

Preference for Procedural Ordering in Distributed Groups: How Do Media and Repeated Interaction Affect Perceptions and Procedural Structuring?

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Abstract

*Groups use procedural structures to organize their efforts in meetings. These structures are affected by group members' preferences for the degree of procedural order they want in a meeting, as well as by the communication media available in the meeting environment. Analysis of thirty partially distributed experimental groups that met over a series of four sessions was conducted by using two methods. Questionnaires were administered to ascertain perceptions of satisfaction and procedural practices. Content analysis was used to determine actual procedural behavioral patterns. Results indicate that members' **preferences for procedural order** do appear to affect the patterns of their actual structuring behaviors, but do not affect their satisfaction with the group process.*

1. Overview

Practical guidelines for conducting effective meetings usually include suggestions for structuring meetings through such methods as setting agendas and using prescribed discussion and decision-making methodologies. In fact, the functional designs of a number of group support technologies have been predicated on the presumption that it is essential to provide procedural structures for the group. In the absence of a highly structured group support system, the effective use of meeting procedures may depend on the use of a facilitator, which is not always practical. In many organizational meetings, a designated, impartial facilitator is not used at all. Often, the group must determine how best to structure its activities. To further complicate matters, although some research points to the effectiveness of providing procedural structures to meetings [1], results from other studies suggest that less

structured approaches can also result in effective group decision-making [5], [10].

Some researchers have argued that individuals exhibit different preferences for procedural ordering [12]. Others have suggested that individual preferences for procedural order mediate the relationship between decision procedures and outcomes [6]. Theoretical perspectives like Adaptive Structuration Theory (AST) view a wide variety of factors, such as the sequence of activities, the pace of the communication and the communication mode, as potential sources of structures [18]. While factors like individual preferences, technologies, and group interaction may impact the creation of meeting structures, we know little about *how* groups structure their activities. In addition, the ways in which groups meet are changing rapidly as they learn to use computer and video meeting support technologies to augment their face-to-face interaction in distributed situations. These various meeting environments provide new challenges to understanding how groups structure their activities. This paper describes an investigation of the effects of communication media and individual preferences on group members' perceptions of procedural structuring and on their actual procedural behaviors during a series of meetings by self-directed, partially-distributed work groups.

2. Existing Theory and Research

2.1 Time-based Interaction

Daft and Lengel [3] and Trevino, Daft and Lengel [13] argue that media vary in the amount and types of information they can deliver within comparable time intervals. This media-characteristics perspective presumes that communication outcomes are determined by a

medium’s characteristics such as its bandwidth and immediacy of feedback. In other words, this view attributes media choice, use and outcomes to the technical and static structures of the medium, i.e., a form of technological determinism. However, some researchers [8], [15], contend that interactions with technology evolve over time and hence need to be examined in a broader and more dynamic context. For instance, Markus [8] suggests that deterministic theories ignore a number of social forces—including users’ intentions and critical mass—that affect outcomes. Similarly, Lea [7] suggests that users can creatively employ computer-mediated communication over time to bring about varying degrees of social interaction, depending on their requirements.

Walther [15] argues that while cue-carrying capacity may indeed differ among media, nevertheless, so called “lean” media such as CMC can still support the exchange of relational (i.e., social) information. His Social Information Processing (SIP) theory asserts that some amount of social information must be processed in order to form personal impressions and develop interpersonal relations. Walther concludes, however, that what is important for relational development is not the amount of information processed in a single exchange but the accrual and processing of information over a *series* of exchanges. Walther [15] demonstrated that relational development does occur via lean media: it just takes more time than with rich media. Thus, the *rate* of relational exchange may be slower in leaner media, but over time, relational exchange in lean media can be as effective as in rich media.

In fact, Walther [16] maintains that, when manipulated intentionally, some structural characteristics in CMC (e.g., reduced cue capacity) may result in *hyperpersonal* communication. To illustrate, the reduced cue capacity of CMC allows users to be very selective—perhaps even deceptive—in how they present themselves. Thus, SIP theory suggests that a lean medium can focus interaction on specific issues that users *prefer* to explore, effectively filtering out contextual factors that may distract those using richer media.

Using different means to study the dynamics of group communication, McGrath [9] identifies three dimensions extant in any workgroup process: Time, Interaction and Performance (TIP). TIP theory contends that groups perform a number of functions simultaneously—production, well-being, and member support—when working on a project. Because multiple functions are being attended to simultaneously, the TIP perspective concludes that *interaction* is critical for effective coordination of resources among the various activities and functions. The sequential nature of activities suggests coordination and action both occur at least partly as functions of time. In other words, neither task nor time can be examined independently of each other. Besides,

neither of them can be considered without also considering their impact on interaction processes or task performance. TIP implies that the temporal characteristics of a medium—like the amount of time delay for feedback—influence members’ use of the medium and methods to support their interaction. These choices in turn affect performance.

In the spirit of the TIP approach, this study is motivated by the expectation that patterns in procedural ordering perceptions and actions are likely to change as groups a) experience shifts in their focus relative to the function currently consuming resources and b) gain experience—with the medium and with each other—over time in a given interaction context.

2.2 Preference for Procedural Order

Putnam [12] argued that people are predisposed differentially to varying forms of procedural ordering during group work. She articulated a person’s preference for procedural order (PPO) as being a sort of “cognitive map” consisting of biases and expectations about structuring work environments and activities. In other words, people differ in their inherent comfort levels with either more or less procedurally ordered (i.e., structured), group sessions. Procedural structures include the use of planned, sequential patterns for organizing activities (e.g., agenda setting), concern for time management, and an emphasis on clarifying group procedures and adhering to the task [12]. Below is a table of attributes characterizing people with high preference for procedural order (HPO) and those with low preference for procedural order (LPO).

Table 1: Characteristics Determining Preference for Procedural Order

HPO	LPO
Sequencing of activities	Non-sequenced, chain association
Focusing on time management	Oblivious to time management
Categorizing and structuring of activities	Flexibility in structuring of activities
Continuing focus on task related activities	Vacillation between task and social activities

Several earlier studies have looked at the mediating effects of both individuals’ preferences for procedural order and technological structures on the performance of groups. In two studies, ([6], [17]) preference for procedural order was determined using measures adapted from a scale developed by Putnam [12]. The instrument, the Group Procedural Order Questionnaire (GPOQ), assesses the degree to which an individual prefers

procedural structuring during group activities. The results of these studies indicate that preference for degree of procedural order has an impact on solution quality, process satisfaction, and participation. With regards to decision quality, it appears that those groups comprised of LPO members are able to perform well in a meeting environment with either a high or low degree of structure. On the other hand, groups comprised of HPO members seem to need a more structured environment than LPO groups [6]. Further, all types of groups, including LPO groups, seem to prefer the guidance offered in a structured environment (establishing an order of tasks to be done, etc.) when working on a complex task [17]. However, HPO groups reported more participation than did LPO groups, regardless of the level of structure in the meeting environment [17].

In order for groups to achieve their objectives, they need to accomplish activities along several fronts. Obviously task-based activities, as well as socially oriented ones (e.g., group development and maintenance interaction), will be required for successful performance. Less obvious, and less understood, however is the requirement for an appropriate mix of procedural structures. For example procedures are required to establish what activities the different members should be doing, when they should be doing them, and for how long. The generation of procedural structures however should not be considered a "static" requirement. In the spirit of *Structuration Theory* [4], procedural structures may be seen as "rules" of behavior that are agreed on by participants in a group. Consensus on their use emerges through the process of interaction, followed by action that is in turn constrained by the structures. When a structure is found to be less relevant, adequate, or functional than intended, further interaction leads to changes in the rule or its application, hence, the process of structuration is an evolutionary and dynamic one. We refer to this dynamic procedural ordering phenomenon as *procedural structuration*.

In light of Putnam's concept, this paper argues that group members--and hence groups--differ in their preferences for procedural ordering. These preferential differences are likely to generate differing perceptions about the procedural structuration that occurs and is also likely to result in different structuring behaviors.

In summary, this paper takes a position that combines the various theoretical perspectives outlined above. All groups require some level of procedural structuring. Based on preferences for procedural ordering however, groups differ in the amount of structure desired: Some groups prefer more structuring while others prefer less, and groups use interaction over time to achieve procedural structuration.

3. Research Methods and Hypotheses

3.1 Agenda

Because relatively little research has been done in this area, this study takes an exploratory approach. This study examined the issue from two perspectives, perceptions and reality. The first approach looks at *perceptions* of the participants with respect to preference for procedural order and process satisfaction. The second approach looks at the *structuration* process itself.

The *structuration* thrust includes the general questions:

1) Does a group's preference for procedural order affect the amount of procedural structuring members engage in?

The *perceptions* thrust includes the general questions:

2) Does a group's preference for procedural order affect its perceptions of procedural structuring and process satisfaction?

3) Does a group's perceptions of procedural structuring reflect the actual patterns of structuring that occur?

3.2 Motivation

While the results of earlier studies indicate that groups comprised of all HPO members may be somewhat less flexible in their ability to work in different meeting environments than all-LPO groups, the limitations of these studies must be kept in mind. Groups of all HPO or LPO members were explicitly formed by selecting only those subjects whose PPO score was one standard deviation either above or below the mean for their entire sample. This, by definition, does not reflect the makeup of the *typical* group. Therefore, these studies tell us little about how typical groups, comprised of HPO, LPO, and "non-extreme" members may, if so inclined, work together to provide their own structure to the meeting environment. Nor do we know much about how meetings are structured when at least one group member must participate from a remote location.

This study differs from and extends previous studies in five important ways. Earlier studies formed HPO and LPO groups in order to manipulate PPO. This study used groups whose members were randomly assigned--hence, groups were composed of people exhibiting a random mix of preferences for procedural order, rather than creating groups of only HPO or LPO members. Moreover, earlier studies employed quite rigidly structured meeting contexts by requiring a structured sequence of activities either manually dictated (for example by giving groups an agenda or by using a facilitator) or by the use of specially designed electronic meeting support systems (EMS). In contrast this study investigates the perceptions and

behaviors of groups using several relatively non-structured support tools. Prior PPO studies looked at groups in only fully co-located contexts. This study looks at partially distributed groups (groups where three members were co-located and one was remote). Partially distributed groups may be very different from fully distributed groups. For example, that the co-located members could be expected to have some history and also benefit asymmetrically (relative to the remote person) from continued face-to-face interaction, potentially creating a "group within the group" while "marginalizing" the remote individual.

Earlier studies were concerned with outcome measures, primarily decision quality and outcome satisfaction. In contrast the current study investigates participants' perceptions about the procedural structuring process as well as the actual behaviors that occur as the group performs. In other words, this study tries to understand the process, not just the outcome. Finally, earlier studies looked at procedural order in the context of one-meeting situations. This study assumes that groups collaborate more typically over time. Hence, this study extends prior research by examining procedural structuration over time.

3.3 Design

Specifically, this research studied thirty groups of four people each that met to perform a policy development and writing task over a series of four meetings, each lasting for one hour and fifteen minutes. All groups used a collaborative writing tool, which allowed all group members to simultaneously edit a common document. The collaborative writing tool did not impose any process structure on the group, but instead functioned only as a shared workspace. One of the members was remote from the others, simulating situations where expertise is required of a person who is located at a distance from the other participants in the group. All remote participants had access to the shared group document through the same writing tool.

Questionnaires were administered prior to the start of the first session to ascertain each participant's preference for procedural order (PPO). At the end of every session, each participant filled in a questionnaire that captured the individual's perceptions about the media, procedural ordering, and satisfaction with the process. All perception scales were comprised of multiple, seven-point, Likert-type items.

In accordance with methods established in prior PPO research, we assigned HPO status to any individuals who scored more than one standard deviation away from the mean on the GPOQ scale, and used a similar method in determining LPO individuals based on the distance of their scores from the mean in the opposite direction. In

determining whether *groups* were HPO or LPO for this study, we assigned HPO status to any group in which there were more HPO individuals than LPO ones. Group LPO status was determined where there were more LPO than HPO members. In cases of equivalence, the group was determined to be neither HPO nor LPO.

All sessions were videotaped. The tapes were transcribed word for word, and the transcriptions were then content coded and statistically analyzed.

In addition to the communication of ideas via the written shared-document space on the computer, all groups were given an alternate form of communication support. For ten of the groups, the remote participant used video conferencing technology to communicate with the other group members. In a second treatment, ten groups had access to only audio conferencing interaction with the remote member. In a third treatment, which we termed the combined-mode treatment, remote participants used audio technology for all but the last session. For the final meeting they interacted via video conferencing technology.

3.4 Hypotheses

The concept of preference for procedural order is based on the observation that some individuals prefer more structure in group meetings than others. Groups that have more HPO members, in order to satisfy them, will tend to engage in more procedural structuring than groups consisting of more LPO or non-extreme members. Their perceptions should reflect those behaviors, and hence HPO groups should also report correspondingly high levels of perceived procedural ordering. As a consequence of achieving a greater degree of procedural structure, we would expect that HPO groups would be more satisfied with the group process as well. Further, despite the fact that LPO groups have been shown to perform well in either a low or high structured situation [6], LPO groups are likely to be less satisfied with the process in the absence of procedural structuring when it is required, as it would be in the execution of a complex task like the one used here.

Using the quantity of procedural comments as a measure for procedural structuring, the discussions and rationale outlined above lead us to state the following hypotheses:

Hypothesis 1: The quantity of procedural comments will be greater for HPO groups than for LPO groups.

Hypothesis 2: Perceived procedural ordering will be higher in groups with a high preference for procedural order (HPO) than in low preference for procedural order (LPO) groups.

Hypothesis 3: Satisfaction with the group process will be higher in groups with a high

preference for procedural order (HPO) than in low preference for procedural order (LPO) groups.

4. Results

The questionnaire data assessing perceptions was analyzed using the repeated measures MANOVA General Linear Model (GLM) in SPSS. Two different sets of tests assessed the potential for main effects with respect to two different prospective factors, media and preference for procedural order (PPO). Thus, the data was analyzed one way for media, and a second way for PPO. We took this approach for purposes of obtaining as much information and generating as much power as possible given the sample size. For instance, it turned out that there were 8 HPO groups. Their distribution across the three media treatments resulted in a sample of only 2 or 3 **within each treatment**, reducing significantly the ability to observe effects. Moreover, the MANOVA indicated interaction affects of PPO within media. Hence, we decided to analyze PPO as a factor separate from media.

Since people were randomly assigned to group, and PPO is an individual trait, one effect of this arrangement is that PPO was not a controlled factor and therefore, not strictly speaking a treatment in the sense that media was. Nonetheless, in order to get a fuller picture of the relationship of perceptions to actual structuring behaviors, we assessed the data from both the media and PPO perspectives.

For assessing structuring behavior--structuration--we coded all verbal comments into one of nine categories; three non-procedural and six procedural. Non-procedural comments included social comments, technical comments (e.g., about the computer application or conferencing being used), and those about the content of the document they were writing. Procedural comments included those targeting task division, task sequencing, time allocation, task synchronization, task summarization, etc. In other words, comments that reflected the PPO items described earlier in this paper were judged to be procedural. After coding them into categories, comments were tabulated and aggregated by group. Repeated measures MANOVAs were run on the content data to look for differences by group PPO type.

Although we captured both kinds of data for all four sessions, we only tested data from sessions two, three and four. The first session was primarily a training session with all participants in the same location and not working on the task until approximately the final 15 minutes of the session. Analysis of the transcripts indicated that almost all groups spent the non-training portion of session one reading the background material and there was very little interaction for most groups.

4.1 Procedural Comments

The first hypothesis predicted that HPO groups, wanting more procedural structure, would generate more procedural comments to enact the desired level of structure.

Results (Table 2) show that there were in fact overall differences between HPO and LPO groups in the quantity of procedural comments ($F = 3.91$, $df = 4$, $sig. = .004$, $power = .89$). Interestingly though, while in the second session the differences were as anticipated, in sessions three and four, counter to expectations, the relationship reversed itself. The number of procedural comments dropped in session three for the HPO groups and was significantly less than the number of comments for LPO groups in session four. Correspondingly, and also counter to expectations, LPO groups increased their procedural interaction in session four.

Table 2: Mean Number of Procedural Comments

	Session 2	Session 3	Session 4
HPO	10.86	8.08	4.86
LPO	7.06	7.63	9.78
Neutral	8.62	9.60	6.48

4.2 Perceptions

In general, results with respect to the predictions about perceptions were non-significant. We expected that HPO groups would tend to exhibit greater levels of procedural interaction than LPO groups. More procedural interaction should generate correspondingly higher levels of perceived procedural structuring.

Results however, do not support this hypothesis (Table 5). There were no differences between HPO and LPO groups in their perceptions of procedural structuring ($F = .98$, $df = 3$, $sig. = .38$, $power = .21$). In fact, although there were significant differences in perceived level of procedural ordering over time ($F = 10.59$, $df = 3$, $sig. = .000$), the changes occurred similarly for all levels of PPO. HPO groups did not perceive more procedural ordering than did LPO groups. Nor, interestingly, did either HPO or LPO groups perceive more or less procedural structuring than groups with no HPO or LPO dominance. In other words, regardless of the PPO makeup of the group, all of them perceived similar levels and overall patterns of procedural ordering.

Table 3: Means of Perceived Procedural Ordering

	Session 1	Session 2	Session 3
HPO	5.31	5.37	5.68
LPO	5.01	5.31	5.74
Neutral	4.76	5.10	5.29

We expected that HPO groups would act on their PPO needs starting early in the process by doing more structuring. Their actions would generate more procedures, resulting in more satisfaction with the process relative to LPO groups.

Results show that PPO makes no difference with regard to overall process satisfaction (Table 4). Satisfaction tended to increase over time for all groups, but no more so for either HPO or LPO groups. In other words, the patterns of change were the same for all three PPO types ($F = 1.26$, $df = 2$, $sig. = .29$, $power = .39$). Despite differences in the timing and patterns of change in the structuring process, the groups' PPO level did not affect participants' overall satisfaction with group processes.

Table 4: Means of Perceived Satisfaction

	Session 2	Session 3	Session 4
HPO	6.20	6.10	6.20
LPO	5.84	6.10	6.23
Neutral	5.71	6.00	5.98

5. Discussion

5.1 Procedural Comments

Interpretation of early PPO research leads us to conclude that different preferences lead to different *amounts* of procedural ordering (e.g., [12]). In general, HPOs want more structure while LPOs prefer less structure. The literature appears however to be silent with regard to the issue of *patterns* of ordering. Results from the current study indicate that groups with more HPO members than LPOs tend to structure themselves differently from groups with more LPOs than HPOs. But the differences are not quite as expected.

When we look at amount of procedural interaction by preference for procedural order (either HPO, LPO, or neither being dominant), results indicate an interesting story (see Figure 3). First, when looked at overall, the total quantities of procedural interaction appear to be roughly equivalent overall (approximately 24 comments per group in total, regardless of PPO). In contrast, patterns appear to tell a different story.

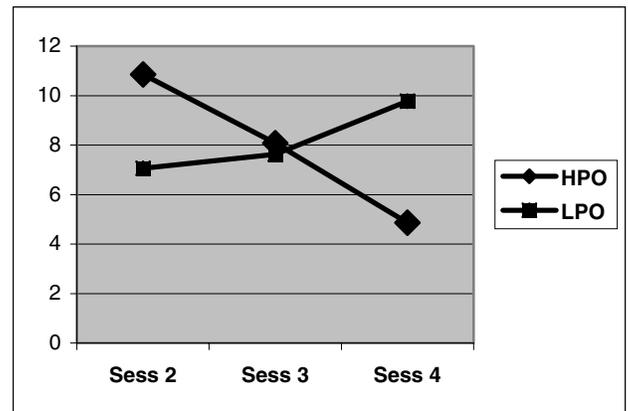
As expected, early in the sessions HPO groups *tended* to use more procedural interaction than LPO groups (we use the conservative term *tended* because one-way ANOVA indicates that session two differences were *non-significant*¹). Interestingly, but counter to our

¹ While means were similarly different between HPO and LPO groups in both the second and fourth sessions, the *standard deviation* for HPO groups was twice that of LPO groups during session two (12.7 vs. 5.5). In session four however, the standard deviations were more comparable

expectations, HPO groups *reduced* their procedural interaction during each of the following two sessions. At the same time, LPO groups, also unexpectedly, *increased* their procedural structuring during the last two sessions. In the final session, they generated significantly more procedural interaction than the HPO groups (one-way ANOVA - $F = 4.71$, $df = 2$, $sig. = .01$).

PPO and structuration theories explain why HPO groups might exhibit more structuring during session two: but, why less as time passes? Does PPO actually change over time? PPO has its foundation as an individual trait, and hence, probably doesn't change much over relatively short time frames, like the life of a specific project. Perhaps though, the structuring achieved by a group early in a project's life lasts throughout the project. For instance, a flurry of subtask assignment and timetable generation during initial stages might provide sufficient structure to carry the project. As our evidence suggests, the third session still requires some procedural structuring, but less than in the second session. Finally, during the last session, HPOs are satisfied that their structures are in place and working. Hence, they require no further procedural interaction.

Figure 1: Procedural Comments by Preference for Procedural Order



In contrast, while apparently desiring less procedural structuring during initial sessions, at some point LPO groups discover that some amount of procedural structuring is required after all, especially in more complex task situations. They then increase their procedural interaction during the third session and, finding themselves still deficient in procedural structure, carry out even more of it in the last session.

In other words, given a complex task, with a sufficiently large number of members, all groups probably

(5.7 vs. 8.1 for HPO and LPO respectively): Hence, the ability to draw conclusions about differences during session four but not for session two.

require some essential level of procedural structuring, regardless of PPO. HPO groups will attempt the structuring early on. If appropriate, these structures may last, permitting the group to focus on task and social activities rather than procedural ones as time passes. Conversely, LPO groups may focus on other types of group needs until discovering that, despite their inherent tendencies to the contrary, they too require procedural structuring. At that point they begin structuring, perhaps tentatively. Faced in the final session with a procedural deficit, they rise to the occasion by generating a flurry of procedural structuring, comparable in quantity to that achieved by the HPO groups in the early sessions.

Additionally, though not presented as formal hypothesis test results in this paper, HPO groups differed from LPO groups in the patterns of content-related and social interaction as well. It seems then that there may be distinct differences in the amounts and timing of communication depending on whether groups have an HPO or LPO dominance.

5.2 Perceptions

We expected that because HPO groups would do more procedural structuring, they would therefore report higher levels of perceived procedural order (Hypothesis 2). This was not the case. All groups, regardless of PPO, perceived equal levels of procedural order. Although HPO groups appeared to engage in more procedural interaction during the second session (Figure 3), recall however that the difference was not significant. Nor were there any differences in amount of procedural interaction during the third session. Since our hypothesis presumed that perceptions would correspond with amount of structuring interaction, and there were no differences (at least in session two and three), it is not surprising then that perceptions did not differ in general.

What is most interesting however is the nature of the patterns. While HPO groups generated a *decreasing* number of procedural comments in each succeeding session, nonetheless, their perceptions about procedural order persisted throughout, even tending to *increase* over time. This phenomenon will be discussed more fully in the *Perceptions vs. Reality* section below.

We expected that LPO groups would be less likely to establish procedures early on. Yet we felt that, given the complexity of the exercise, they would eventually feel the need to structure their activities, albeit perhaps too late. The result was expected to generate less satisfaction for LPO groups than for HPO ones (Hypothesis 3). Again, this was not the case. Since this prediction also presumed specific differences in procedural structuring that failed to come about, the absence of differences in satisfaction is once again understandable. HPO groups did not exhibit significantly more procedural interaction in any session

and in fact exhibited significantly less in the final session. Moreover, LPO groups engaged in procedural structuring, especially in later sessions. Hence, reported levels of satisfaction are generally consistent with actual amounts of procedural interaction.

5.3 Perceptions vs. Reality

One of the major motivating issues for this research was to better understand the *processes* that partially distributed groups experience while performing a complex task and the relationship of those processes to outcomes like perceptions. Hence we want to explore matters related to the following research issue:

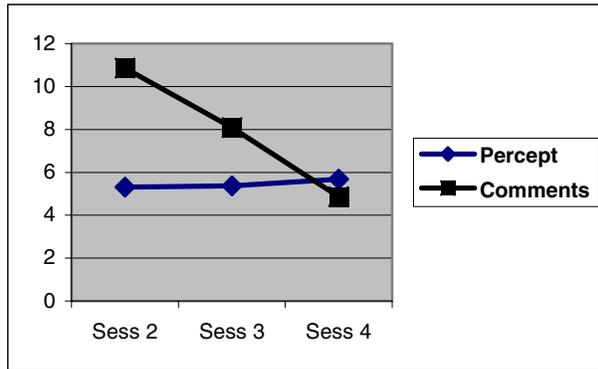
Does the amount of perceived procedural order reflect the actual quantity of procedurally structuring comments?

If we compare the perceptions of procedural ordering to actual procedural interaction, the results appear to be at odds with each other. For instance, we find all groups *perceive more* procedural order during the final session than during early sessions (Figure 4). But if we look at actual structuring interaction, we find that groups *engaged in less* procedural interaction during the fourth session than in earlier ones (Figure 2).

Graphing results from both sets of data—perceived procedural ordering vs. numbers of procedural comments, per session—for HPO groups separately shows the differences in the trends over time (Figures 8). HPO groups report increasing levels of perceived procedural structuring with each session, yet exhibiting a decreasing number of procedural comments in each subsequent session. The obvious question is: "Do perceptions reflect reality accurately?"

As pointed out earlier, one explanation is that procedural structuring is a lasting phenomenon, and once enacted, continues to provide the requisite structure. Once an agenda is agreed on for instance, groups tend to stick to it (perhaps only in very loose terms for some groups) and the structure is perceived to be present throughout. Although members may need to be reminded from time to time about that agenda, in general maintaining it probably takes less active structuring as the process evolves than initiating it, hence interaction about the agenda will decrease over time. As long as it is adhered to, the structure will be perceived as active.

Figure 2: HPO - Perceived Level of Procedural Ordering vs. Number of Procedural Comments



If we look at session four, we find that the number of procedural comments drops off relative to the prior session, yet the perceived ordering increases slightly. Procedures enacted during the prior session remain active in the final session, and perceptions reflect the continual procedural success.

To summarize our observation about perceptions vs. reality, while at first blush they appear to differ, on closer examination it appears that perceptions are indeed consistent with reality. Whether looked at by media or by PPO, initially, levels of perceived procedural order are low. Over time, however, perceived procedural order increases. Procedural structuring is initiated with a spell of procedural interaction. Over time, as the need for procedural structuring is met appropriately, levels of procedural interaction tend to decrease correspondingly. Structures tend to have persistence though, and are perceived to remain active.

5.4 Limitations and Future Research

The interpretation of preference for procedural order (PPO) in groups is a potential limitation in our analysis. PPO is by definition an individual trait. In this paper we have extended the concept to reflect a group attribute. There is precedence for assessing individual PPO in groups (e.g., [6], [12], [17]). The issue is *how* do we define the level of PPO for a group? As discussed earlier, we assigned HPO status to any group in which there were more HPO individuals than LPO ones. Group LPO status was determined where there were more LPO than HPO members. In cases of equivalence, the group was determined to be neither HPO nor LPO.

An alternative method is to obtain a group PPO score as an aggregate of the individual scores, then determine some cut-off point for HPO and LPO. We conducted the analysis using this method of status determination as well and found no differences from the initial MANOVA results. Hence, for purposes of this paper we chose to use

individual scores and assign status based on numbers of HPO and LPO members.

Of course the study used student subjects in a highly controlled setting where motivation for task performance may not parallel that in the real work world. Hence, in organizational settings where participants have great flexibility in the time spent on task and in media composition and where motivations can be much more critical, extrapolation of these results and conclusions should be made with great caution. Future studies would do well to assess procedural structuring in real organizations.

Observed power was quite low for several of the tests. This is probably largely a result of the relatively small group and cell sizes. Groups were small, consisting of four members each. Nine of the thirty groups were HPO, while eight were LPO. Moreover, the number of comments of a particular category frequently numbered fewer than five or six in a session. Future content-oriented, PPO research would probably be able to generate higher levels of observed power by using even more complex and contentious tasks and by using larger groups: both factors would likely increase the amount of interaction, hence boosting interaction cell size.

This study looked at quantity of procedural interaction as a measure of procedural structuring. Future research could extend this work by looking at specific types of procedural interactions. For instance, we had six categories of procedural interaction and used totals of all types of procedural comments as our level of analysis. Assessing specific *types* of procedural interaction by time periods would provide a finer-grained view. For example, researchers might investigate whether certain kinds of procedural interaction occur more frequently at certain stages in the process for HPO groups vs. LPO groups. GSS research would also benefit from investigation of these issues in conjunction with performance, a factor ignored in this paper.

6. Conclusions and Implications For Managers

The notion of individual characteristics and their relation to group work and performance has long been a concern for managers. Results in this study suggest several things with regard to procedural structuring in distributed work groups. First, groups must produce procedural structures to engage in work over long time frames. Moreover, whether they have an HPO or LPO dominance (or neither), groups with no history need to engage in procedural structuring, apparently to equivalent extents over the course of a project. Hence, managers should carefully consider providing groups with supporting mechanisms that facilitate procedural

structuring. For instance, some technologies offer more procedurally oriented support than others (e.g., workflow software, scheduling applications, decision support systems, etc.). Likewise, human intervention in the form of meeting facilitators can provide required procedural support when appropriately planned.

When to provide the support appears to be the critical issue. Managers can expect HPO groups to engage in more procedure setting early in the project, while groups with more LPO members may defer procedural structuring until later in the project. Hence, determining the PPO composition of the project group, then allocating the resources at times that are appropriate for their PPO may enhance the group's efficiency and productivity. For instance, management of resources may be made more effective by providing a procedurally structured DSS early for an HPO group but later for an LPO group. Moreover, perceptions about procedural structuring tend to persist. This suggests that timely support of procedural structuring can generate positive and lasting perceptions and satisfaction for the group.

While our study, like all empirical work, exhibits limitations in its generalizability, nonetheless, it provides important information about the nature of perceptions and behaviors during group work. In this sense, we view our work as a starting point for understanding the role of technology support in the critical area of procedural structuration for distributed groups.

References

- [1] Burgoon, M., Heston, J., & McCrossky, J. (1974) *Small Group Communication: A functional approach*. Holt, Reinhart, & Winston, New York.
- [2] Burke, K., Aytes, K., Chidambaram, L., and Johnson, J., (1999) "A Study of Partially Distributed Work Groups: The Impact of Media, Location, and Time on Perceptions and Performance." *Small Group Research*, Vol. 30, No. 4, pp. 453-490.
- [3] Daft, R.L. and Lengel, R.H. (1986) "Organizational Information Requirements, Media Richness, and Structural Design," *Management Science*, Vol. 32, No. 5, pp. 554-571.
- [4] Giddens, A. (1979) *Central Problems in Social Theory*. Berkeley, CA; University of California Press.
- [5] Hirokawa, R. Y. & Pace, R. (1983) "A descriptive investigation of the possible communication-based reasons for effective and ineffective group decision-making." *Communication Monographs*, (50), pp. 363-379.
- [6] Hirokawa, R.Y., Ice, R., & Cook, J. "Preference for procedural order, discussion structure, and group decision performance." *Communication Quarterly*, 1988. 36 (3), pp. 217-226.
- [7] Lea, M. (1991) "Rationalist Assumptions in Cross-media Comparisons of Computer-mediated Communication," *Behavior and Information Technology*, Vol. 10, No. 2, pp. 153-172.
- [8] Markus, M.L., (1994) "Electronic Mail as the Medium of Managerial Choice," *Organization Science*, Vol. 5, No. 4, pp. 502-527.
- [9] McGrath, J.E. (1991) "Time, Interaction and Performance (TIP): A Theory of Groups," *Small Group Research*, Vol. 22, No. 2, pp. 147-174.
- [10] Mintzberg, H. Raisinghani, D., & Theoret, A. (1976) "The structure of "unstructured" decision processes." *Administrative Science Quarterly*, 21, pp. 246-275.
- [11] Nixon, C.T and Littlepage, G.E. (1992) "Impact of meeting procedure on meeting effectiveness." *Journal of Business and Psychology*, 6 (3), Spring, pp. 361-369.
- [12] Putnam, L. (1979) "Preference for procedural order in task-oriented small groups." *Communication Monographs*, 46, pp. 193-218.
- [13] Trevino, L.K., Daft, R., and Lengel, R.H. (1990) "Understanding Managers' Media Choices: A Symbolic Interactionist Perspective," in J. Fulk and C. Steinfield (Eds.), *Organizations and Communication Technology*, Newbury Park, CA: Sage Publications, pp.71-94.
- [14] Valacich, J.S., Mennecke, B.E., Wachter, R., and Wheeler, B.C. (1994) "Extensions to Media Richness Theory: A Test of the Task-Media Fit Hypothesis," *Proceedings of the Twenty-Seventh Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Vol. IV., pp. 11-20.
- [15] Walther, J.B. (1992) "Interpersonal Effects in Computer Mediated Communication: A Relational Perspective," *Communication Research*, Vol. 19, No. 1, pp. 52-90.
- [16] Walther, J.B. (1996) "Computer-mediated Communication: Impersonal, Interpersonal and Hyperpersonal Interaction," *Communication Research*, Vol. 23, No. 1, pp. 3-43.
- [17] Wheeler, B.C., Mennecke, B., and Scudder, J. N. (1993) "Restrictive group support systems as a source of process structure for high and low procedural order for groups." *Small Group Research*, 24 (4) pp. 504-522.
- [18] Wheeler, B.C. & Valacich, J. S., (1996) "Facilitation, GSS, and training as sources of process restrictiveness and guidance for structured group decision making: An empirical assessment." *Information Systems Research*, 7 (4) pp. 429-450.