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QUANTIFYING PARTICIPATION: AN IPD CASE STUDY

Sean M. Mulholland[1], Caroline M. Clevenger[2]

ABSTRACT

As the construction industry moves to greater project collaboration, greater participation and involvement by project team members is necessary for project success. Quantifying participation by project participants can present challenges though. The COVID-19 epidemic presented an opportunity to quantify participation due to the government mandated limitations of in-person meetings and the subsequent transition to videoconferencing. This paper presents a method via a case study utilizing videoconferencing to quantify project member participation. Findings indicate that utilizing videoconferencing is a possible method to measure project member participation but may not evaluate characteristics of the participation.

KEYWORDS

Case Study, Collaboration, Participation, Commitment, Relational

INTRODUCTION

The construction and design industry is moving towards a more collaborative approach that encourages the early participation of contractors and vendors (Franz, et al., 2017). To facilitate a heavily collaborate team environment, strategies such as co-located work spaces, shared financial incentives, and design/construction teams structures to enable collaboration have been utilized (Pishdad-Bozorgi, 2017). Fundamental to these strategies is the benefit of early involvement from multiple project team members (Assainar & El Asmar, 2014; Bascoul et al., 2018) and the ability of project members to work in near proximity to each other to increase the speed and quality of communication over more formal methods of communication.

Due to the COVID-19 pandemic, alternate strategies to facilitate collaborative team environments in non-collocated environments were needed. Government mandated social distancing requirements, travel restrictions, and other means to reduce the risk of transmission from the Corona virus meant that in-person meetings and co-location workspaces could no longer be used to promote engagement and collaboration amongst project participants. In lieu of in-person meetings, videoconferencing was rapidly adopted as a necessary alternative.

The use of videoconferencing for many project teams presented challenges and opportunities, as engagement by participants were affected with this alternate communication method. Specifically, videoconferencing can facilitate more task-oriented

[1] Assistant Professor, Civil & Environmental Engineering Department, United States Air Force Academy, USA, sean.mulholland@afacademy.af.edu, orcid.org/0000-0002-6598-6830
[2] Professor, Civil Engineering, Assistant Director, Construction Engineering and Management, University of Colorado Denver, Denver, USA, caroline.clevenger@ucdenver.edu, orcid.org/0000-0003-2265-8447

decision making, but peripheral discussions and non-task-oriented decision making may be reduced when compared to face-to-face meetings (Gallo, Carpenter, & Glisson, 2013). An unforeseen benefit with videoconferencing, however, was the possibility to monitor participation and possibly engagement of team members. To test and explore this new dataset, a project was selected as a case-study. This research aimed to gather and analyze case-study data to validate the application of content analysis as a proxy for participant engagement via video conferencing. To test this, the following research propositions were assumed:

Proposition 1: Project team members' participation can be quantified using videoconferencing data, and may be used as a proxy for participation.

Proposition 2: Videoconferencing data can be used to evaluate the impact of project roll on participation level from an individual.

Proposition 3: Videoconferencing data can be used to evaluate the impact of a company's fee at risk on their representative's participation level.

For the purpose of this research, only the quantity of recorded content was reviewed and not the quality of content.

LITERATURE REVIEW

This paper builds upon existing research and evaluates the potential to utilize videoconferencing data in construction research. Reviewed research included literature specific to in-person versus online meetings challenges, impact to a team's performance, and the impact to a team's decision-making ability. Concerning the impact of on-line meetings to a team compared to that of in-person, Archibald et al. (2019) evaluated the effectiveness of both the researchers and research participants using videoconferencing and found videoconferencing to be useful in conducting qualitative interviews. Similarly, Lilian (2014) reviewed previous research on the challenges that virtual teams face in communicating online and how this may present additional leadership difficulties due to limitations within that media. In slight contrast to Lilian's findings, Mühlfelder et al. (1999) research found no difference in the quantity of trust promoting behavior acts between face to face and virtual meetings. In another study, Anderson et al. (2007) simulated virtual team meetings and noted the challenge of having mixed team interfaces: individual videoconferences versus a meeting room sharing a terminal.

The impact to a project team from on-line meetings was reviewed by Mesmer-Magnus et al. (2011) on the effects of information sharing between virtual teams. Findings included different types of team information sharing as well as the extent to which the degree of "viturality" and type of information sharing set important boundary conditions for the information sharing-team performance. Fiol and O'Connor (2005) studied the differences between face-to-face, virtual, and hybrid (using both face-to-face meetings, as well as virtual) teams in developing a team identity, and among their findings they noted that virtual teams had the fewest "politeness rituals" that may impact a team's polarization of issues. Leadership dynamics of virtual and partially distributed teams were reviewed by Ocker et al (2011). Among their findings was that multiple cues are available for teams that share a physical space that aren't available to virtual teams. Additionally, leaders must use their "telepresence" which may impact the time it takes to express the same idea when compared to in-person meetings (Ocker et al., 2011). In other research, Gallo, Carpenter, and Glisson (2013) studied what, if any affects, teleconference versus face-to-face meetings had on scoring peer reviewed grant applications. There was "little difference" found in the scoring metrics between either review method, but a

decrease in discussion times was noted with the teleconference option when compared to face-to-face meetings. This is a worthy note to consider in that discussion time (this measurement would be based in large part by the total amount of words used) was less with teleconference, but based on scoring, no less substantive.

Concerning the effect of participation with decision making, Barki and Hartwick (1994) developed a participation measurement method. It was noted in their research that participative decision making is more closely related to perceived decision making, whereas decision quality is more closely related to actual participation. Simoff and Maher (2006) used text analysis to measure different aspects of participation in online collaborative design university course. The research did not compare their results to collaboration in a face-to-face environment but did provide a method for participation analysis. These methods included content analysis principals of word use, word use per expression, and comparison between participant roles. Warkentin et al. (1997) reviewed the effectiveness of virtual teams versus face-to-face, and found no significant difference in the proportion of unique information exchanged between the two groups but did cite a lower level of cohesion and satisfaction with decision processes within the virtual teams.

RESEARCH METHODS AND DATA

This study was conducted utilizing a recorded videoconferencing session from a construction project team meeting over a two-week period to test the applicability of this method. This involved tracking and measuring participation by reviewing i) participant word count and ii) times spoken. Recordings were transcribed with an online tool and then was reviewed with a content analysis software. Measurements were taken from a meeting comprised of project team leaders for a healthcare building construction project.

CASE STUDY

This paper presents findings from a $23million pediatric behavior-health expansion project located in the Rocky Mountain west of the United States. The project was an integrated delivery project (IPD), utilizing an AIA-191 contract. The project was spread over multiple floors of an existing building, roughly 80,000sf. Each floor contained different behavior health care modalities, as well as support administrative spaces. Design began in the fall of 2019, with construction starting during the summer of 2020 and is scheduled to be fully completed during early summer of 2022.

For this analysis, a recurring IPD leadership progress meeting was selected over a multi-week period during early schematic design. The project team had met previously during project interviews, but due to timing had not had a project progress meeting in-person before the COVID-19 outbreak.

The project leadership team met regularly to review design and construction progress and was comprised of individuals that were signatory to a multiparty agreement (see Table 1). Purpose of meetings were to evaluate and address design/project process and progress with IPD contract participants. Participants knew that the sessions were being recorded but were unaware of the recordings use in analysis, apart from one of the hospital owner representatives (who is co-author of this paper). Two separate meetings were used for analysis, with both meetings lasting just over an hour in length. Meetings reviewed were limited to reduce variability between meeting participants to establish this as a viable means of research and tracking of participant participation.

Table 1: Project Team Membership

Participant	Position	Relationship
General Contractor 1a	Project Executive	Supervisor
General Contractor 1b	Project Manager	Employee
Architect 1	Design Principal	No Relationship
Owner 1a	Department Director	Supervisor
Owner 1b	Project Manager	Employee
Engineer 1	Design Lead	No Relationship
Sub-Contractor 1	Project Manager	No Relationship
Sub-Contractor 2	Project Manager	No Relationship
Sub-Contractor 3	Project Manager	No Relationship

RECORDED MEETINGS

Due to the COVID-19 related prohibition of in-person meetings, in-person meetings transitioned exclusively to videoconferencing. Meetings were conducted with a web-based, videoconferencing program (for this analysis, Zoom was used). The meetings were recorded, an optional setting within the program, to allow for review, analysis, and archiving of project decisions.

Each meeting member participated either from their computer or their smartphone device. Though the audio and video were both recorded, at times participants disengaged their video recording, which for the purposes of this research, did not affect analysis.

TRANSCRIPTION OF MEETING

After the meeting was completed, the audio and video recording were downloaded from the videoconferencing program. The videoconference program automatically compiled the meeting into both mp4-video and mp4-audio files. The recorded sessions were then uploaded to a separate program for the transcription (for this analysis, Otter was used).

MEETING ANALYSIS

To analyze the meeting, the transcription was reviewed via a three-part process; i) downloading the transcription to a word processing program, ii) content analysis review, and iii) tracking of meeting metrics.

Download to Word Processing Program

Upon completion of transcribing the meeting, the speaker's individual content was separated and copied into an individual word processing document. For this research MS Word was used.

Upload for Content Analysis

The documents were then uploaded into a content analysis software for review. For this research, NVIVO was used. The content analysis software provided details on word count, words per sentence, common word use, among many others. For this research, data pertaining to word counts and times spoken were used.

Data Analysis

Data obtained from the content analysis software were then downloaded to a spreadsheet program to analyze the output of each speaker. For this research, MS Excel was used.

Data was separated by the following: a) date of meeting (each meeting separated by tab), b) speaker (separated by name), c) role (general contractor, owner, architect, engineer, sub-contractor), d) corporate position (project manager, director, principal, lead, etc), e) relationship between company affiliation (boss, employee). Only content from the start of the meeting until meeting completion was analyzed, and content during the participant logging on period was not reviewed.

RESULTS OF ANALYSIS

MEETING 1

For meeting 1, all project leadership members were present and participated in the project meeting. Table 2 and Figure 1 show the breakdown of participation by each meeting participant. Based on this data and the roles noted from

Table 1, Figure 21 details the active participation by word count by project industrial role. Figure 2 summarizes total work count by project role. Figure compares the participation by employment relationship of supervisor and employee with the same company.

Table 2: Meeting 1 Participation Breakdown

Participant	Words Used	Times Spoken	Word Count/ Times Spoken
General Contractor 1a	992	23	43
General Contractor 1b	4,563	58	79
Architect 1	646	15	43
Owner 1a	2,610	27	97
Owner 1b	1,862	34	55
Engineer 1	1,572	32	49
Sub-Contractor 1	316	13	24
Sub-Contractor 2	293	5	59
Sub-Contractor 3	178	12	15

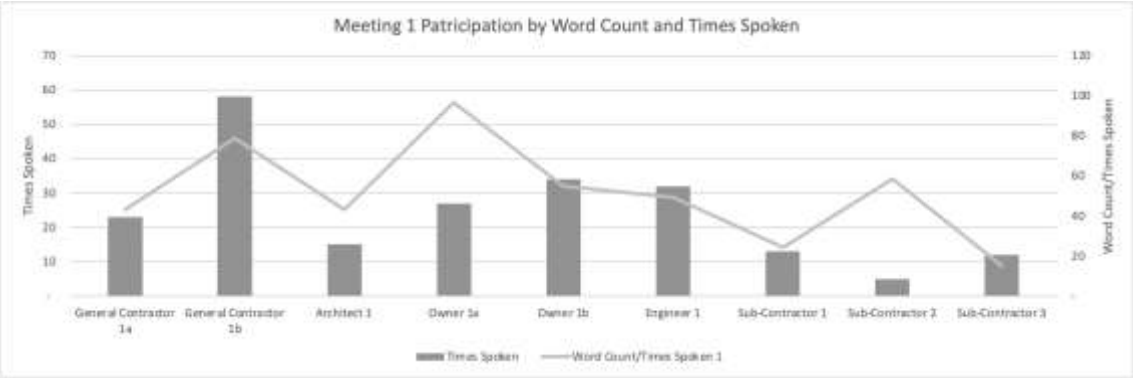

Figure 1: Meeting 1 Participation Breakdown

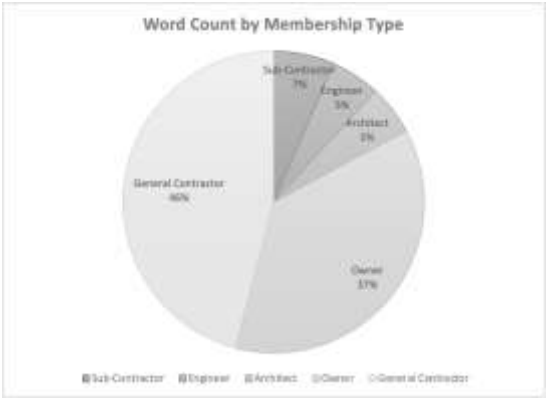

Figure 2: Word Count by Membership Type

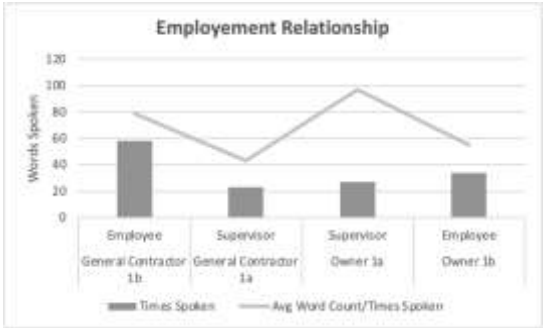

Figure 3: Participation by Employment Relationship

MEETING 2

For meeting 2, all project leadership members were present and participated in the project meeting. Table 3, based on the membership noted in

Table 1, shows the breakdown of participation by each meeting participant. Based on this data and the roles noted

Table 1, Figure details the active participation by word count versus total word count by project industrial role. Similar to Figure 2, Figure 5 summarizes total work count by project role. Figure 6 compares the participation by employment relationship of boss and employee.

Table 3: Meeting 2 Participation Breakdown

Participant	Words Used	Times Spoken	Word Count/ Times Spoken
General Contractor 1a	2,425	38	64
General Contractor 1b	1,886	33	57
Architect 1	1,679	40	42
Owner 1a	1,367	21	65
Owner 1b	1,066	34	31
Engineer 1	644	8	81

Sub-Contractor 1	149	12	12
Sub-Contractor 2	92	2	46
Sub-Contractor 3	46	2	23

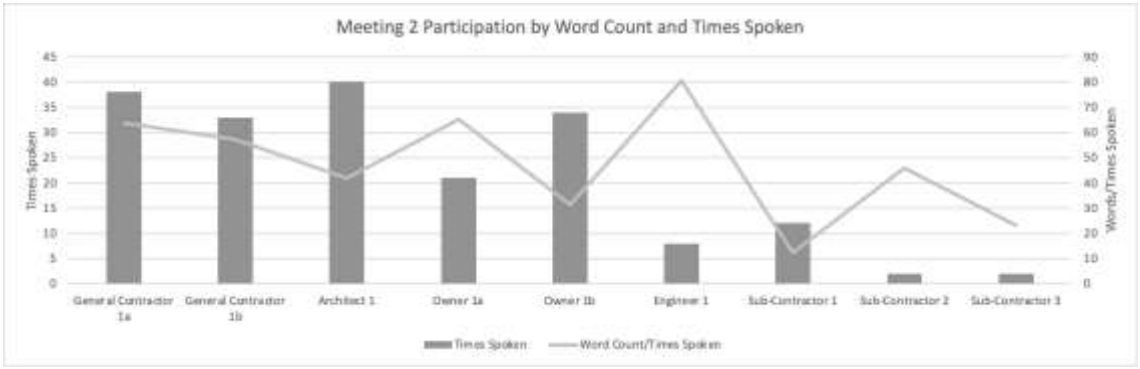

Figure 4: Meeting 2 Participation Breakdown

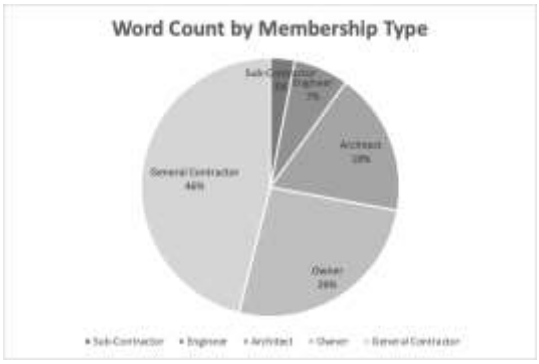

Figure 5: Word Count by Membership Type

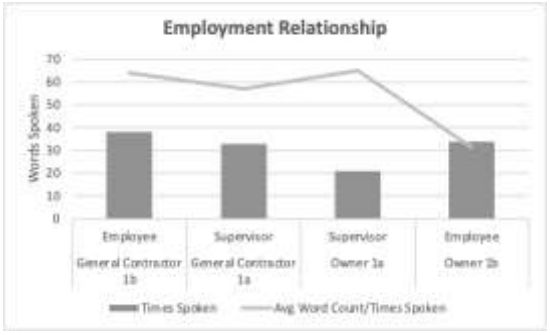

Figure 6: Participation by Employment Relationship

DISCUSSION & ANALYSIS

Results generated using the videoconferencing dataset suggest that such a dataset is valuable and provides an innovative method to analyze and compare the active participation of project team members. With construction moving to more collaboration amongst designers and contractors, a method to review the participation of team members to assist in evaluating the effort of team members could provide valuable insight for research related to collaboration in construction teams. As can be seen from Figure 1 and Figure 4, project participation varied amongst team members, but greater participation by

the owner and general contractor can be seen. Based on this, this method appears to validate Proposition 1 and Proposition 2. For meeting 1(76.9%) and meeting 2 (72.1%), roughly three-quarters of the words spoken were from the general contractor and owner. The topic for both meetings centered on the impact of design to the overall budget, and input from each project member was encouraged.

As previously noted, words spoken and/or times spoken may not directly correlate to the content or quality of the words spoken itself, it does correlate to the participation of team members (Simoff & Maher, 2006). For project teams that work in collaborate environments and where profits of participants operate in an "at risk" scenario, it is important to evaluate the input of participants. Figure 77 notes the differences in the amount spoken by each team member, versus the percentage at risk by the same team member. It appears that in reviewing Figure 7, the amount of fee at risk (as a percentage of the total sum of fee at risk between the IPD contracted parties) had little to no impact to an individual's participation. The participating sub-contractors had comparatively larger fee at risk compared to the other meeting participants, but routinely participated far less than other project members. This would indicate that this method may be used to evaluate the impact of fee at risk on participation (Proposition 3), but the impact appears to be negligible.

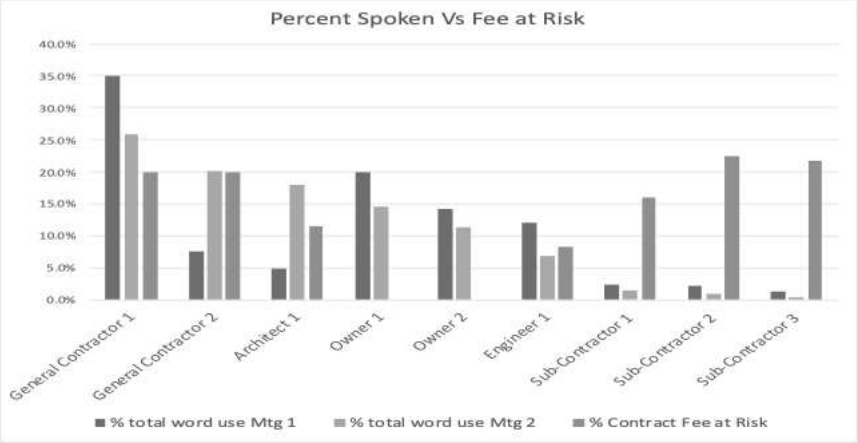

Figure 7: Comparison of Percent Spoken versus Fee at Risk

Another aspect that was reviewed with the data obtained was the impact of an employee's participation with their supervisor present in the meeting. Figure 3 and Figure 6 compare the number of times spoken and words spoken per time spoken for two examples of an employee/ supervisor relationship. Though the sample size was small, the variation between each employee/ supervisor couple was enough to presume that this hierarchical relationship did not anchor or impact participation of the employee.

It is interesting to review the results with the understanding that participation of individuals in meetings may not correlate to substitutive contribution, but a lack contribution most certainly would correlate to no substitutive contribution. The software was not used to evaluate the content of the contribution for each individual. It is assumed though that in a professional setting the general goal would be at least a substitutive contribution by each participate.

CONCLUSION AND IMPLICATIONS OF THE FINDINGS

A method to analyze the participation of project participants utilizing videoconferencing data resulting from changes due to the COVID-19 pandemic were presented. Word count and times spoken was used a proxy for individual participation. Quantity, and not the quality, of content was reviewed by the authors. Results suggest that the research based on analysis of videoconferencing data provides an innovative and valuable method to quantify participation of project team members. Due to the sample size, results may not be generalizable but was meant to highlight the possibility applications of the method used.

As construction project teams move away from in-person meetings, either due to geographic proximity or due to social distancing requirements, a tool to monitor team member participation was developed. This method adds to the body of knowledge by providing a method to capture and analyze participation. Whether this method is practical for every meeting is beyond the scope of this paper. This method of analysis is not meant to be a tool to forcibly encourage participation by individuals. Instead, it may provide the ability for participants to examine if their participation is limiting the involvement by others. Projects that successfully implement lean concepts and reduce waste, do so by the influence and involvement of project participants (Coffey, 2000). Integrating teams to reduce waste is based on the collective knowledge of project participants and their success may not be related to equal participation, but would certainly be hindered by limiting the participation of project members. This method to quantify participation may assist IPD projects in encouraging a more equitable discourse of project participants to leverage a more diverse experience set.

This research method allows for multiple opportunities to examine different aspects of project teams. First as technology changes, this method will certainly become easier and will generally improve. Real-time transcribing is becoming more common and offers an accelerated approach than that of what the authors were subject to. Overall, future research can look at how such data may impact a project team and associated behaviors. It can be assumed that behaviors would be impacted from the observer effect, which would thus alter natural behaviors. Other influencing factors such as age, gender identity, experience, project type, project phase, number of project participants, to name a few, may all produce interesting results that may be useful to academia and industry alike. Further, this method could also be used to review the quality of participation, and if this quality is impacted by project role, project length, and/or if this quality is impacted by project incentives.

DISCLAIMER

The views expressed in this article, book, or presentation are those of the author and do not necessarily reflect the official policy or position of the United States Air Force Academy, the Air Force, the Department of Defense, or the U.S. Government

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