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## The Temporal Dimension of Electronic Meetings: A Study of Synchronous and Asynchronous Idea Generation

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### ABSTRACT

*Electronic meeting systems can increase the efficiency and effectiveness of group discussions, but relatively little research has investigated use of the technology in asynchronous environments. In this study, five groups of 10 students participated in synchronous legislative sessions and five groups of 10 met in asynchronous settings. Results showed that there were no differences in meeting process satisfaction, production blocking, evaluation apprehension, and total and relevant comments generated, but synchronous groups believed there was more participation and were more satisfied with the comments. Although there could be less feeling of social presence, use of asynchronous, distributed meetings might become more prevalent as groups seek to reduce travel.*

### INTRODUCTION

Some have estimated that managers spend over 60% of their working hours participating in meetings (Tobia & Becker, 1990), and the purpose of these sessions is often accomplished only 50% of the time (LaPlante, 1993). Electronic meeting systems (EMS), otherwise known as group support systems (GSS), can improve the productivity of many meetings involving large groups sharing information (Travica, 2005), and studies have shown that meeting time can be reduced up to 56% of (Grohowski et al., 1990) and overall project time by up to 71% (Martz, et al., 1992).

However, prior GSS research has been conducted mostly on synchronous, face-to-face groups, and other meeting environments have been generally overlooked (Baltes et al., 2002). For example, from 1982 to 1996, 60% of 164 studies were conducted using a face-to-face decision room environment, while less than 20% focused on geographically-dispersed, asynchronous meetings (Fjermestad & Hiltz, 1997). In addition, globalization has increased the need for meetings that can span time-zones and geographic distance (Bandow, 2001; Gibson et al., 2008). Distributed, asynchronous electronic meetings allow participants to share information and make decisions irrespective of physical and time barriers (Berge, 1997; Hung et al., 2008; Kraut, 1994), and organizations could be wasting huge amounts of money on travel and accommodations for face-to-face meetings that could be conducted asynchronously (Dowling & St. Louis, 2000).

The purpose of this study is to investigate the possible differences between synchronous and asynchronous meetings. First, we discuss prior research on non-synchronous electronic

environments and then present the results of an experiment comparing the two settings. Results show that asynchronous meetings might be able to replace more typical decision-room discussions in many situations.

### **SYNCHRONOUS AND ASYNCHRONOUS COMPARISON STUDIES**

In a study comparing traditional, face-to-face, oral with asynchronous, electronic groups (Ocker, et al., 1996), the latter reported less social pressure and greater participation equality. With less social pressure and more participation equality, asynchronous participants were able to produce more total comments and more quality comments. Further, asynchronous technologies can reduce the need for an individual to be “sociable” in order to meet and correspond in a meaningful way with other users, and this can increase productivity (Pendergast & Hayne, 1999). Asynchronous, electronic groups can also provide a higher quality of resolution (Benbunan-Fich & Hiltz, 1999) and present a more complete summary report of the meeting (Benbunan-Fich et al., 2002). However, another study (Warkentin et al., 2007) found that asynchronous groups did not outperform face-to-face teams under otherwise comparable circumstances, and face-to-face groups reported higher levels of satisfaction.

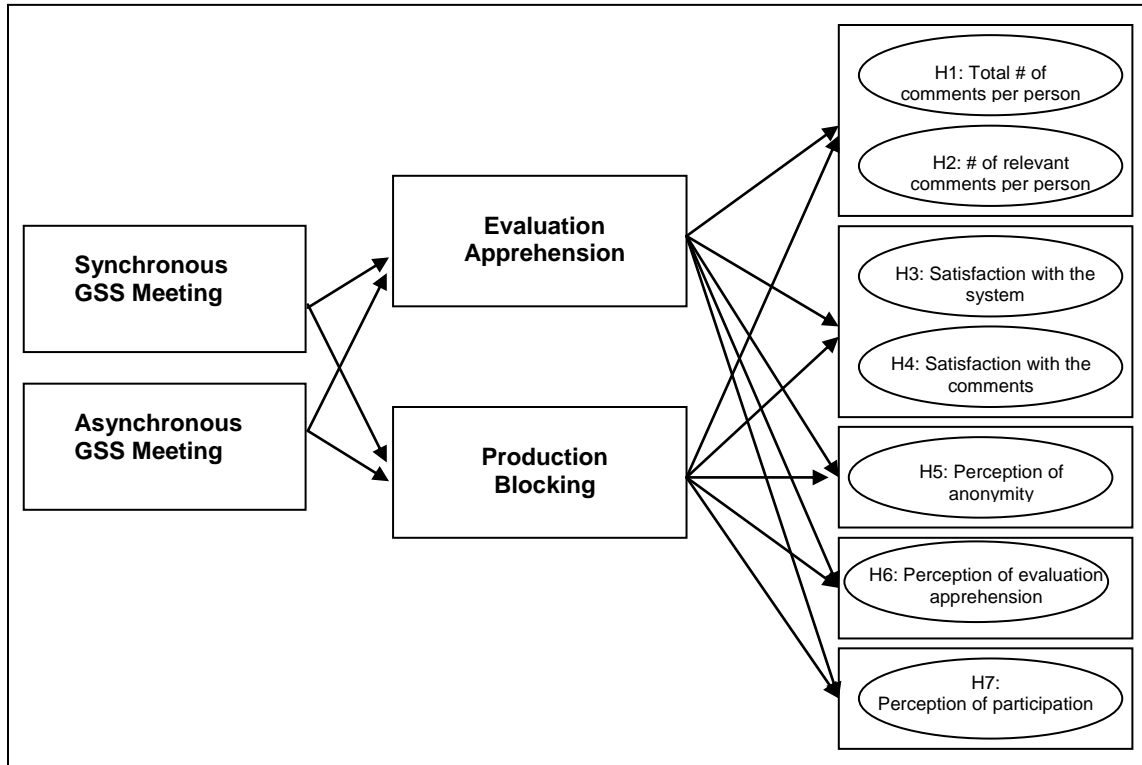
Comparisons between synchronous and asynchronous electronic meetings have also had conflicting results. One study (Shirani, et al., 1999) found that asynchronous groups performed a deeper problem analysis, but the synchronous participants generated more comments. Asynchronous groups might make decisions more slowly (Gallupe & McKeen, 1990), but in many other respects (e.g., cohesiveness, participation, and process satisfaction), no differences were found (Burke & Chidambaram, 1995; Smith & Vanecek, 1990; Watson, et al., 1988). However, it is not clear which environment provides more ideas, greater member satisfaction, or better final decisions (Lowry, 2002; Ngwenya & Keim, 2001; Ocker & Morand, 2002; Sedbrook, 2010; Tung & 1998).

### **THEORETICAL MODEL AND HYPOTHESES**

Prior research has had some conflicting results, and a wide variety of technologies were used (e.g., electronic mail, bulletin boards, and chat rooms) for the asynchronous treatment. In addition, tasks varied in complexity, and some group sizes fell below the minimum where most electronic meeting benefits arise (Adrianson & Hjelmquist, 1999; Dennis & Williams, 2008). Therefore, we prepared a test of the two temporal environments.

The theoretical model shown in Figure 1 borrows from earlier research (Dennis, et al., 1988) and includes the total number of comments, the number of relevant comments, satisfaction with the system, satisfaction with the comments, the perception of comment anonymity, the perception of evaluation apprehension, and the perception of participation as dependent variables, all of which have been used in many previous studies (Dennis & Wixom, 2001; Fjermestad & Hiltz, 2001).

Figure 1: Theoretical Model with Hypotheses.



### *Number of comments generated*

In general, more, varied ideas without restrictions are preferred in an electronic meeting (Ocker, et al., 1996), and computer-based groups tend to generate more comments than traditional, oral groups (Fan, et al., 2007). A synchronous meeting provides parallel communication, and participants might be more apt to contribute comments if they see others in the group submitting ideas. On the other hand, asynchronous group members sitting alone might want to type comments simply for something to do.

**H1: There will be no difference between synchronous and asynchronous groups in the number of raw comments (total comments) generated.**

**H2: There will be no difference between synchronous and asynchronous groups in the number of relevant comments generated.**

### *Satisfaction with the system*

Although a synchronous meeting provides more social presence (Hiltz et al., 1986), the software is exactly the same in each treatment. The only difference is that asynchronous participants do not see others' comments when they are generated.

**H3: There will be no difference between synchronous and asynchronous groups in satisfaction with the meeting technology.**

***Satisfaction with the comments generated***

Asynchronous participants have little or no social interaction, and therefore, they might be less satisfied with the meeting and subsequently, the comments. On the other hand, they might be more committed to the task without the distraction of other group members nearby, affecting the quality of the comments generated.

**H4: There will be no difference between synchronous and asynchronous groups in satisfaction with the comments generated.**

***Perception of anonymity***

Most GSS software allows group members to enter comments anonymously, but in a face-to-face meeting, some group members sitting nearby might be able to see what others are typing (Er & Ng, 1995). In addition, some group members might be known to have particular opinions or compose sentences in unique way (e.g., frequent capitalization), thereby reducing the anonymity. Separating the face-to-face participants who are relatively unknown to each other minimizes this threat, however.

**H5: There will be no difference between synchronous and asynchronous groups in their perception of comment anonymity.**

***Perception of evaluation apprehension***

A major cause of productivity loss in a traditional, oral meeting is “evaluation apprehension” that occurs when participants are hesitant to express their true opinion because of the unpopularity of the idea, the presence of higher-status individuals in the meeting, or for some other reason (Diehl & Stroebe, 1987; Gallupe, et al., 1992). Evaluation apprehension can be reduced in an electronic meeting that provides anonymous entry of comments, and as a result, participants can concentrate more on the discussion (Chidambaram, 1996) and generate more uninhibited text (Kiesler, et al., 1984; Kiesler, et al., 1985). During an electronic meeting, criticism shifts more toward the ideas generated rather than to the person who wrote the comments. Because anonymity is expected to be equal with both treatments, evaluation apprehension should likewise be the same.

**H6: There will be no difference between synchronous and asynchronous groups in their perception of evaluation apprehension.**

***3.6 Perception of participation***

Because all can participate anonymously and simultaneously in a face-to-face electronic meeting, status effects are reduced (Dubrovsky et al., 1991). With less evaluation apprehension, these group members can submit comments more freely and produce better results, while oral groups

tend to be led by one or a few dominant members who can monopolize “air time” (Dennis et al., 1997; Jain & Solomon, 2000; Thatcher & De La Cour, 2003; Tyran & Shepherd, 2001). Although synchronous group members might have an idea whether or not others are participating based upon the sounds of clicking on keyboards and the appearance of new comments on the screen, asynchronous members have no external cues, but rely on faith that others will contribute (Michinov & Primois, 2005). If asynchronous group members meet in “relay” mode in which each subsequent person builds upon comments written by earlier participants (De Vreede et al., 2000), participation can be gauged more accurately. But, actual participation could be less in a synchronous meeting if members simply read comments and do not contribute, and more in an asynchronous meeting if members have nothing else to do except type new text.

**H7: There will be no difference between synchronous and asynchronous groups in their self-perceived participation.**

## EXPERIMENTAL STUDY

### *Subjects, Task, and Treatment*

Five groups of 10 students each participated in synchronous meetings and another five groups of 10 were in the asynchronous treatment. This sample achieved a statistical power of 0.99, and thus, there was a 0.01 probability of falsely accepting a null hypothesis.

The groups were asked to provide solutions for the parking problem on campus, a creative, idea generation task that has been used in several prior studies (e.g., Jessup et al., 1990). The subjects were believed to have a high involvement with this issue, but they have no decision-making authority, possibly limiting the external validity (Gu et al., 2007). However, the students have a significant stake in the issue, and some studies suggest that students could be surrogates for business personnel in similar meeting situations (Briggs et al., 1996; Fjermestad & Hiltz, 1998).

A locally developed, Web-based electronic meeting system implementing Gallery Writing (Aiken et al., 1997; Coskun, 2005; VanGundy, 1984) was used, and thus, students could contribute and read all comments anonymously. Asynchronous participants met in “relay” mode in which each subsequent group member built upon prior comments, and synchronous subjects met in a face-to-face decision room, thus implementing asynchronous or synchronous legislative sessions (Aiken & Vanjani, 1997). All subjects were monitored by a meeting facilitator.

All meetings lasted 10 minutes, as one study found the optimum duration for generating solutions for the parking problem is about nine minutes (Wong & Aiken, 2006). Also, in a meeting under “time pressure,” participants might focus on the topic (Kelly & Karau, 1999), and fewer irrelevant comments are likely to be generated (Kelly & Loving, 2004). After each meeting, the students completed the questionnaire shown in the Appendix.

### *Comment analysis*

Two evaluators independently categorized each comment generated by meeting participants as either “relevant” or “not relevant” to the topic, and there was 82% agreement on the 254

synchronous comments (76.0% relevant) and 92% agreement on the 226 asynchronous comments (91.6% relevant). To avoid the possibility of overestimation of agreement (Straub, et al., 2004), Cohen's coefficient Kappa (Gwet, 2002; Jones, et al., 1983) was calculated with a result of 0.419 for the synchronous group and 0.428 for the asynchronous, within the range between 0.41 and 0.60 considered to be "moderate agreement" (Sim & Wright, 2005). Further, the raters showed significant agreement at  $\alpha = 0.05$ . Table 1 shows that more comments were generated by the synchronous groups, but these had fewer relevant comments. There was no significant difference in the number of total comments ( $F= 0.863$   $p= 0.355$ ) or relevant comments ( $F= 0.313$ ,  $p= 0.577$ ), so we cannot reject H1 and H2.

**Table 1: Number of Comments Generated per Person.**

Group Type	Total comments (mean / std dev)	Relevant comments (mean / std dev)
Synchronous	5.08/2.98	3.86/2.06
Asynchronous	4.52/3.05	4.14/2.88

### Questionnaire summary

Table 2 shows that all participants were satisfied with the meeting technology, satisfied with the comments generated, believed the comments were relatively anonymous, had little comment evaluation apprehension, and thought many in their groups participated. Table 3 shows that although results were favorable in both types of meetings, students in the synchronous groups were more satisfied with the system and perceived there was more participation. Thus, we reject H4 and H7, but we cannot reject H3, H5, and H6.

**Table 2: Summary of Questionnaire Variables.**

	All		Synchronous		Asynchronous	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Satisfaction with the system	6.03*	1.07	6.02*	1.11	6.04*	1.05
Satisfaction with the comments	5.71*	1.08	6.00*	0.91	5.42*	1.16
Comment anonymity	6.64*	0.97	6.73*	0.57	6.54*	1.25
Evaluation apprehension	1.63*	1.02	1.65*	0.90	1.60*	1.12
Perceived participation	6.05*	1.00	6.41*	0.70	5.70*	1.13

(\* Significantly different from neutral value of 4.00 at  $\alpha=0.05$ .)

**Table 3: Summary of the Findings.**

	ANOVA		Kruskal-Wallis	Findings
	F	Pr > F	Asymp. Sig	
H1: Number of total comments per person	0.863	.355	.338	no difference
H2: Number of relevant comments per person	0.313	.577	.917	no difference
H3: Satisfaction with the system	0.008	.928	.991	no difference
<b>H4:</b> <b>Satisfaction with the comments</b>	7.605	<b>.007</b>	<b>.014</b>	<b>synchronous better</b>
H5: Comment anonymity	0.989	.322	.798	no difference
H6: Evaluation apprehension	0.067	.797	.289	no difference
<b>H7:</b> <b>Perceived participation</b>	13.944	<b>&lt;.001</b>	<b>.001</b>	<b>synchronous better</b>

#### *Comment distribution and correlation analysis*

With the exception of group 3 within the synchronous treatment, the other nine comment distributions were determined to fit the uniform distribution based on the Kolmogov-Smirnov D statistic. Thus, the students contributed about the same number of comments without one or two dominating the discussion, confirming students' perceptions that there was high participation among group members.

A correlation analysis showed the same significant relationships (at  $\alpha = 0.05$ ) among the variables for both the synchronous and asynchronous sessions, with the exception that there was a significant correlation between anonymity and system satisfaction ( $R = -0.333$ ,  $p = 0.019$ ) only within the synchronous treatment. As expected, the total comments were correlated with the relevant comments (synchronous:  $R = 0.835$ ,  $p < 0.001$ ; asynchronous:  $R = 0.977$ ,  $p < 0.001$ ). Satisfaction with system was correlated with comment satisfaction (synchronous:  $R = 0.435$ ,  $p < 0.002$ ; asynchronous:  $R = 0.433$ ,  $p = 0.002$ ) and perceived participation (synchronous:  $R = 0.569$ ,  $p < 0.001$ ; asynchronous:  $R = 0.339$ ,  $p = 0.016$ ), and satisfaction with the comments was correlated with perceived participation (synchronous:  $R = 0.514$ ,  $p < 0.001$ ; asynchronous:  $R = 0.644$ ,  $p < 0.001$ ).



## CONCLUSION

### *Summary*

In a study of synchronous and asynchronous electronic meetings, the former were found to be significantly better in comment satisfaction and perceptions of participation, but otherwise, there were no differences between the two environments. In both treatments, satisfaction and participation were high and evaluation apprehension was low. Thus, we believe that groups can meet in asynchronous, distributed settings and enjoy the same benefits as those experienced in the more traditional face-to-face, decision room.

### *Limitations*

However, the study suffers from several limitations. First, the use of somewhat homogeneous groups of students as experimental subjects hinders generalizing the results to business situations. Second, a relatively non-controversial topic was used in the discussions: the parking problem on campus. More controversial or complex topics could affect group members' satisfaction and participation (Gu, et al., 2007). Third, subjects who self-report might not accurately reflect their attitudes (Bertrand & Mullainathan, 2001; Spector, 1994). For example, the subjects might answer a questionnaire in a way that they perceive would be more pleasing toward the survey conductor (Bovinet & McVay, 2005).

### *Future research*

One possible reason that asynchronous group members contributed a statistically equal number of comments is that they were monitored by a researcher. Future research should duplicate the experiment with no supervision of group members in this setting. Left alone, subjects might be more likely to read, surf the Web, or perform some other task. However, use of monitoring software might mitigate any potential free-riding by non-face-to-face participants (Aiken, et al., 1991).

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