## **Abstract**

In this study, our objective was three-fold. Firstly, we wanted to better understand virtual meetings through the influence of meeting participation (i.e., meeting energy and meeting engagement) on perceived meeting satisfaction. In this respect, we hypothesized that meeting energy and meeting engagement would each positively relate to meeting satisfaction. Secondly, we tried to discover the effects of meeting size, meeting length, and meeting leader presence, respectively, on meeting participation. For these meeting factors, we assumed that each would bear negative relationships with our meeting participation constructs. Lastly, we sought to find a negative relationship between meeting size and perceived meeting satisfaction, as well as a negative relationship between meeting length and perceived meeting satisfaction.

To analyze these relationships, we collected 23 virtual meeting recordings from five different organizations. In addition, we had each meeting participant answer a survey measuring perceived meeting satisfaction shortly after each meeting was held. We then incorporated speech analysis software (i.e., ELAN 6.0) in order to measure the speaking time of each meeting participant. Overall, our results confirmed several of our hypotheses: meeting size, meeting length, and meeting leader presence each shared a negative relationship with both meeting energy and meeting engagement. In addition, meeting size, as we anticipated, was shown to have a direct, negative relationship with meeting satisfaction. However, we failed to notice a significant relationship between meeting length and meeting satisfaction, or a significant relationship between meeting energy and meeting satisfaction. Lastly, and opposite to what we intended to find, our results showed a direct, negative relationship between meeting engagement and meeting satisfaction.

This study adds to the existing literature on the developing field of meeting science by emphasizing the concept of participation within virtual meetings and its worthwhile relationship with meeting satisfaction. Theoretical and practical implications of the findings are discussed.

---

## Introduction

Meetings themselves are essential for the success of any organization, yet only to the extent that they are constructive. Peter Drucker, one of the most prominent and influential management consultants of the twentieth century, claimed that “if they are to be effective, executives must make meetings productive” (2004, p. 20). Scott et al. (2015) further emphasize five strong possibilities for why meetings are held within organizations; these reasons include meetings as: 1. stressors, 2. collaboration technology, 3. rituals, 4. sensemaking sessions, and 5. interventions.

Firstly, Scott et al. (2015) claim that stressors “punctuate an imbalance of situational demands and the individual and collective resources needed to manage them” (p. 25). Many workers may perceive meetings as interruptions that simply prevent them from carrying on with their individual work. Such stressors can therefore negatively affect employee attitudes, whereby time within meetings bears a negative relationship with the completion of personal initiatives.

Secondly, Scott et al. (2015) emphasizes, on the other hand, that meetings may be understood as a tool. As a hammer drives the nail, meetings can be used to optimize coordination and properly orient the goals of an organization. In this sense, Scott et al. (2015) equate meetings to collaboration technology as a means to coordinate overall group activity, whereby meeting groups represent systems that strategize and maximize the benefits of collaboration. Such coordination may be done in a fairly systematic manner, thereby creating a normalized perspective for the group to harness when addressing organizational projects.

Thirdly, Scott et al. (2015) show that meetings may, however, function as rituals that essentially reinforce the traditional organizational values associated with a group. To this extent, Schein (1990, p. 12; as cited in Scott et al., 2015, p. 38) states that meetings “sustain patterns of shared assumptions developed through problem solving and reinforce them among newcomers and incumbents as ‘the correct way to perceive, think, and feel in relation to those problems.’”

Fourthly, Scott et al. (2015) also identified meetings as sensemaking sessions in that meetings may be called in an effort to understand the group’s relation within an open system; this thought translates into how the group can adapt to and interact appropriately with its environment. Thus, Scott et al. (2015) assert that Weick’s theory of enactment is alive and well within meetings; in

---

conjunction with the environment, organizations may use meetings to enact, select, and retain optimal strategies for growth.

Lastly, Scott et al. (2015) addressed that meetings can be understood as interventions. Thus, organizations, if they are to survive, must utilize meetings to critically and continually assess their mission statements to create worth in society. Scott et al. (2015) notes that such “monumental meetings ... may be viewed as traditional interventions rather than just as another meeting” (p. 38).

These reasonings behind why meetings occur are sensible and represent the dynamic spectrum that meetings fall within. There are many factors that go into a successful meeting, as well, from the type of challenge being addressed to the number of people addressing it, for example. A great deal of research has been put toward meeting interaction and meeting outcomes: Rogelberg et al. (2010) found that satisfaction within meetings is related to overall job satisfaction; Kauffeld and Lehmann-Willenbrock (2012) discovered how complaining within meetings leads to poorer team performance and also showed how positive team interactions predict organizational success; and Yoerger et al. (2015) determined that participation within meetings bears a positive relationship with employee engagement.

More specifically, in the United States alone, there are anywhere between 11 million and 55 million meetings a day, with managers spending up to 80% of their work time in meetings (Mroz et al., 2018a). However, despite the pervasive influence of meetings, data has shown that up to half of meetings are a waste of time and potentially costing the U.S. up to \$283 billion a year (Keith, 2015; Mroz et al., 2018a). Apart from the financial and temporal resources associated with meetings, meetings have also been shown to have an impact on employee well-being. For instance, Luong & Rogelberg (2005) identified a significant positive relationship between the number of meetings an employee attends and an increased feeling of fatigue and workload.

Thus, there appears to be an organizational blind-spot with regard to meetings, but these profound studies have primarily involved in-person interactions. Yet, with the development of technology and an all-encompassing pandemic, more individuals are engaging each other from a distance, and more meetings are taking place within a virtual platform.

The recent spread of Covid-19 has strongly disrupted normal work routines, and thereby meeting routines, within thousands of organizations



---

(Chappell, 2020). Because of measures associated with social distancing, many have taken to communication through online means using platforms such as Zoom, Microsoft Teams, etc. In a recent study by DeFilippis et al. (2020), the researchers found a 12.9% increase in the number of post-pandemic digital meetings in 16 major cities in Europe and the United States. The researchers also found that the number of meeting attendees increased by 13.5% and that the average length of meetings decreased by 20.1%—such findings signal a significant change in how we conduct meetings. In reaction, media outlets have made bold claims about digital technology, such as the New York Times highlighting the negatives associated with digital communication and a desire by the public to resume traditional work regimes (Murphy, 2020). However, employers have also altered their organizational strategies, such as Twitter enabling their employees to work from home for as long as they would like (Kelly, 2020).

There are, of course, negatives associated with strategizing business operations via virtual meetings. From poor resolutions to lagging connections, virtual meetings are at times unable to live up to their full potential. Nevertheless, moving beyond the objective issues primarily related to internet connection, the concept of virtual meeting engagement remains as a frontier to be explored and improved. Once a robust internet connection is established, supervisors must venture for new means of developing more satisfactory virtual meetings. This digital revolution resulting from Covid-19 undoubtedly bears with it complex physical and mental changes for workers that are worth investigating.

In sum, we hope to utilize past research in order to better identify the relationship between participation within virtual meetings and the perceived satisfaction of such meetings. Through this process, we hope to test the validity of past research on in-person meetings by applying it to a digital context. The results of our study should provide a more thorough baseline for virtual meeting participation, which may prove useful for meeting leaders or facilitators who wish to improve meeting satisfaction within their respective organizations, encouraging or muting participant input as needed.

---

## Theory and Literature Review

Hertel, Geister, & Konradt (2005, as cited in Maynard et al., 2017), define virtual teams (VT's) as:

two or more persons who collaborate interactively to achieve common goals while at least one of the team members works at a different location, organization, or at a different time so that communication and coordination is predominantly based on electronic communication media (p. 316).

Maynard et al. (2017) notes that the most prominent means of understanding the efficacy of VT's has been to compare such work arrangements with face-to-face (FtF) teams. In today's time, teams are rarely strictly virtual or FtF. Instead, a hybrid of such work arrangements has resulted for many groups in order to most effectively communicate under mixed sets of circumstances.

Thus, Maynard et al. (2017) addresses that there is a virtuality continuum among most teams. While it is often assumed that FtF teams are generally higher performing than VT's, certain studies such as Van der Kleij et al.'s (2009) study on conversational development have shown that "video-teleconferencing groups suffered no decrement in performance as compared with face-to-face groups" (p. 371). However, Van der Kleij et al. (2009) also found that participants in FtF groups reported greater overall satisfaction than VT's and less difficulty with regard to the regulation of conversation. However, as we have narrowed our focus onto the perceived satisfaction of VT's, we believe that participation should encompass a high degree of the variability within perceived virtual meeting satisfaction.

### *Meeting Satisfaction*

While meetings are clearly of value to many organizations, there is a pervasive feeling among individuals that satisfaction with many meetings is hardly what it should be. According to Geimer et al. (2015) in a global sampling analysis of over 1,000 respondents across multiple industries, it was found that less than half of the respondents' comments on meeting satisfaction were positive. Such data may create a tendency for many to want to eliminate meetings; however, it should be understood that meetings are inherent in the development of group coordination and represent a "coherent whole" that ultimately promotes

---

consensus within an organization (Rogelberg, 2019). Often, too, cases of general dissatisfaction with meetings may be due to the specific climate within the organization; if most employees do not enjoy the work they do, they may be less likely to deem meetings associated with their work as being satisfactory.

Rogelberg et al. (2006; 2010) measured meetings in terms of the perceived effectiveness of the meeting, as well as in terms of the perceived satisfaction with the meeting, respectively. More specifically, Rogelberg et al. (2006) developed a 6-item scale to assess meetings in terms of their perceived value. This perceived value ranged from interruptions, in the form of low-quality meetings, to productive periods “potentially of value,” in the form of high-quality meetings (p. 84). In contrast, Rogelberg et al. (2010) constructed a separate 6-item scale, whereby the researchers “took an affective orientation to meeting satisfaction” (p. 153). Through this measure, higher scores emphasized more pleasurable or positive affective states in relation to meetings. These scales were used to investigate the positive relationship between meeting effectiveness and job attitudes and well-being (JAWB; Rogelberg et al., 2006), as well as the positive relationship between meeting satisfaction and job satisfaction (Rogelberg et al., 2010).

In addition, Leach et al. (2009) have also noted that there are several contributing factors toward the perceived effectiveness of meetings, such factors include the use of an agenda and the completion of the stated agenda. Leach et al. (2009) also found that “appropriate meeting facilities” constitutes a significant level of variance toward perceived meeting effectiveness (p. 75). This point on facilities would relate strongly to the need for an appropriate virtual platform to increase meeting satisfaction.

Nixon & Littlepage (1992) also identified several key criteria that lead to perceived meeting effectiveness:

clear, well defined goals; timely and efficient action on decisions; active participation; full exploration of decision consequences; exploration of a variety of options; commitment of time and effort to the meeting; agenda integrity; meetings that begin on time; comfortable feeling about working with group members in the future; and more satisfaction than frustration derived from the meeting (p. 366).

---

Many of these meeting qualities are duly emphasized within Lehmann-Willenbrock et al.'s (2013) questionnaire, which seems to combine both aspects of meeting satisfaction and meeting effectiveness in measuring the effects of procedural communication—"verbal behaviors that structure group discussion to facilitate goal accomplishment"—on perceived meeting effectiveness (p. 365). However, the questionnaire measures both satisfaction with the meeting process and satisfaction with the meeting outcome in order to develop an understanding of perceived meeting effectiveness. Thus, one can see that the two constructs, meeting satisfaction and meeting effectiveness, are fairly similar when goal orientation within meetings is emphasized. Furthermore, the questionnaire is twice the length of the 6-item scales built by Rogelberg et al. (2006; 2010) and is, therefore, likely to capture a broader array of noteworthy relationships.

Thus, for this study, we chose to utilize Lehmann-Willenbrock et al.'s (2013) questionnaire as the best means to assess both meeting satisfaction and meeting effectiveness. Ultimately, based on the lack of specificity for construct descriptions within past research, we believe that a meeting which leaves all participants highly satisfied equates to being a highly effective meeting. Furthermore, because the questionnaire items focus on two combined constructs—satisfaction with the meeting process and satisfaction with the meeting outcome—we will frame the results of the questionnaire as perceived meeting satisfaction. Such a questionnaire, however, has yet to be used within a virtual atmosphere. We will therefore be using this questionnaire as a means for measuring the relationship of meeting energy and meeting engagement, respectively, on perceived meeting satisfaction.

### ***Participation***

#### *Meeting Energy & Meeting Engagement*

One of the best predictors of an employee's job performance is his or her level of employee engagement, which is defined as a "a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption" (Allen & Rogelberg, 2013). However, a level of engagement can and should also be measured on a narrower construct in order to identify other avenues that organizations can use to better influence an employee's overall engagement—two such constructs include meeting energy and meeting engagement.

---

Pentland (2012) differentiates between energy and engagement in meetings, where energy is defined as “how team members contribute to the team as a whole,” while engagement represents “how team members communicate with one another” (p. 64). Based on these definitions, we propose tailored operationalizations of both meeting energy and meeting engagement within this study. Thus, the measure of a participant’s time spent talking during a virtual meeting will correspond with Pentland’s (2012) definition of energy in the form of his or her individual contribution. In addition, Pentland’s (2012) definition for meeting engagement will be measured through each participant’s respective talking time compared to every other participant’s talking time during the meeting. Ultimately, higher meeting energy will be characterized by greater individual speaking time while higher meeting engagement will be characterized by evenly distributed contributions from participants in the meeting—in contrast to lower meeting engagement, which would be characterized by a select few of the overall meeting participants using up an inordinate amount of the discussion.

Furthermore, Allen et al. (2014) developed a taxonomy for meeting purpose, because the level of participation for a team may also be tied to the purpose at hand. For instance, if a manager is holding a meeting to administer a status update to his or her employees, there will be less cause for a high level of meeting engagement. Thus, for the purpose of this project we tried to seek out groups who were meeting to discuss an ongoing project, whereby participants will have reason to contribute more to the discussion. Allen et al. (2014) note also that the discussion of an ongoing project is one of the most popular reasons for why teams meet across governmental organizations and publicly traded, private, and non-profit firms; thus, this meeting purpose is fairly generalizable for the results of our study.

To date, there has not been a great deal of research on how differing levels of meeting energy and meeting engagement influence the perceived satisfaction of virtual meetings—the current research is even less so as it relates to virtual communication in meetings. However, attempts have been made to account for human distinctions within virtual meetings and relate valuable feedback to meeting participants. CoCo represents an example of a fully-automated collaboration system that enables virtual communication among participants while analyzing audial and visual data to develop key insights into a group’s conversational patterns (Samrose et al., 2018). Such objective feedback has been

---

shown to markedly improve virtual team communication, but this technology is not yet widespread within the general public. Allen et al. (2020) have also shown that meeting effectiveness is positively associated with work engagement, but this represents a more general form of engagement than our proposed construct.

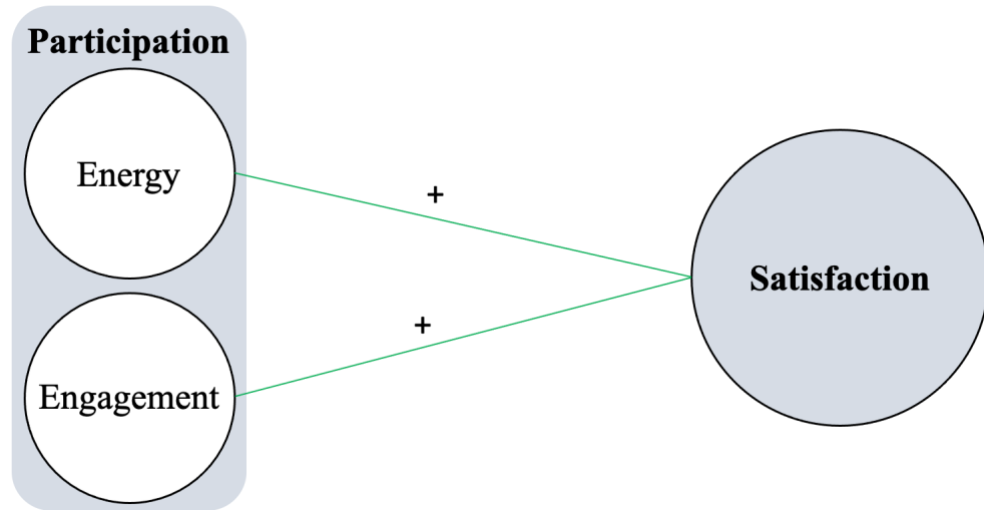
However, Sonnentag (2001, as cited in Mroz et al., 2018a) noted that there is a contrast between high-performing and low-performing employees with regard to meetings: “[h]igh performers contribute more than low performers by helping to set goals, facilitating group understanding of work problems and seeking feedback” (p. 488). Similarly, Sonnentag & Volmer (2009, as cited in Mroz et al., 2018a), add that expert employees, or those with in-depth skill sets and knowledge, tend to contribute more than non-experts within meetings. Given that both high-performers and experts are more likely to contribute within meetings, we assume that both high-performers and experts will utilize more talking time. In conjunction with this notion, we believe that those who utilize more talking time will tend to perceive meetings as more satisfactory, as their key insights will have been shared among the meeting participants.

Pentland (2012) additionally found that typical hierarchical teams show a disproportionate amount of the discussion allocated to a few participants of the meeting, which he describes as dysfunctional communication patterns. Typically, when dysfunctional communication patterns occur, a team within a team emerges, leaving the left-out individual meeting attendees unable to contribute to the discussion. Pentland (2012) further postulates if this uneven distribution occurs due to power differences or personality traits in the attendees. Interestingly, Pentland (2012) finds that successful teams talk and listen at an equal measure, while also having direct, FtF discussions. This notion seems to suggest that greater meeting engagement will lead to enhanced meeting satisfaction. He adds that, while the media richness of FtF interaction is most valuable, a phone call or videoconference is second best in terms of overall communication.

Thus, analyzing conversation patterns in virtual meetings is not only feasible, but it is also crucial for gaining a better understanding of how this second-best medium for communication influences talking and listening interactions. Overall, both Sonnentag (2001) and Pentland (2012) represent credible sources for how meeting energy and meeting engagement may influence meeting satisfaction. In tandem with the thoughts of these researchers, we propose the following hypotheses. See Figure 1.

**H1a:** meeting energy is positively related to perceived meeting satisfaction

**H1b:** meeting engagement is positively related to perceived meeting satisfaction



*Figure 1: Hypothesized relationship between participation and satisfaction*

### ***Meeting Characteristics***

#### ***Meeting Size***

A group is a social entity of people where the members have mutual influence on each other (Turner, 2000). The traditional definition of a group includes regular FtF interactions between members, but has been extended to interaction through multimedia platforms (Maynard et al., 2017). The group must also have mutual interests over a period of time and a set of common norms where members have a visible relationship to the group (Kaufmann & Kaufmann, 2015).

Naturally, the number of participants in a group has an effect on how the group relates and interacts among each other. As two people interacting is better characterized as a dyad, we account for the minimum number of members in a group as being three people (Northouse, 2019). However, there is some discussion as to what is the maximum number of members. Schein (1988) states that important group characteristics start to break down once the number of members starts to exceed a certain range of ten to fifteen people.

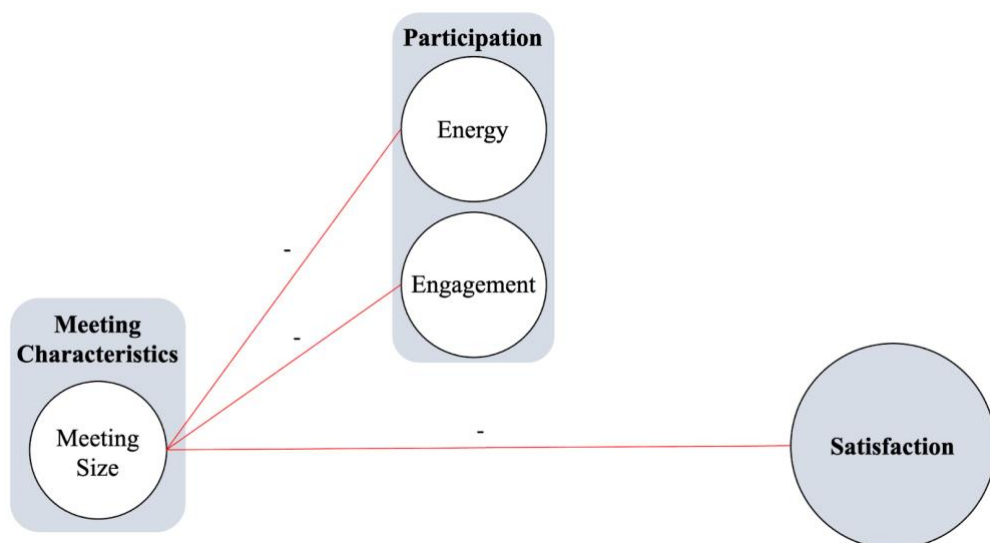
Hackman and Vidmar (1970) composed a study of groups ranging from 2-7 participants and ultimately concluded a group between 4 and 5 members to be the most optimal; this number was reasoned to be because members may feel too

“exposed” within smaller-sized groups while larger-sized groups tend to face “conflict-and-coordination problems” (p. 49). More recently, Allen et al. (2020) further elaborated on the theory that meeting size has an effect on both engagement and the performance of employees. Yet, the researchers emphasized that meeting size itself does not dictate beneficial outcomes. However, because meetings are dynamic in and of themselves, properly sized meetings can help lead to positive outcomes. But, ultimately, meeting size is strongly influenced by the task at hand.

Moreover, Aubé et al. (2011) surmised that the more participants within a team, the more likely the team will face “problems with its functioning and its outcomes” (p. 369). In addition, Pentland (2012) stresses that the effectiveness of virtual technology bears a negative association with an increase in the number of participants. Leach et al. (2009) also highlighted this concept in mentioning “[t]he zero-order correlation between size and involvement, though, shows a negative association: larger meetings are associated with lower levels of involvement” (p. 75); thus, the researchers showed that the participation of meeting attendees may be more engaging when there are fewer attendees in a meeting. Therefore, in accordance with these findings, we propose the following hypotheses. See Figure 2.

**H2a:** meeting size is negatively related to perceived meeting satisfaction

**H2b:** meeting size is negatively related to meeting energy and meeting engagement



*Figure 2: Hypothesized relationship between meeting size, participation, and satisfaction.*



---

*Meeting Length*

With regard to meeting length, White (2014) notes that “a virtual meeting that takes longer than 60 mins. is unlikely to be successful” (p. 115). This reasoning is due to the immense level of physical and emotional energy spent with regard to maintaining a virtual meeting. There is an immense amount of literature documenting the consequences of working in front of a computer screen and the toll it takes on the body. Epstein et al. (2012) note that computer-related musculoskeletal disorders are related to poor work stations and poor ergonomics, leading to an increase in these disorders as our work tasks move toward more digital arenas. The researchers also note that the increase in musculoskeletal disorders is documented in a wider population, even in children as young as 10 to 15 years old. Similarly, research by Toomingas et al. (2014) showed that professional computer users have a higher increase of eye-symptoms. Overall, it is evident that sitting in front of computers over a long period of time takes its toll on employees.

In addition, results from Standaert et al. (2021) indicate that “it is harder to maintain a sense of co-location among participants as technology-enabled meetings last longer” (p. 8). Interestingly, Leach et al. (2009) found that neither meeting size nor meeting length had any significant correlations with perceived meeting effectiveness. However, they did find a positive correlation between meeting duration and involvement of participants. Luong & Rogelberg (2005) explain that it is not the length of time itself that creates a mental toll, but the number of interruptions in and between meetings. The researchers explain that “five meetings would generate more and a greater variety of issues, ideas, and concerns that demand the individual’s attention than one long meeting that consumes the same amount of time” (Luong & Rogelberg, 2005, pg. 65).

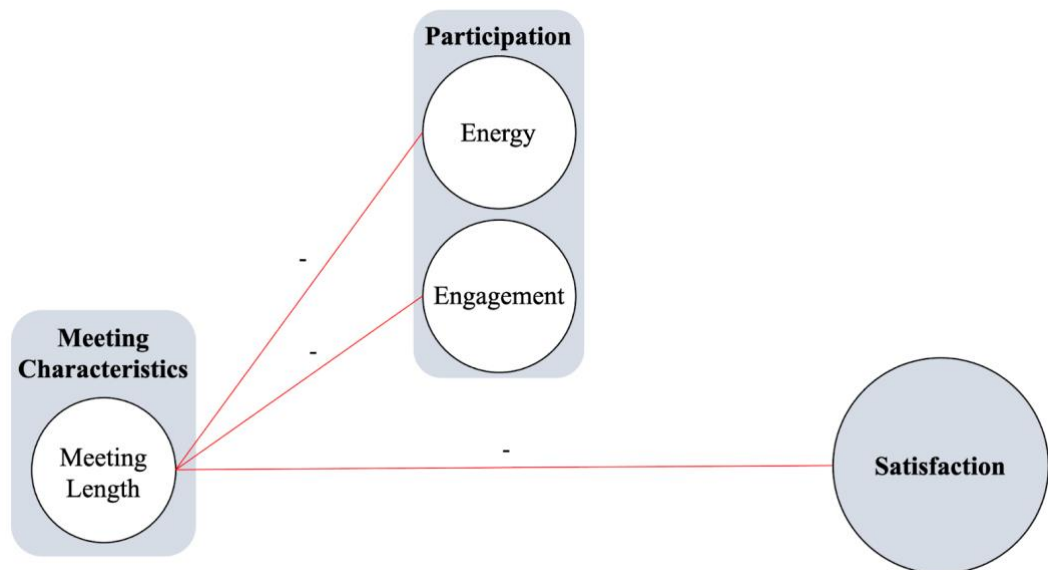
However, with the current pandemic, researchers have been studying what is colloquially termed “Zoom fatigue” where virtual settings create exhausting environments for meeting attendees (Fosslien & Duffy, 2020). This new work environment serves as a medium that ultimately transcends normal teamwork phenomena by further generating acute psychological responses among virtual employees, which in itself justifies closer inspection. Causes of this fatigue may be due to the constant interruptions that spawn from participants being in a multitude of different atmospheres or even the unsatisfactory interaction with other participants in the meeting. For example, meeting participants find the

constant gaze of other participants to be emotionally uncomfortable and tiring; this notion goes in tandem with struggling to understand and interpret other participants’ emotions, body language, and surroundings (Bailenson, 2020).

When modern work life is centered around the computer, we can assume that the participants are using their computers before and after the meeting, as well—resulting in the combination of bodily and mental consequences influencing the participation in longer meetings. Our assumption is that virtual meetings differ from the traditional FtF meetings as participants may not have access to ergonomically proper work stations. In addition, the physical and mental fatigue of virtual meetings will decrease the meeting energy and meeting engagement in longer meetings. For these reasons, we hypothesize that longer meetings will be perceived as less satisfactory. See Figure 3.

**H3a:** meeting length is negatively related to perceived meeting satisfaction

**H3b:** meeting length is negatively related to meeting energy and meeting engagement



*Figure 3: Hypothesized relationship between meeting length, participation, and satisfaction*

*Meeting Leader Presence*

There are typically differences in influence and power among meeting attendees, whereby power is defined as “the ability of an individual or group to ensure that another individual or group complies with its wishes” (Arnold &

---

Randall, 2016, pg. 490). Finkelstein (1992) separates between different sources of power, such as legitimate power which occurs when a person is awarded a formal role of authority by another person. In many cases, meeting leaders are likely to be supervisors who hold higher authority in an organization. Other sources of power include both referent power, such as when a person informally gains influence because of other people's perception of their status, and expert power, whereby a person's extensive knowledge on a subject influences the perception of his or her judgments.

In addition, office politics represents a form of interaction that occurs when a person with a source of power acts on it in order to influence others (Arnold & Randall, 2016). Acts of office politics can be positive, such as enlisting support from others, or negative, such as when controlling access to information in order to gain an upper hand. In the end, the effectiveness of power and politics boils down to what the intended goals of the actions are. While all members of a group or organization can revert to office politics, the formal power of supervisors might be the most visible source of power in an organization.

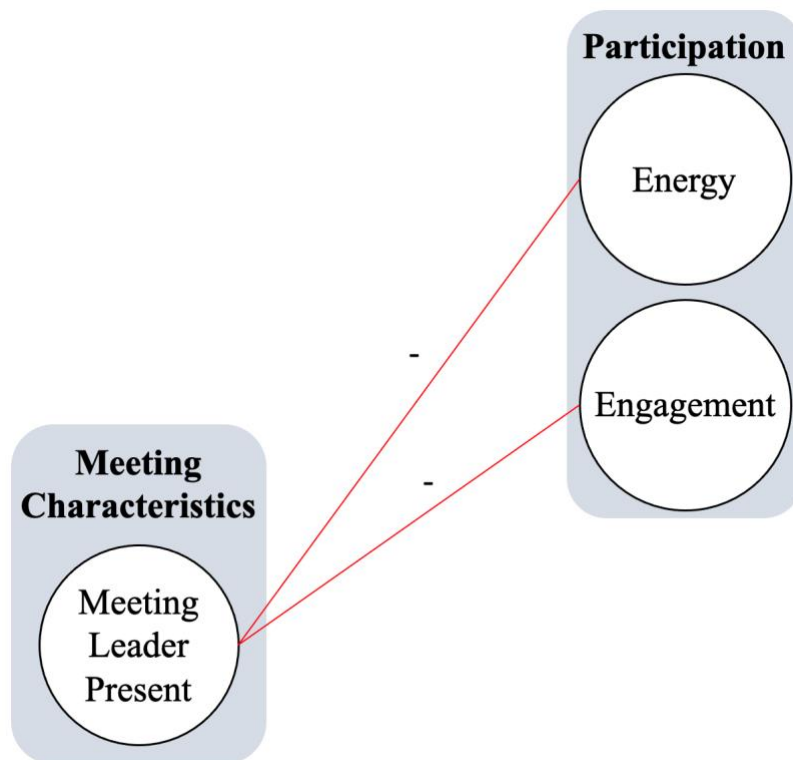
Furthermore, meetings are an arena where decisions are to be made and where office politics can play an important role in the decision-making process. Papadakis and Barwise (2002) found that the supervisor's personality had little influence on the use of power in decision-making situations; however, the researchers found that the higher the impact the decision had on the organization, the more likely supervisors were to avoid autocratic decisions and invite more people in the decision-making process. In essence, the extent to which relevant information to the decision is sought, obtained, and evaluated is critical to meeting satisfaction, and office politics are often detrimental to the process (Dean & Sharfman, 1996).

Supervisors typically are involved in larger decisions regarding company strategy and are meant to coordinate group processes in an effort to seamlessly accomplish company objectives. This position also bears a responsibility with regard to meetings. Baran et al. (2012) point out that meetings represent significant developmental periods within supervisor-subordinate relationships.

Naturally, meeting leaders tend to speak often in order to both engage with the topic at hand, as well as to direct the focus of meeting participants back on the agenda and maintain a sense of order in relation to the meeting. Bilbow (1998) emphasizes this style of managerial governance in meetings as "chair-talk," which

“contrasts with the spoken discourse of other participants in meetings” (p. 158). Part of Bilbow’s (1998) study addressed the proportion of talking time that managers take up within meetings and found that, for meetings with an average size of 10 meeting participants, managers tend to speak for nearly 40% of the meeting time. Undoubtedly, this represents a significant portion of meeting discussion. For this reason, we hypothesize that if there is a meeting leader present, then, based on our definitions for meeting energy and meeting engagement, the meetings will be less energetic and less engaging. See Figure 4.

**H4:** having a meeting leader present in the meeting is negatively related to meeting energy and meeting engagement



*Figure 4: Hypothesized relationship between having a meeting leader present and participation*

## Methods

As our research question concerns the amount of individual spoken time and the distribution of spoken time among meeting participants, as well as their perception of meeting satisfaction, a quantitative approach was most appropriate. This study’s approach is mainly deductive as the current literature on meeting science is centered on FtF meetings, and the research questions focus on similar

---

relationships in virtual settings. Due to the nature of this research project and the limited time allocated, a cross-sectional study was chosen in order to identify patterns of perceived meeting satisfaction in virtual meetings.

### ***Participants and Procedure***

Participants were recruited through convenience sampling. A small selection of employees (hereby called coordinators) in five different organizations within the U.S. and Norway were tasked to record an agreed upon number of meetings within a four-month period. Due to the sensitive and intimate nature of meetings, it was highly challenging to reach an agreement with companies in which we could access video material of their internal meetings. Several companies we reached out to declined to participate due to strict confidentiality clauses with clients or due to natural skepticism that competitors would gain knowledge of valuable competitive advantages.

In the end, we received six meeting recordings from a consultancy company in the U.S., five meeting recordings from an educational supply company in Norway, four meeting recordings from a renewable power supply company in the U.S., four meeting recordings from a shipping company in Norway, and, lastly, four meeting recordings from a non-profit organization in the U.S. Thus, a total of 23 virtual meeting recordings were received and analyzed.

The participants were invited to join our research project through an information letter sent by their respective departments. This letter includes the design of the project and a consent form ([Appendix A](#)). The coordinators selected meetings that fit our criteria: (a) a number of participants between 3 and 10, (b) a meeting agenda targeted towards an ongoing project, and (c) a meeting length of at least 25 minutes. The coordinators also developed a master list of participant codes and participant names.

After completing the recorded meeting, the participants answered a short survey (see [Appendix B](#)). Participants were reminded by the coordinators to complete the survey shortly after the meeting in order to ensure that the respondents had a fresh memory of what had taken place in the meeting. Coordinators were responsible for uploading the video files based on our security guidelines after all recordings were completed.

---

*Response rate*

Based on participant lists given by coordinators, we accumulated a total of 125 participants within our study. However, these are not unique participants as one or several persons might have been present in one or more different meetings.

Based on survey results, 121 responses were recorded in the survey, resulting in a response rate of 90.3%. However, not all responses were satisfactory. After cleaning the dataset we ended up with 108 recorded responses in our study, totaling 32 unique individuals.

*Analysis of Video Material*

After all virtual recordings were collected, we initially tried to manually time the speaking times. However, after excessive hours spent coding by generic stopwatch and comparing results, we decided to investigate the use of current speaker diarization technology (i.e., technology that determines who spoke when and for how long they spoke). Based on our experience in seeking out the necessary technology, we found that many of the current technologies easily available today are not highly accurate for processing virtual meeting recordings. For example, in their study Fujita et al. (2019) noted that “a conventional clustering-based system produced [a] diarization error rate of 28.77%” (p. 1).

After several trial and error procedures testing different technologies, we decided on and utilized the qualitative analysis software ELAN 6.0 developed by the Max Planck Institute for Psycholinguistics (ELAN, 2020). While the software originally was intended to annotate and code voice and video recordings, we found it to work both effectively and accurately for our purposes. Using the built-in silence recognizer in ELAN 6.0, the software separated voice sections in the recordings that were higher than -40 decibels and longer than 20 milliseconds. Assigning these sections to each participant in the meeting allowed us to receive a detailed report regarding which of the meeting participants spoke for the different sections, as well as the duration of each section. The report was then processed in Microsoft Excel to calculate the total speaking time per person and the meeting duration.

Overall, when comparing our manually timed results for our first two meeting recordings with the results produced by Elan 6.0, we found that the two sets of speaking times had an average difference of 28%. Assuming that our manually timed results were fairly accurate, 28% almost precisely coincides with

what Fujita et al. (2019) assessed as a standard diarization error rate. In addition, when comparing further results in Elan 6.0, we found that there was less of a difference between the results of the researchers. Figure 5 shows a screenshot of ELAN 6.0 where one can see the speaking segments of participants A, B, and C.

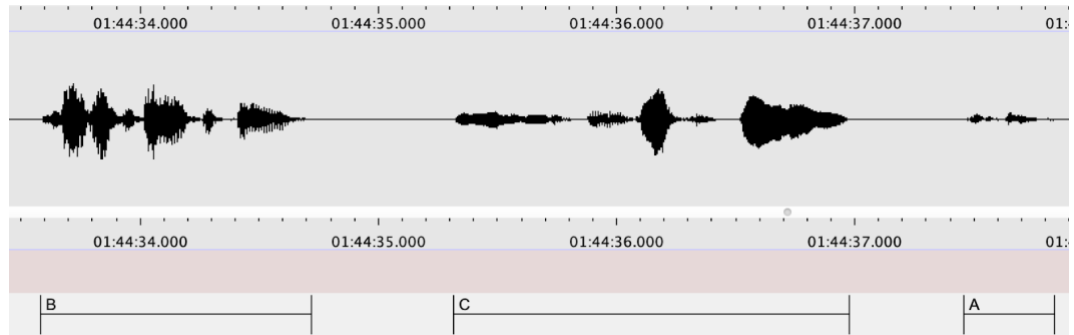


Figure 5: Screenshot from ELAN 6.0 showing how different speech segments were attributed to different meeting participants.

### *Variables and Measures*

To study our research question, we collected information from both virtual meeting recordings and digital surveys sent to the meeting attendees after the meeting.

*Meeting energy* (i.e., the percentage time spent speaking per meeting participant) was assessed through the use of ELAN 6.0—the most appropriate software we could find to accurately diarize the virtual meeting participants. Time spent speaking was recorded in minutes. As there were differences in meeting length among the meetings recorded, the time each member spoke was input as a percentage of the overall meeting length to standardize the times.

*Meeting engagement* (i.e., the distribution of time spent speaking per meeting member) was found by calculating the average deviation from the mean of all participant speaking times within a meeting by using the formula as follows provided by Lehmann-Willenbrock et al. (2013):

$$AD_M = \frac{\sum_{i=1}^N |x_i - \bar{x}|}{N}$$

Where  $AD_M$  is the degree of distribution,  $X_i$  is the individual speaking time for a meeting participant,  $\bar{X}$  is the mean speaking time of all the participants in a meeting, and  $N$  is the number of participants in the meeting. One meeting engagement score by itself is not as informative as when compared to multiple

---

engagement scores. For example, a score of .1 would represent a very high meeting engagement score when compared to a score of 10, which would represent a very low meeting engagement score. The original AD<sub>M</sub> scores were multiplied by  $-1$  before being entered into the correlation analyses so that a higher score represented a higher degree of distribution. Due to the abstract nature of this variable, please see [Appendix C](#) for an elaborated explanation of meeting engagement if needed.

*Meeting size* is defined as the number of participants present in the meeting (Cohen et al., 2011). A list of participants was provided by the organization before the meeting took place. We also controlled for this number when recording data from the video files. The virtual meetings contained 3 to 10 participants.

*Meeting length* encompassed time spans between 25 mins. and 120 mins. for each virtual meeting recording. Coding for meeting length started when two or more participants began a dialogue and ended when the recording or dialogue was over. Thus, the meeting length was not the same as the video length in all cases.

*Meeting role* was a dummy-variable differentiating between meeting leaders and meeting attendees, coded as 1 and 2, respectively. Meeting leader is defined as “the individual designated as leader of the meeting group” (Mroz et al., 2018b, p. 4) and was measured by a single item asking if the role of the participant was an “meeting attendee” or a “meeting leader.” Note, the role of meeting leader is not ubiquitous with being an organizational leader, and the role of meeting leader was self-reported by participants.

*Perceived meeting satisfaction* was assessed using Lehmann-Willenbrock et al.’s (2013) 5-point questionnaire on satisfaction with the meeting process and satisfaction with the meeting outcome. In total, there are four items regarding satisfaction with the meeting process and eight items pertaining to satisfaction with the meeting outcome (see [Appendix B](#)). Based on the mentioned survey battery, we created the following satisfaction measures:

*Overall satisfaction* was calculated by averaging each respondent’s response to the twelve survey items.

*Average group satisfaction* is the average satisfaction among the participants in each unique meeting for all twelve survey items.

*Satisfaction with the meeting process* and *satisfaction with the meeting outcome* was calculated by averaging each participant’s response to the individual



---

survey items differentiated by Lehmann-Willenbrock et al. (2013; see [Appendix B](#)).

### ***Validity***

Validity concerns whether the measures capture what they are intended to measure (Bryman et al., 2019). As the variables used in the research project have been used in previous meeting research literature, we expected to find similar findings in virtual meeting settings. By using a survey battery from a peer-reviewed article in the survey (Lehmann-Willenbrock et al., 2013), we assume a high construct validity to be found.

We expect some changes in behavior due to the fact that participants realize they are being recorded. However, because the meetings take place in familiar circumstances (e.g., familiar digital meeting platform, familiar team), we assume this change to be minimal and, thus, a high ecological validity to be present.

Due to the cross-sectional nature of our design, we are not able to determine the causality of the variables. Although there are some limitations, we assume that, by gathering data from different types of teams and industries, we are able to increase the generalizability of our findings.

### ***Reliability***

Reliability assesses “how much numerical error there is in the measurements” (Hayes, 2009, p. 24). An important measure of reliability is inter-rater reliability, which assesses the agreement between raters. This procedure requires that all raters agree on how to measure variables and that such measurements will achieve the same results.

To determine the inter-rater reliability of the research project, each researcher measured two of the same video recordings and compared the results in order to ensure equal measurement practices. Both researchers coded the speaking time in seconds for each participant (A, B, and C), as well as virtual *noise* “x”—recognized as sound outside the bounds of acceptable linguistic communication (e.g., two participants speaking at roughly the same time, coughing, laughter, sneezing, etc.)—in two separate meetings. The results showed a relatively high inter-rater reliability between the researchers with the lowest comparison being for virtual noise “x” in Meeting 2 at 73%, and the highest comparison being for participant “A” in Meeting 1 at 99%.

---

Inter-rater reliability was assessed using a two-way mixed, consistency, single measures ICC. The resulting ICC was 1.00 with a 95% confidence interval from .999 to 1.00 ( $F(7,7) = 8913,127, p = <.001$ ). This finding suggests an excellent agreement between the raters (Hallgren, 2012); therefore, the quantifiable data obtained from the video material was identified as suitable for use in further analyses.

### ***Ethics***

There are several ethical considerations to evaluate when conducting a research study. In collaboration with Norsk Senter for Forskningsdata (NSD), several of these considerations were evaluated and approved (see [Appendix A](#)). Firstly, all participation in the study was voluntary and participants had the right to withdraw their data at any time during the study. All participants were given an informational letter about the project and their rights, as well as an opportunity to sign the consent form before any data was collected. Secondly, all data collected was stored appropriately to ensure that no information about individual participants would be transferred to actors outside the research project.

## **Results**

Statistical analysis of the collected data was analyzed using IBM SPSS 25.0 software. Before analyzing any data we cleaned the data based on the following criteria: if respondents (a) didn't complete the survey, (b) didn't provide a personal code, or (c) spent more than 4 days to complete the survey.

### ***Descriptive Statistics***

First, we investigated the descriptive nature of the variables presented in the methodology. A summary of the descriptive statistics can be found in Table 1.

**Table 1: Correlations between variables**

	Mean	S.D.	Speaking time (min)	Meeting energy	Meeting engagement	Meeting size	Meeting length (min)	Meeting role	Overall satisfaction	Average group meeting satisfaction	Satisfaction with the process	Satisfaction with the outcome
Speaking time (min)	6.21	8.04	--									
Meeting energy <sup>d</sup>	.13	.14	.80**	--								
Meeting engagement	-4.29	2.29	-.16	.17	--							
Meeting size	7.19	2.74	-.09	-.43**	-.30**	--						
Meeting length (min)	53.16	24.61	.16	-.27**	-.84**	.58**	--					
Meeting role	1.85 <sup>c</sup>	.36	-.72**	-.73**	.09	.01	.01	--				
Overall satisfaction	4.25	.49	.15	.13	-.30**	-.26**	.09	-.12	--			
Average group meeting satisfaction	4.25	.33	.12	.14	-.45**	-.38**	.14	-.04	.67**	--		
Satisfaction with the process	4.47	.59	.19*	.21*	-.26**	-.32**	.04	-.18	.89**	.72**	--	
Satisfaction with the outcome	4.15	.50	.10	.06	-.30**	-.20*	.12	-.07	.96**	.58**	.74**	--

*Note: Due to the variables average group satisfaction, satisfaction with the process, and satisfaction with the outcome being calculations of the same individual survey items, these show high, expected correlation values.*

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

c. Meeting leader = 1; Meeting attendee = 2

d. Percentage of speaking time in meeting

Table 1: Correlations between variables, including mean and standard deviations

---

### *Participation*

Hypothesis 1a postulates that there is a positive relationship between meeting energy and perceived meeting satisfaction. This finding is not supported as we do not see any significant correlations between meeting energy and any of the satisfaction scores.

Hypothesis 1b postulates that meeting engagement has a positive relationship with perceived meeting satisfaction. We did, however, find negative correlations between meeting engagement and average group meeting satisfaction ( $r = -.448$ ,  $p = <.001$ ). Additionally, we found negative relationships between meeting engagement and overall satisfaction ( $r = -.301$ ,  $p = .002$ ), satisfaction with the process ( $r = -.256$ ,  $p = .007$ ), and satisfaction with the outcome ( $r = -.297$ ,  $p = .002$ ).

### *Meeting Size*

Hypothesis 2a postulates that meeting size has a direct, negative relationship with meeting satisfaction. We found significant, negative correlations between meeting size and all satisfaction measures, specifically overall satisfaction ( $r = -.258$ ,  $p = .007$ ), average group satisfaction ( $r = -.385$ ,  $p = <.001$ ), satisfaction with the process ( $r = -.306$ ,  $p = <.001$ ), and satisfaction with the outcome ( $r = -.197$ ,  $p = 0.41$ ).

Hypothesis 2b postulates that meeting size has a negative relationship with meeting energy and meeting engagement. We did find significant, negative correlations between meeting size and meeting energy ( $r = -.428$ ,  $p = <.001$ ), as well as between meeting size and meeting engagement ( $r = -.298$ ,  $p = .002$ ).

### *Meeting Length*

Hypothesis 3a postulates that meeting length has a negative relationship with meeting satisfaction. To this end, we did not find any significant findings with any of the satisfaction measures.

Hypothesis 3b postulates that meeting length has a negative relationship with energy and engagement. As expected, we found significant, negative correlations between meeting length and meeting energy ( $r = -.267$ ,  $p = .005$ ), as well as between meeting length and meeting engagement ( $r = -.841$ ,  $p = <.001$ ).

In order to investigate these effects further, we created a new variable categorizing the meetings into short and long meetings based on if the meeting

---

was shorter or longer than the average duration of 53.16 minutes. An independent samples test shows that there is only a significant difference for energy ( $F = 5.85$ ,  $p = .001$ ) and engagement ( $F = 64.451$ ,  $p = <.001$ ).

#### *Meeting Leader Presence*

Hypothesis 4 postulates that having a meeting leader present in the meeting has a negative relationship with energy and engagement. We find support that having a meeting leader present in the meeting is negatively related to meeting energy ( $F = 3.12$ ,  $p = <.001$ ) and meeting engagement ( $F = 18.271$ ,  $p = <.001$ ).

Below is a table of the hypothesized relationships and our findings. A visual representation of the hypothesized and found relationships can be found in [Appendix D](#).

---

***Testing of Hypotheses***

<b>Hypothesis</b>	<b>Hypothesized relationship</b>	<b>Findings</b>
1a: Meeting energy and perceived meeting satisfaction	Positive	<b>Not supported</b>
1b: Meeting engagement and perceived meeting satisfaction	Positive	<b>Negative</b>
2a: Meeting size and perceived meeting satisfaction	Negative	Negative
2b: Meeting size and meeting energy/engagement	Negative	Negative
3a: Meeting length and perceived meeting satisfaction	Negative	<b>Not supported</b>
3b: Meeting length and meeting energy/engagement	Negative	Negative
4: Meeting leader presence and meeting energy/engagement	Negative	Negative

---

*Table 2: Summary of hypothesized relationships and findings*

***Analysis of Individual, Group and Organization Factors***

Furthermore, we wished to investigate whether the variance in satisfaction could be explained by factors in the individual participants, the group compositions, or in the overall organizations we worked with in this study. As each participant was given a unique code for each meeting, we were able to categorize identifiers for each unique participant, group composition, and organization.

Through several ANOVA-analyses that included the organizational code, group code, and individual codes for the different participants, we uncovered that individual factors accounted for a large percentage of the individual and group meeting satisfaction.

	<b>Individual meeting satisfaction</b>	<b>Group meeting satisfaction</b>
Individual level	.75**	.64**
Group level	.41	.40*
Organizational level	.35	.15
** $p < .001$		
* $p < .1$		

*Table 3: Summary of explained individual and group meeting satisfaction when looking at individual, group, and organizational factors*

### ***Factor Analysis***

Before running any analyses we performed a factor analysis of the survey items, distinguishing between satisfaction with the process and satisfaction with the outcome of the meeting (see [Appendix B](#)). Being concerned with our sample size, we investigated the Kaiser-Meyer-Olkin measure of sampling adequacy, giving us an excellent score of .815 (Field, 2018). A factor analysis of our survey results identified 3 factors with an Eigenvalue higher than 1. Since the third factor barely hit the mark with a value of 1.085, we chose to suppress the number of factors to two. The results gave quite different results than found by Lehmann-Willenbrock et al. (2013). For example, several individual survey questions shared some commonalities with both factors (see [Appendix E](#) for complete pattern and structure matrices).

Evaluation of Cronbach's alpha for our survey responses also showed a somewhat different picture than Lehmann-Willenbrock et al. (2013) in terms of the satisfaction scores: overall satisfaction (.86), satisfaction with the process (.73), and satisfaction with the outcome (.78). Previously, Lehmann-Willenbrock et al. (2013) had found high reliability measures for the satisfaction with the meeting process (Cronbach's  $\alpha = 0.85$ ) and satisfaction with the meeting outcome (Cronbach's  $\alpha = 0.97$ ). While the factor analysis did not show the same factor distinction between process and outcome as mentioned in Lehmann-Willenbrock et al. (2013), we chose to continue our investigation with our survey results to

---

understand if there were other variables tied to the differentiated satisfaction measures.

## **Discussion**

The primary purpose of this study was to investigate the energizing relationship between meeting participation and meeting satisfaction. In tandem with this process, we tried to understand the draining effects of meeting size, meeting length, and meeting leader presence, respectively, on meeting participation. We also sought out direct relationships between meeting size and meeting satisfaction, as well as between meeting length and meeting satisfaction. Our procedures enabled us to collect data from a variety of virtual meeting recordings, whereby participant speaking times were measured using the speech analysis software from ELAN 6.0. Satisfaction scores were found by administering a survey on meeting satisfaction to each participant shortly after each meeting was held.

Overall, we confirmed our hypotheses regarding the relationships between key meeting characteristics (e.g., meeting size, meeting length, and meeting leader presence) and meeting participation. To this end, meeting size appeared to dilute energy and engagement levels. Meeting length seemed also to exhaust participant involvement. Furthermore, meeting leaders tended to hold fast to the proverbial microphone. Thus, each meeting characteristic showed a negative relationship with both meeting energy and meeting engagement. In addition, we intended to see a negative relationship between meeting length and meeting satisfaction, but we failed to notice any sort of relationship between meeting length and meeting satisfaction. However, meeting size did prove to have a significant, negative relationship with meeting satisfaction, as we expected. With regard to meeting participation, a significant relationship between meeting energy and meeting satisfaction failed to materialize. Lastly, and surprisingly opposite to our hypothesis, we discovered that meeting engagement shared a negative relationship with meeting satisfaction.

### ***Meeting Size & Meeting Length***

Meeting size was shown to have a direct, negative relationship with perceived meeting satisfaction ( $r = -.258, p = .007$ ). Furthermore, meeting size was shown to have a direct, negative relationship in terms of satisfaction with the meeting process ( $r = -.316, p = <.001$ ). The relationship became insignificant



---

when meeting size was paired with satisfaction with the meeting outcome ( $r = -.197$ ,  $p = .041$ ). This information stands in slight contrast to Leach et al. (2009) who were unable to recognize an effect between meeting size and perceived meeting effectiveness. However, Aubé et al. (2011) noted that having more meeting attendees is likely to increase difficulties with group functioning.

Furthermore, Pentland (2012) stressed that virtual technology may put constraints on discussion as meeting size increases. Virtually managing numerous individuals with perfect internet connections is a fairly improbable scenario in today's time. Simply put, a higher number of meeting attendees greatly enhances the probability for disruption within virtual meetings, which puts greater necessity on optimizing virtual meeting processes. Meeting size was also shown to have a direct negative relationship with meeting energy ( $r = -.428$ ,  $p = <.001$ ) and meeting engagement ( $r = -.298$ ,  $p = .002$ ). Our data corroborates this finding. As meeting size increased, meeting attendees tended to speak less often, and the distribution became more unequal. This effect seemed to be stronger on the individual level in terms of meeting energy, as opposed to the group level in terms of meeting engagement.

While meeting length did not have any significant correlations to any of the satisfaction measures (overall, group, process, or outcome); however, as stated, we did find a negative correlation between meeting length and meeting energy ( $r = -.267$ ,  $p = .005$ ), as well as a negative relationship between meeting length and meeting engagement ( $r = -.841$ ,  $p = <.001$ ). This finding indicates that longer meetings have less participation and engagement between attendees. However, our findings may also be explained by the fact that longer meetings had more participants ( $r = .576$ ,  $p = <.001$ ), whereby increased size was found to have a negative relationship with both energy and engagement.

### ***Meeting Leader Presence***

The presence of a meeting leader had a strong negative effect on meeting energy and meeting engagement, as well as a strong positive effect on meeting length and meeting size. In addition, we did not see a significant relationship between meeting leader presence and overall satisfaction. As mentioned above, our data and findings from Bilbow (1998) seem to confirm that meeting leaders are highly process-oriented and, therefore, must take up greater portions of the discussion to maintain proper dialogue. Our data gives strong indications that the

---

presence of a meeting leader has a number of relationships with key meeting factors and gives the impression that meeting leaders seem to dominate the overall discussion. To this end, Bilbow (1998) stresses, “One should be wary, however, of interpreting such chair volubility as a desire on the part of chairs to dominate meetings...a chair might reasonably be expected to talk more simply to keep order” (p. 163).

### ***Meeting Energy & Meeting Engagement***

Unfortunately, the level of meeting energy showed no influence on overall satisfaction within our study, suggesting there is more to the story of meeting satisfaction outside of individual speaking time. Furthermore, meeting energy was also positively related to the role of meeting leader, yet negatively related to the presence of a meeting leader. These findings indicate that meeting leaders tended to speak more, but participants would speak more if a meeting leader was not present. The meeting leader naturally carries with it the necessity of facilitating group understanding of work problems while also seeking important feedback from the meeting attendees. Undoubtedly, meeting leaders within our study claimed the highest level of speaking times among the meeting participants.

In fact, virtual meeting leaders talked on average for 38% of the meeting discussion—compared to 9% for meeting attendees—which roughly mirrors Bilbow’s (1998) finding that managers speak for 40% of the time within meetings that have an average size of ten meeting attendees. Notably, the average size for our meeting leaders was roughly eight meeting attendees. Bilbow’s (1998) finding was in relation to in-person meetings, yet it represents an average meeting leader talking time that is slightly higher than our average virtual meeting leader talking time. However, our virtual meeting sizes averaged two meeting attendees fewer than Bilbow’s (1998) meeting sample. Thus, perhaps meeting size represents a greater influence on meeting leader talking time, even when considering the effects of a virtual atmosphere.

Lastly, meeting energy shared a negative relationship with both meeting length and meeting size, respectively. As meeting length extends, meeting attendees were less moved to participate. This finding, however, shows the opposite of Leach et al. (2009) who found a positive correlation between meeting duration and involvement of participants. In tandem with meeting length, increasing meeting size seemed to further limit the willingness of meeting

---

attendees to participate in our sample. In this respect, Leach et al. (2009) did express that increased meeting size was strongly tied to less involvement.

Surprisingly, with regard to meeting engagement, the results appeared opposite to what we initially hypothesized. The significant, negative relationship between meeting engagement and overall satisfaction seems to indicate that virtual meetings with unequal distributions of speaking times among the participants are more satisfactory than virtual meetings with relatively equal distributions of speaking times. It is plausible that meeting leaders may have to maintain a greater level of order to maintain a proper virtual meeting, as the presence of a meeting leader was negatively related to meeting engagement. Amidst virtual communication issues and lagging internet connections, the data may support the notion that virtual meetings require more unequal distributions of participant speaking times. This assumption emphasizes the mentally draining process that Fosslien & Duffy (2020) labeled as *Zoom fatigue*.

In conjunction with these results, both meeting size and meeting length were both shown to negatively impact meeting engagement by further skewing the speaking distribution. In fact, we found that talking time was nearly equally distributed among one group of three, who attained a meeting engagement score of -.09—a strong contrast to another meeting group of nine with a meeting engagement score of -8.83. For a visual representation of the speaking distribution in these meetings, see [Appendix C](#).

In summary, perhaps a better explanation for the resulting negative relationship between meeting engagement and overall satisfaction can be understood through findings from Aguinis & O’Boyle Jr. (2014), who highlight that organizations in the twenty-first century do not manifest employee talent in terms of a normal distribution. Rather, the researchers note that a disproportionate level of contribution comes from a select few employees, referred to as “stars” (p. 315). Thus, Aguinis & O’Boyle Jr. (2014) proposed that employee productivity in organizations is represented better in terms of a power law distribution due to key employees rather than a normal distribution. Sonnentag (2001) also found that, for generally unstructured meetings, “high performers participated more in process regulation activities” (p. 13). In addition, Sonnentag (2001) claimed that such a participation pattern enables high performers to emerge as informal leaders.

Indeed, when analyzing the speaking time of each participant compared to the average speaking time within a virtual meeting, we found that roughly 34% of

---

participants spoke above the average speaking time in meeting groups of six or more (i.e., representing more than half of the meetings in our sample). This percentage translates to an average of around two individuals who spoke above the average speaking time in each of these meetings.

Pentland (2012) also postulates that participation may be attributed to personality differences among the meeting attendees. When assigning individual codes to each survey respondent, we did find that the individual code accounted for 64% of the variance between subjects, whereby average group satisfaction was the dependent variable. When assigning group codes for all of our respondents who held meetings with the same group, we found a lower explanation of variance between subjects at 40% in terms of average group satisfaction. In addition, Barkhi (2002) ascertained that, for mixed-motive tasks (i.e., win-lose tasks), extroverts tend to be more frustrated in FtF groups than in VT's. These findings, overall, suggest that personality, as well as group member dynamics and history, have fairly significant impacts on meeting satisfaction. To this end, several studies have emphasized other key factors outside of the constructs discussed in this study that have significant ties to meeting satisfaction. For instance, meeting satisfaction was found to be unrelated ( $p > .05$ ) to organization size and organization type, as well as participants' gender, job level, age, employment status, and tenure (Rogelberg et al. 2010, p. 154). Lateness also accounted for 28% of the variation in meeting satisfaction according to Allen et al. (2018).

In sum, extrapolating significant data patterns from virtual meetings encompasses a broad range of factors that remain challenging to control for. Our results were somewhat surprising, but, given the intricacies within meetings themselves, our study nevertheless sheds light on how meeting satisfaction is influenced, particularly with regard to meeting participation.

### ***Practical Implications***

Based on our data, virtual meeting leaders should be more willing to take the reins during virtual meetings. In order to make up for the various complications that may likely arise due to virtual settings and maintain a proper sense of order, meeting leaders may need to speak more than their colleagues. Additionally, our results show a significant negative relationship between meeting size and meeting satisfaction; therefore, meeting leaders should strive to incorporate only those participants whose input is most critical for the topic at

---

hand. Findings from DeFilippis et al. (2020) showed that there are more virtual meetings in today's time, and they are encompassing more participants as compared to pre-pandemic virtual meetings. The ease of attending virtual meetings may tempt supervisors to allow anyone and everyone to join virtual meetings if they wish; however, our results show that doing so may hinder the overall satisfaction of meetings. Our results seem to corroborate findings from Hackman and Vidmar (1970), which emphasized optimal team meetings of 4 to 5 participants—whereby the group is not too few for attendees to feel overly exposed, and not too large to suffer from coordination issues. Furthermore, if enhanced participation is the goal, meeting leaders should reduce meeting size, meeting length, and support attendee input.

### ***Limitations and Suggestions for Future Research***

This study has several limitations that may affect the validity and reliability of the results. Firstly, a noteworthy limitation for this study was the lack of statistical power due to only having 108 respondents. Due to the sensitive nature of meetings, companies were naturally reluctant to hand over video data for us to analyze. Through convenience sampling, we were able to amass 23 virtual meeting recordings and pursue this project; however, this sampling method makes it difficult to generate enough statistical power to conclude on significant relationships, or generalize our findings to a population. Increasing the time scope and available resources might produce more fine-grained results for future research.

Secondly, after testing multiple software systems, we utilized a software called ELAN 6.0 that enabled us to capture and categorize the timing segments of the speakers within our recorded meetings (i.e., the process of diarization). Diarization itself represents a budding field within the realm of speech measurement. As there exists no clear guidelines for what is coded as “speech,” we created our own system where we discussed what should be considered linguistic communication. Imperfect speech measurements may therefore have impacted our overall findings; however, we believe that a 28% diarization error rate is still fairly high and respectable for the purposes of this study. As innovation persists in the world of speech software, future research should utilize software capable of more upstanding measures of speech within virtual meetings.

---

Thirdly, there was a lack of previous research conducted on both meetings in a digital setting and on airspace taken up by participants within meetings. Most available research was centered around FtF meetings, which we built on and tailored to our research on VT's. By keeping the data simple in terms of timed speech participation and its relationship to our survey results for perceived meeting satisfaction, our study represents a straightforward approach to better understand virtual meetings. Despite the lack of past research, a primary strength of this study is that it utilizes well-validated past research. Our key independent variables, meeting energy and meeting engagement, were first emphasized by Pentland (2012). In addition, we repeated the same methods used by Lehmann-Willenbrock et al. (2013) in relation to our survey battery and our meeting engagement formula for the degree of distribution among participant speaking times.

Fourthly, there are multiple other factors that could affect both participation and satisfaction in virtual meetings. To this end, Allen et al. (2014) identified the percentage of discussion for 16 different meeting purposes across publicly traded firms, private firms, non-profit firms, and government organizations, as well as across job levels. We cannot admit to having controlled for such a vast spread of factors within our study (e.g., job level, tenure, salary, the presence of a meeting agenda, etc.). However, as found by Rogelberg et al. (2010), these factors did not show any relationship when accounting for gender, job level, age, employment status, and tenure. Hence, we decided to limit the scope of our research and assume that these factors do not play a significant role in virtual meetings. Future research with the appropriate resources should confirm that this is the case in both in-person and virtual meetings.

Lastly, across cultures *speaking up* has varied implications. In Western cultures, the power distance between subordinates and superiors is fairly small; however, the opposite is true in Eastern cultures (Hofstede et al., 2010). Therefore, the measurement of meeting energy and meeting engagement on perceived meeting satisfaction among virtual meetings in Eastern cultures may show noticeably different results. Therefore, future research should seek to encompass a diverse set of nationalities within virtual meetings.

## **Conclusion**

Meetings are inherent within every organization. As such, meetings represent an important facet of employee engagement. Furthermore, virtual

---

meetings are becoming more popular as technology develops. The coronavirus pandemic greatly helped to expedite the future of meetings in this regard. Our study dives further into the field of meeting science by emphasizing the significance of participation within virtual meetings in the form of speaking time. Our work also assessed the advent of speech software analysis with regard to diarization. Diarization technology has yet to reach its full potential in accurately reading the complexities of communication within virtual meetings. However, ELAN 6.0 speech software enabled us to create fairly reliable data to better investigate speech patterns within virtual meetings.

Ultimately, the results of our data were somewhat unexpected. We did indeed recognize the draining effects of meeting size, meeting length, and meeting leader presence, respectively, on meeting participation. In addition, increased meeting size coincided with previous studies in that it negatively impacted meeting satisfaction. However, meeting length failed to show an assumed negative relationship with meeting satisfaction. Furthermore, meeting energy and meeting engagement did not share a positive relationship, respectively, with meeting satisfaction, as we had expected. Rather, meeting energy showed no significant effect, and meeting engagement showed the opposite of what we hypothesized—a negative relationship with meeting satisfaction. These findings, however, draw greater attention to the presence and influence of meeting leaders. Our results, while surprising, nevertheless provide a better baseline for general participation within virtual meetings and a new lens with which to consider the development of meeting satisfaction.

---

## References

- Aguinis, H., & O'Boyle Jr, E. (2014). Star performers in twenty-first century organizations. *Personnel Psychology*, *67*(2), 313-350.
- Allen, J. A., & Rogelberg, S. G. (2013). Manager-Led Group Meetings: A Context for Promoting Employee Engagement. *Group & Organization Management*, *38*(5), 543–569. <https://doi.org/10.1177/1059601113503040>
- Allen, J. A., Beck, T., Scott, C. W., & Rogelberg, S. G. (2014). Understanding workplace meetings. *Management Research Review*.
- Allen, J. A., Lehmann-Willenbrock, N., & Rogelberg, S. G. (2018). Let's get this meeting started: Meeting lateness and actual meeting outcomes. *Journal of Organizational Behavior*, *39*(8), 1008–1021. <https://doi.org/10.1002/job.2276>
- Allen, J. A., Tong, J., & Landowski, N. (2020). Meeting effectiveness and task performance: meeting size matters. *Journal of Management Development*.
- Arnold, J., & Randall, R. (2016). *Work psychology: Understanding human behaviour in the workplace* (Sixth Edition). Pearson.
- Aubé, C., Rousseau, V., & Tremblay, S. (2011). Team size and quality of group experience: The more the merrier?. *Group Dynamics: Theory, Research, and Practice*, *15*(4), 357.
- Bailenson, J. (2020, April 3). Opinion | Why Zoom Meetings Can Exhaust Us. *Wall Street Journal*. <https://www.wsj.com/articles/why-zoom-meetings-can-exhaust-us-11585953336>
- Baran, B. E., Shanock, L. R., Rogelberg, S. G., & Scott, C. W. (2012). Leading group meetings: Supervisors' actions, employee behaviors, and upward perceptions. *Small Group Research*, *43*(3), 330-355.



- 
- Barkhi, R. (2002). Cognitive style may mitigate the impact of communication mode. *Information & Management*, 39(8), 677-688.
- Bilbow, G. T. (1998). Look Who's Talking: An Analysis of "Chair-Talk" in Business Meetings. *Journal of Business and Technical Communication*, 12(2), 157-197.
- Bryman, A., Bell, E., & Harley, B. (2019). *Business research methods* (Fifth edition). Oxford University Press.
- Chapell, B. (2020, April 7). *4 Of 5 Workers Are Affected By COVID-19 Worldwide, U.N. Agency Says*. NPR.Org.  
<https://www.npr.org/sections/coronavirus-live-updates/2020/04/07/828778490/4-of-5-workers-are-affected-by-covid-19-worldwide-u-n-agency-says>
- Cohen, M. A., Rogelberg, S. G., Allen, J. A., & Luong, A. (2011). Meeting design characteristics and attendee perceptions of staff/team meeting quality. *Group Dynamics: Theory, Research, and Practice*, 15(1), 90–104.  
<https://doi.org/10.1037/a0021549>
- Dean, J. W. Jr. & Sharfman, M. P. (1996). Does decision process matter? A study of strategic decision-making effectiveness. *Academy of Management Journal*, 39, 368-396.
- DeFilippis, E., Impink, S. M., Singell, M., Polzer, J. T., & Sadun, R. (2020). *Collaborating during coronavirus: The impact of COVID-19 on the nature of work* (No. w27612). National Bureau of Economic Research.
- Drucker, P. F. (2004). What makes an effective executive. *Harvard business review*, 82(6).

- 
- ELAN (Version 6.0) [Computer software]. (2020). Nijmegen: Max Planck Institute for Psycholinguistics, The Language Archive. Retrieved from <https://archive.mpi.nl/tla/elan>
- Epstein, R., Colford, S., Epstein, E., Loye, B., & Walsh, M. (2012). The effects of feedback on computer workstation posture habits. *Work, 41*(1), 73–79. <https://doi.org/10.3233/WOR-2012-1287>
- Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th edition). SAGE.
- Finkelstein, S. (1992). Power in top management teams: Dimensions, measurement and validation. *Academy of Management Journal, 35*, 505–538.
- Fosslien, L., & Duffy, M. W. (2020, April 29). How to Combat Zoom Fatigue. *Harvard Business Review*. <https://hbr.org/2020/04/how-to-combat-zoom-fatigue>
- Fujita, Y., Kanda, N., Horiguchi, S., Nagamatsu, K., & Watanabe, S. (2019). End-to-end neural speaker diarization with permutation-free objectives. arXiv preprint arXiv:1909.05952.
- Geimer, J. L., Leach, D. J., DeSimone, J. A., Rogelberg, S. G., & Warr, P. B. (2015). Meetings at work: Perceived effectiveness and recommended improvements. *Journal of Business Research, 68*(9).
- Hackman, J. R., & Vidmar, N. (1970). Effects of size and task type on group performance and member reactions. *Sociometry, 33*(1), 37–54. <https://doi.org/10.2307/2786271>
- Hallgren, K. A. (2012). Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutor Quant Methods Psychol. 8*(1), 23–34.

- 
- Hayes, A. F. (2009). *Statistical Methods for Communication Science*.  
<http://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=425516>
- Hofstede, G. H., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: Software of the mind: intercultural cooperation and its importance for survival* (3rd ed). McGraw-Hill.
- Kauffeld, S., & Lehmann-Willenbrock, N. (2012). Meetings matter: Effects of team meetings on team and organizational success. *Small group research*, 43(2), 130-158.
- Kaufmann, G., & Kaufmann, A. (2015). *Psykologi i organisasjon og ledelse*. Fagbokforlaget.
- Keith, E. (2015, December 4). *55 million: A fresh look at the number, effectiveness, and cost of meetings in the U.S.*  
<https://blog.lucidmeetings.com/blog/fresh-look-number-effectiveness-costmeetings-in-us>
- Kelly, J., (2020). *Twitter CEO Jack Dorsey Tells Employees They Can Work From Home 'Forever'—Before You Celebrate, There'S A Catch*. Forbes.  
<https://www.forbes.com/sites/jackkelly/2020/05/13/twitter-ceo-jack-dorsey-tells-employees-they-can-work-from-home-forever-before-you-celebrate-theres-a-catch/#3c07f8e52e91>
- Leach, D. J., Rogelberg, S. G., Warr, P. B., & Burnfield, J. L. (2009). Perceived meeting effectiveness: The role of design characteristics. *Journal of Business and Psychology*, 24(1), 65-76.
- Lehmann-Willenbrock, N., Allen, J. A., & Kauffeld, S. (2013). A sequential analysis of procedural meeting communication: How teams facilitate their meetings. *Journal of Applied Communication Research*, 41(4), 365-388.
-

- 
- Luong, A. & Rogelberg, S.G. (2005), “Meetings and more meetings: the relationship between meeting load and the daily well-being of employees”, *Group Dynamics: Theory, Research, and Practice*, Vol. 9 No. 1, pp. 58-67.
- Maynard, M. T., Gilson, L. L., Jones Young, N. C., & Vartiainen, M. (2017). Virtual teams. In G. Hertel (Ed.), *The Wiley Blackwell handbook of the psychology of the Internet at work* (First edition, pp. 315–346). John Wiley & Sons, Inc.
- Mroz, J. E., Allen, J. A., Verhoeven, D. C., & Shuffler, M. L. (2018a). Do we really need another meeting? The science of workplace meetings. *Current Directions in Psychological Science*, 27(6), 484-491.
- Mroz, J. E., Yoerger, M., & Allen, J. A. (2018b). Leadership in Workplace Meetings: The Intersection of Leadership Styles and Follower Gender. *Journal of Leadership & Organizational Studies*, 25(3), 309–322.  
<https://doi.org/10.1177/1548051817750542>
- Murphy, K., 2020. *Why Zoom Is Terrible*. [Nytimes.com](https://www.nytimes.com/2020/04/29/sunday-review/zoom-video-conference.html).  
[https://www.nytimes.com/2020/04/29/sunday-review/zoom-video-conference.html?](https://www.nytimes.com/2020/04/29/sunday-review/zoom-video-conference.html)
- Nixon, C. T., & Littlepage, G. E. (1992). Impact of meeting procedures on meeting effectiveness. *Journal of Business and Psychology*, 6(3), 361-369.
- Northouse, P. G. (2019). *Leadership: Theory and practice* (Eighth Edition). SAGE Publications.
- Papadakis, V. M. & Barwise, P. (2002). How much do CEOs and top management matter in strategic decision-making?. *British Journal of Management*, 13(1), 83-95.

- 
- Pentland, A. (2012). The New Science of Building Great Teams. *Harvard Business Review*, 4(2012), 60–70.
- Rogelberg, S. G., Leach, D. J., Warr, P. B., & Burnfield, J. L. (2006). " Not another meeting!" Are meeting time demands related to employee well-being?. *Journal of Applied Psychology*, 91(1), 83.
- Rogelberg, S. G., Allen, J. A., Shanock, L., Scott, C., & Shuffler, M. (2010). Employee satisfaction with meetings: A contemporary facet of job satisfaction. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, 49(2), 149-172.
- Rogelberg, S. (2019). *Why Your Meetings Stink—And What To Do About It*. Harvard Business Review. <https://hbr.org/2019/01/why-your-meetings-stink-and-what-to-do-about-it>
- Samrose, S., Zhao, R., White, J., Li, V., Nova, L., Lu, Y., Ali, M. R., & Hoque, M. E. (2018). CoCo: Collaboration Coach for Understanding Team Dynamics during Video Conferencing. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 1(4), 1–24. <https://doi.org/10.1145/3161186>
- Schein, E. H. (1988). *Organizational Psychology*. Englewood Cliffs, NJ: Prentice Hall.
- Scott, S., Allen, J. A., Rogelberg, S. G., & Kello, A. (2015). *Five theoretical lenses for conceptualizing the role of meetings in organizational life*. In J. A. Allen, N. Lehmann-Willenbrock, & S. G. Rogelberg (Eds.), *The Cambridge handbook of meeting science* (pp. 20–48). New York, NY: Cambridge University Press.
-

- 
- Sonnentag, S. (2001). High performance and meeting participation: An observational study in software design teams. *Group Dynamics: Theory, Research, and Practice*, 5(1), 3.
- Standaert, W., Muylle, S., & Basu, A. (2021). How shall we meet? Understanding the importance of meeting mode capabilities for different meeting objectives. *Information & Management*, 58(1), 103393.
- Toomingas, A., Hagberg, M., Heiden, M., Richter, H., Westergren, K. E., & Tornqvist, E. W. (2014). Risk factors, incidence and persistence of symptoms from the eyes among professional computer users. *Work*, 47(3), 291–301. <https://doi.org/10.3233/WOR-131778>
- Turner, M.E. (2000). *Groups at work*. New York, NY: Erlbaum
- Van der Kleij, R., Maarten Schraagen, J., Werkhoven, P., & De Dreu, C. K. W. (2009). How Conversations Change Over Time in Face-to-Face and Video-Mediated Communication. *Small Group Research*, 40(4), 355–381. <https://doi.org/10.1177/1046496409333724>
- White, M. (2014). The management of virtual teams and virtual meetings. *Business Information Review*, 31(2), 111-117.
- Yoerger, M., Crowe, J., & Allen, J. A. (2015). Participate or else!: The effect of participation in decision-making in meetings on employee engagement. *Consulting Psychology Journal: Practice and Research*, 67(1), 65.

---

## **Appendix A: Approval from NSD**

Our assessment is that the processing of personal data in this project will comply with data protection legislation, so long as it is carried out in accordance with what is documented in the Notification Form and attachments, dated 12.01.2021, as well as in correspondence with NSD. Everything is in place for the processing to begin.

### **SHARE THE PROJECT WITH THE PROJECT LEADER**

For students it is mandatory to share the Notification form with the project leader (your supervisor). You can do this by clicking on "Share project" in the upper left corner of the Notification form.

### **NOTIFY CHANGES**

If you intend to make changes to the processing of personal data in this project it may be necessary to notify NSD. This is done by updating the information registered in the Notification Form. On our website we explain which changes must be notified. Wait until you receive an answer from us before you carry out the changes.

### **TYPE OF DATA AND DURATION**

The project will be processing general categories of personal data until 01.10.2021.

### **LEGAL BASIS**

The project will gain consent from data subjects to process their personal data. We find that consent will meet the necessary requirements under art. 4 (11) and 7, in that it will be a freely given, specific, informed and unambiguous statement or action, which will be documented and can be withdrawn. The legal basis for processing personal data is therefore consent given by the data subject, cf. the General Data Protection Regulation art. 6.1 a).

### **PRINCIPLES RELATING TO PROCESSING PERSONAL DATA**

NSD finds that the planned processing of personal data will be in accordance with the principles under the General Data Protection Regulation regarding:

- 
- lawfulness, fairness and transparency (art. 5.1 a), in that data subjects will receive sufficient information about the processing and will give their consent
  - purpose limitation (art. 5.1 b), in that personal data will be collected for specified, explicit and legitimate purposes, and will not be processed for new, incompatible purposes
  - data minimisation (art. 5.1 c), in that only personal data which are adequate, relevant and necessary for the purpose of the project will be processed
  - storage limitation (art. 5.1 e), in that personal data will not be stored for longer than is necessary to fulfil the project's purpose

### THE RIGHTS OF DATA SUBJECTS

Data subjects will have the following rights in this project: transparency (art. 12), information (art. 13), access (art. 15), rectification (art. 16), erasure (art. 17), restriction of processing (art. 18), notification (art. 19), data portability (art. 20). These rights apply so long as the data subject can be identified in the collected data.

NSD finds that the information that will be given to data subjects about the processing of their personal data will meet the legal requirements for form and content, cf. art. 12.1 and art. 13.

We remind you that if a data subject contacts you about their rights, the data controller has a duty to reply within a month.

### FOLLOW YOUR INSTITUTION'S GUIDELINES

NSD presupposes that the project will meet the requirements of accuracy (art. 5.1 d), integrity and confidentiality (art. 5.1 f) and security (art. 32) when processing personal data.

Qualtrics is a data processor for the project. NSD presupposes that the processing of personal data by a data processor meets the requirements under the General Data Protection Regulation arts. 28 and 29.



---

To ensure that these requirements are met you must follow your institution's internal guidelines and/or consult with your institution (i.e. the institution responsible for the project).

#### FOLLOW-UP OF THE PROJECT

NSD will follow up the progress of the project at the planned end date in order to determine whether the processing of personal data has been concluded.

Good luck with the project!

Data Protection Services for Research: +47 55 58 21 17 (press 1)

---

## Appendix B: Survey outline

Q1: Your personal code: \_\_\_\_\_

Q2: What role did you play in the meeting?

- Meeting Leader
- Meeting Attendee

Q3: What is your gender?

- Male
- Female
- I prefer not to answer

Q4: Overall how satisfied or dissatisfied were you with the meeting?

Q5: I would be happy to have another team meeting with the same group composition.

Q6: The team meeting has brought about new ideas

Q7: The team meeting was time well-spent for me.

Q8: Overall, I am satisfied with the meeting outcome.

Q9: The results of the meeting are clear and unambiguous. I know what I need to do now.

Q10: The meeting results can be applied in practice.

Q11: Implementing the results of the meeting will lead to measurable cost savings.

Q12: Implementing the results of the meeting will lead to increased customer satisfaction.

Q13: Implementing the results of the meetings will foster collaboration.

Q14: Implementing the results of the meeting will improve the workflow.

Q15: Implementing the results of the meeting will lead to higher product quality.

*Note: Q4-Q15 are questions from Lehmann-Willenbrock et al. (2013). The responses are recorded on a 5-point Likert scale (completely agree, somewhat agree, neither agree or disagree, somewhat disagree, and completely disagree).*

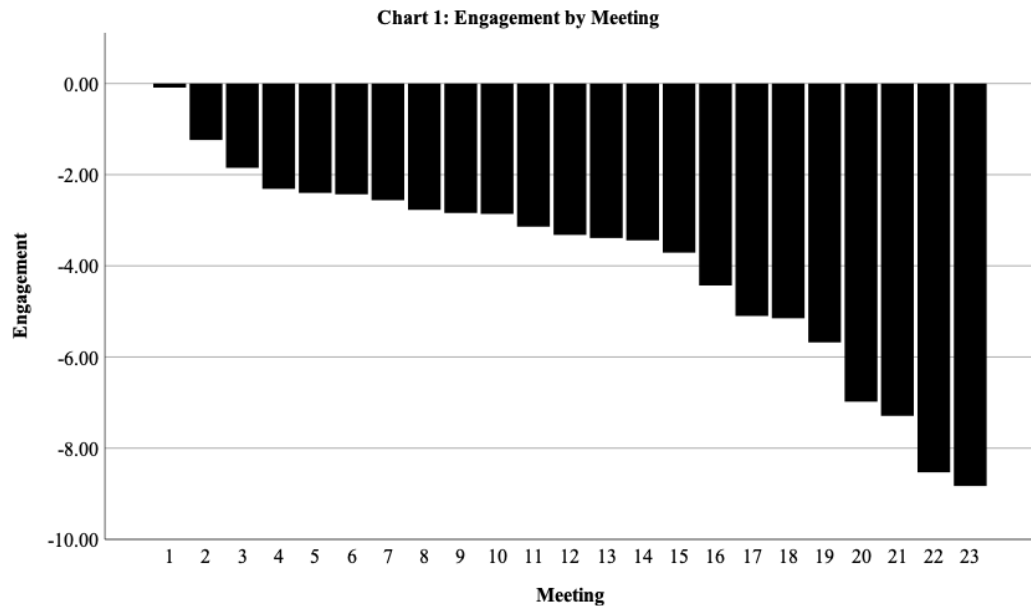
- Question 4-7: Satisfaction with the process
- Question 8-15: Satisfaction with the outcome

## Appendix C: Further Explanation of Engagement Measure

Because meeting engagement represents a value that is slightly more abstract than our other constructs, we have provided two figures to support its understanding.

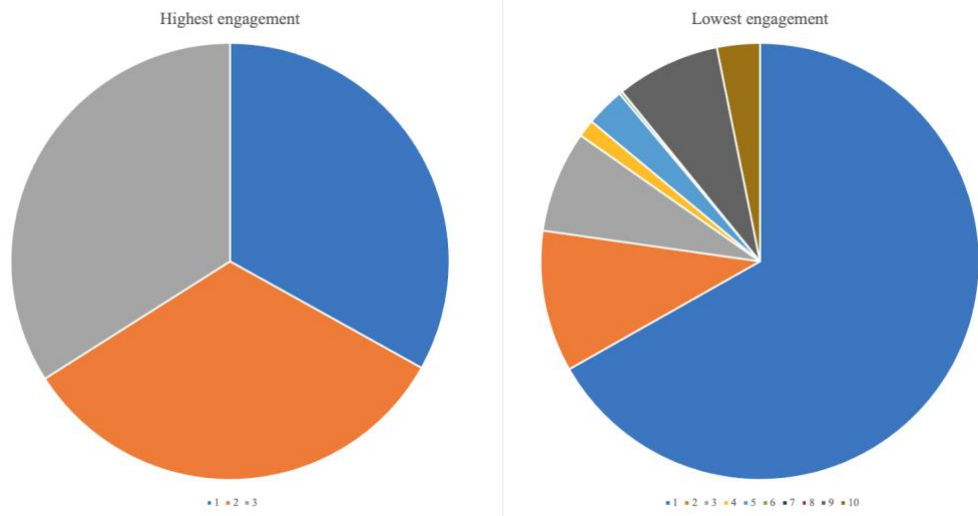
Figure A represents the spread of engagement scores among the meetings. Seen here, the engagement scores are sorted ascendingly, where the left side (meeting 1) shows the most equally distributed meeting, while the right side (meeting 23) shows the least equally distributed meeting. Figure B shows a representation of the two mentioned meetings.

*Figure A: Graphic illustration of engagement for the meetings in our sample, sorted ascending.*



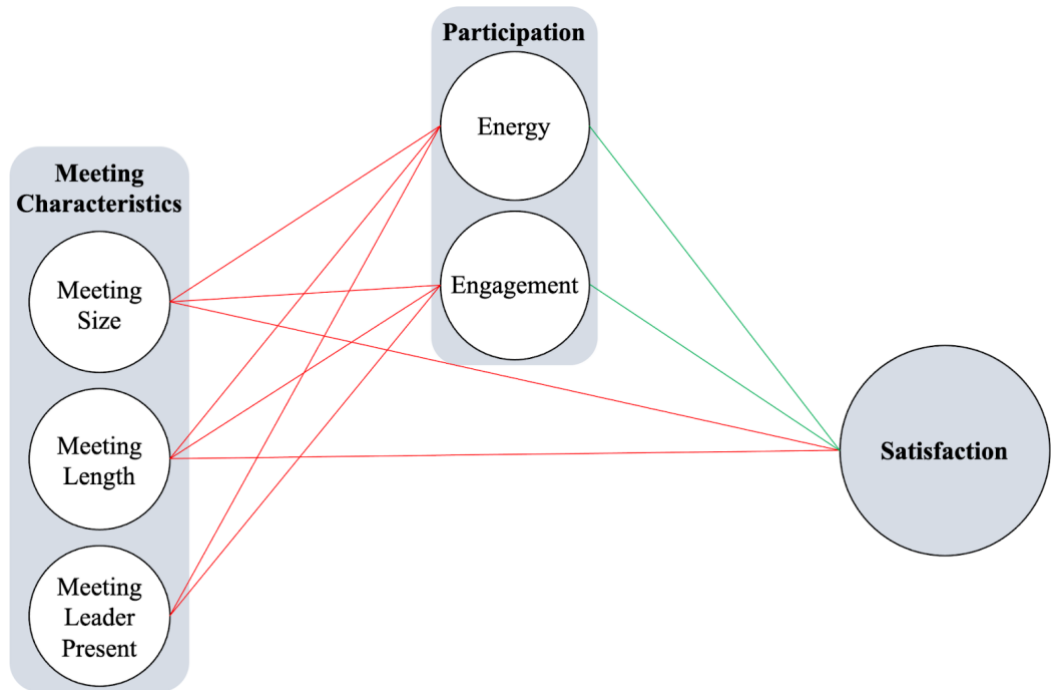
As seen in the pie chart to the left, each participant had an equal share of the speaking time in the meeting, which produced the highest engagement score out of all the meetings analyzed. However, in the pie chart to the right, we see that one participant accounted for approximately 66% of the speaking time, which produced the lowest engagement score out of all meetings analyzed.

*Figure B: Graphic illustration of the distribution of speaking times between meeting 1 on the left (the highest engagement score) and meeting 23 on the right (the lowest engagement score).*

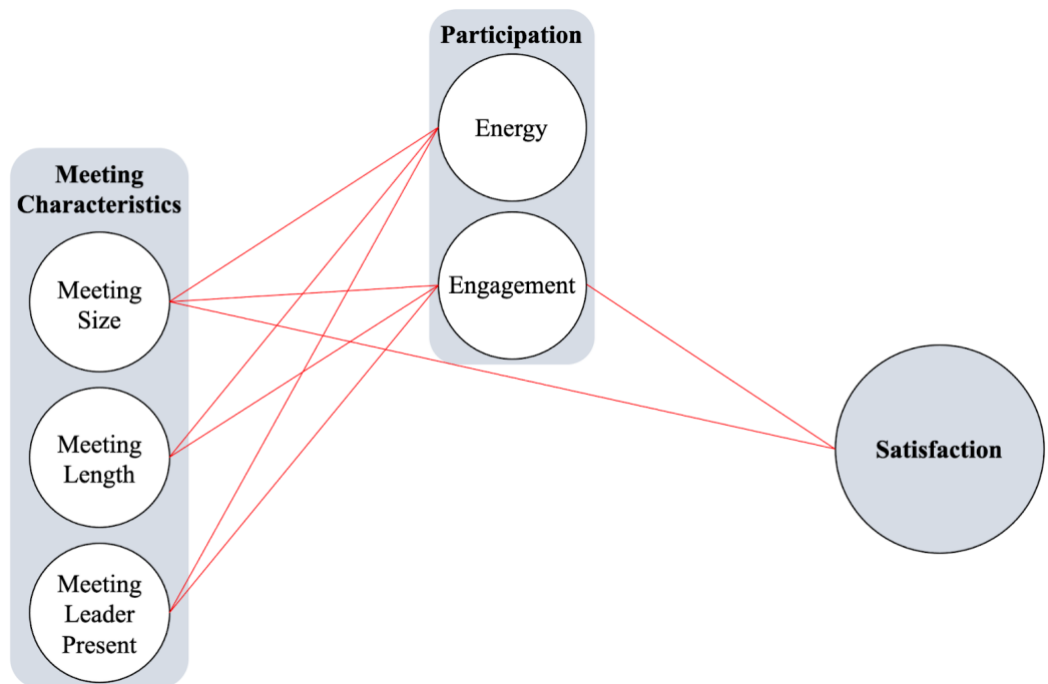


## Appendix D: Initial and Revised Model

### Initial model



### Revised model



*Note: Green lines represent a positive relationship, red lines represent a negative relationship, while no lines either represent no hypothesized relationship (initial model) or no relationship found (revised model).*

---

## Appendix E: Factor Analysis with Promax Rotation

**Pattern Matrix<sup>a</sup>**

	Component	
	1	2
Overall, I am satisfied with the meeting process	.803	-.051
I would be happy to have another team meeting with the same group composition	.774	-.179
The team meeting has brought about new ideas	.329	.288
The team meeting was time well spent for me	.821	.046
Overall, I am satisfied with the meeting outcome	.878	-.044
The results of the meeting are clear and unambiguous. I know what I need to do now	.718	-.057
The meeting results can be applied in practice	.459	.236
Implementing the results of the meeting will lead to measurable cost savings	-.036	.571
Implementing the results of the meeting will lead to increased customer satisfaction	.042	.798
Implementing the results of the meeting will foster collaboration	.442	.141
Implementing the results of the meeting will improve the workflow	.478	.321
Implementing the results of the meeting will lead to higher product quality	-.118	.899

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

**Structure Matrix**

	Component	
	1	2
Overall, I am satisfied with the meeting process	.779	
I would be happy to have another team meeting with the same group composition	.691	
The team meeting has brought about new ideas	.462	.440
The team meeting was time well spent for me	.842	.426
Overall, I am satisfied with the meeting outcome	.857	
The results of the meeting are clear and unambiguous. I know what I need to do now	.692	
The meeting results can be applied in practice	.568	.448
Implementing the results of the meeting will lead to measurable cost savings		.554
Implementing the results of the meeting will lead to increased customer satisfaction	.412	.818
Implementing the results of the meeting will foster collaboration	.507	
Implementing the results of the meeting will improve the workflow	.627	.542
Implementing the results of the meeting will lead to higher product quality		.844

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.