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RESEARCH ON PROXIMITY CHOICES FOR DISTRIBUTED, ASYNCHRONOUS COLLABORATIVE WRITING GROUPS

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Abstract

This paper investigates whether using variations in proximity choices can improve outcomes of distributed, asynchronous collaborative writing (CW) teams that work on the Internet. This paper reports preliminary results of a field experiment on asynchronous collaborative writing using 550 participants over a month and a half. It is found that groups that met face-to-face for convergence processes had no advantages over groups that did all their work asynchronously and distributed. This supports the notion that with correct processes and tools, distributed groups can be just as effective as face-to-face groups.

Introduction

This paper investigates using variations in proximity choices¹ to improve outcomes of distributed, asynchronous collaborative writing (CW) teams that work on the Internet. The underlying research question for this research is whether asynchronous, distributed work can be a strategically advantageous form of work, compared to face-to-face (F2F) work. In other words, should all-asynchronous, distributed groups necessarily suffer outcome and process losses because they have never met F2F? However, before proceeding with the details of this research, this section emphasizes the growing importance of distributed CW as a form of tele-work.

CW is a critical form of professional communication that can be more effective than single-author writing (Gere & Abbott, 1985) and is ubiquitously performed in industry and academia (Couture & Rymer, 1989; Ede & Lunsford, 1990; Gordon, 1980). Moreover, while CW is already pivotal to many group processes, it is likely to increase in importance and complexity because of the increased use of distributed work, driven by increased globalization, competition, and Internet usage. Since CW is a significant form of group work, as distributed group work increases, distributed CW will also likely increase in usage. By 1998, over 17% of industry meetings involved remote participants (Simons, 1998), and it is likely to increase in prevalence over time (Burke & Chidambaram, 1994). Two key reasons exist why distributed work will continue to increase and thus drive an increase in CW work: (1) increased globalization and competition (Hax & Majluf, 1991; Horton, Holman, & Bess, 1992; Johansen et al., 1991) (2) increased Internet usage, because of increased globalization and increased Internet usage that is transforming organizations (Lipnack & Stamps, 2000; Mandel, 1999).

Given that CW is an important form of group work that is increasingly conducted in tele- or distributed settings, the rest of this paper investigates whether or not all-asynchronous CW groups can be just as effective as CW groups that also use F2F meetings. First, this paper explores the theoretical implications of proximity choices in asynchronous CW. The resulting hypotheses are tested using a field experiment of 550 participants using a Java-based CW tool called, Collaboratus, a Java-based CW tool further explained in (Lowry, 2002; Lowry, Albrecht, Nunamaker Jr., & Lee, 2002). The results of the field experiment with corresponding contributions, limitations, and future research opportunities are then presented.

¹How physically close a group works together or not (e.g. F2F versus distributed).

The Effect of Proximity on Asynchronous Group

A commonly held assertion in group research is that distributed groups will suffer more process and outcome losses than F2F groups, because F2F groups work more “naturally.” This assertion is generally supported by media richness and social presence theories, which predict that distributed work causes worsened media interactions and social presence in work groups (Burke & Chidambaram, 1996). Thus, some researchers have posited that adding F2F interactions to distributed groups would give such groups a strategic advantage. Existing CW research has generally supported these notions. For example, Galegher and Kraut. (Galegher & Kraut, 1994) emphasized the importance of communication in CW by stating that “open-ended problems requires interactive, expressive communication” (Galegher & Kraut, 1994) p. 112. On this basis, they used Structural Contingency Theory² to predict that CMC groups performing complex collaborative tasks would have more difficulty performing their work because of the lack of interactive communication, compared to F2F groups, because CMC is perceived to have low ability to support interactive, expressive communication (Galegher & Kraut, 1994; Zmud, Lind, & Young, 1990). They stated the importance of a rich communication media:

“Richer communications media permit communicators to modify their messages in response to cues from their partners, to amplify their messages using nonverbal and paralinguistic channels, to speak naturally and colloquially and to direct their messages to a particular individual or group” (Galegher & Kraut, 1994) p. 113

Likewise, F2F communication should provide advantages to CW groups that non-F2F communication cannot provide. Theoretical support for Galegher and Kraut’s assertions has also been given by fieldwork in CW.

Existing CW field research suggests that asynchronous CW groups that conduct their initial planning sessions and convergence process sessions as F2F sessions, should have better consensus, quality, and overall performance than groups that do all of their work asynchronously (Adkins, Reinig, Kruse, & Mittleman, 1999; Romano, Nunamaker Jr., Briggs, & Mittleman, 1999). Moreover, case research in synchronous CW found outcomes were improved if the participants first met in person (Sasse & Handley, 1996). This supports Galegher and Kraut’s (Galegher & Kraut, 1994; Kraut, Galegher J., Fish, & Chalfonte, 1992) claim that F2F work in CW planning and revising activities was critical to asynchronous group success, because these activities require the most amount of interactive communication.

However, despite the commonly held claim that work in close proximity has benefits over work conducted at a distance, proximate work still can have disadvantages. For example, natural limitations exist as to how many people can effectively participate in closely proximate settings (Kimball, 1999), which provides a limited information transfer rate (Harris, 2000) and often forces linear conversations (Kimball, 1999). Because of these limitations (especially linear conversations), F2F work can be wasteful and boring (Kimball, 1999).

The primary limitation of the aforementioned research is that it primarily focused on comparing groups conducting all their activities F2F versus groups conducting all their activities in a distributed mode. While these results likely carry over to groups conducting part of their work F2F and part distributed, this has not been clearly established by experimental CW research. Thus, the following hypothesis is proposed to further test and establish this developing theory on proximity in CW:

H1: Small, asynchronous, distributed CW groups that use Collaboratus but conduct planning and convergence in F2F sessions will have (a) higher productivity, (b) higher quality of documents, (c) more satisfaction, (d) better relationships, and (e) better communication than similar groups that do all their work in an asynchronous, distributed mode.

Figure 1 graphically summarizes hypothesis H1.

Research Methodology

This section describes a field experiment used to investigate small distributed, asynchronous CW groups using Collaboratus with different process scripts, to start to establish which proximity choices are most effective for non-facilitator-lead CW teams. This field experiment was conducted over a month and a half, involving 550 student participants who were required to participate for a substantial portion of their course grade. As such, this field experiment sacrificed control for the sake of realism / external

²See (Lawrence & Lorsch, 1967).

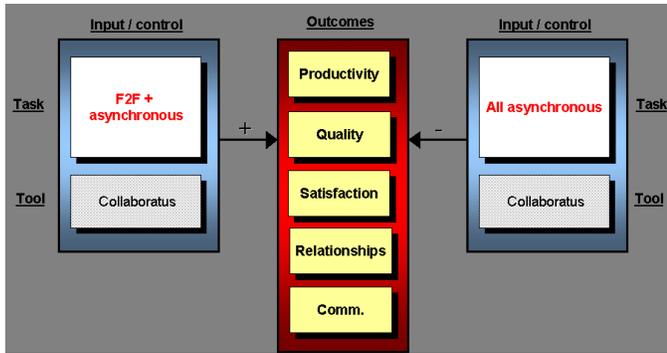


Figure 1. Summary of H3.1

validity. Approximately 550 students were enrolled in the three sections and started the project, while 479 students completed the project. Meanwhile, 47 students started the project but did not fully complete it for various reasons.

Research Design

The general research design for this experiment was a one-way ANOVA, with the “A” factor representing two conditions: (1) a group performed all of its work asynchronously (2) a group performed most of its work asynchronously (conducted all group formation, planning, and convergence processes F2F).

Research Measures

The dependent variables (DV’s) that were examined during this experiment were designed to measure the major constructs of productivity, quality, satisfaction, communication, relationships, and usability. Most of these constructs were measured by multiple DV’s to increase the richness of the results. The theoretical basis for these measures, and their underlying instruments, are further described in (Lowry, 2002).

The **productivity** measures include chat length, document length, calendar time, time for each specific CW activity, participation percentage, and completion rate. The **quality** measures include perceived discussion quality and externally judged document quality. The **satisfaction** measures include process satisfaction, outcome satisfaction, and satisfaction with group. The **relationship** measures include dominance, evaluation, agreement, positivity, and teamwork. The **communication** measures include communication appropriateness, involvement, mutuality, richness, task discussion effectiveness, and task orientation. Only one **usability** measure was used.

Research Procedures

This research was limited to small, distributed work groups. No other work modes or group sizes were tested. Furthermore, this research focused on the activities of group formation, planning, brainstorming, drafting, reviewing, and revising activities of collaborative writing. Hence, the primary Collaboratus features that were used included the following: group outliner, group interface, editing, and locking. In all treatments, subjects were given exact scripts and directions on how to proceed. All subjects conducted their communication via Nicenet’s™ asynchronous chat facility and email; all CW was conducted using Collaboratus.

Participants were given basic instructions via email for the particular activity (and corresponding level of process structure) they were supposed to be engaged in. As time productivity was a key dependent variable, no set time limits were given for each session; although, all participants were given general suggestions and guidelines on time and length in several conditions. Thus, groups were allowed to progress at their own pace.

All groups worked toward the same writing task, which was essentially to come up with several problems that exist at the UofA that negatively affect undergraduates and to come up with creative and feasible solutions. Additionally, all participants were given a general schedule and deadline as to when the six assignments for the writing experiments needed to be completed. Finally, participants completed three, questionnaires to assist data collection.

Research Analysis and Results

It was determined that most of the measures involved in the experiment were highly interdependent group data. As a result, virtually all the data was analyzed using regressions that factor out the effects of intracorrelations, as advocated by (Kashy & Kenny, 2000). Thus, all F-test results reflect these adjustments, with the exceptions of “document length” and “chat length,” which were group-level data that were not intracorrelated. Table 1 presents the hypotheses that had a significant F-statistic involving the F2F control variable.

Table 1. Significant Results for F2F Control Variable

Hypothesis	Variable	Average All asynchronous condition	Average F2F + Asynchronous condition	Adjusted F statistic
H1a	Chatlen	709.53	461.60	3.92 *
H1a	time3 (brain)	35.56	40.69	2.76 +
H1a	time4 (c. brain)	20.48	17.02	2.89 +

* = significant at both $\alpha=.05$ and $\alpha=.10$ + = significant only at $\alpha=.10$

Overall, varying the mix of proximity with the CW groups had little effect on the experiment outcomes. One difference was that the chat lengths for the all-asynchronous groups were significantly higher, which is a likely artifact of the mixed groups conducting F2F meetings: Even though the participants in F2F meetings were required to “log” their discussions in Nicenet™, as if they had conducted their discussions asynchronously, they likely more tersely summarized their discussions than the all-asynchronous groups. Thus, although significant, this finding may have no theoretical importance.

However, differences were discovered in terms of brainstorming and convergence and brainstorming. It was found that all-asynchronous groups spent less time on the brainstorming process and more time converging on the brainstorming output, than the mixed groups. However, it is difficult to determine whether this difference was to the benefit or detriment of mixed groups: For example, F2F groups may have more quickly converged because of social pressure, or because of better focus, efficiency, or buy in. Furthermore, no other significant outcomes resulted between the treatments (e.g. communication, relationships, quality, and satisfaction).

Discussion

This final section of the paper discusses overall findings, contributions, and limitations; and proposes future research in the study of proximity usage in distributed work groups.

Research Contributions

The use of a large, asynchronous field experiment was a significant contribution, in that it was the first extensive experiment involving comparisons of proximity for asynchronous, distributed CW. However, more importantly, it was found that interspersing F2F convergence with asynchronous CW produced slight benefits – not nearly as strong as the literature predicts. These differences in theory versus outcome are likely the positive result of using a realistic writing scenario where participants were required to schedule their own F2F meetings. These results call into question theoretical assertions that F2F work is innately superior to distributed work. These results support another distributed CW study that found that distributed CW groups working on time-constrained conditions were not less effective than F2F, despite the lack of media richness and diminished social presence (Burke & Chidambaram, 1996).

One likely explanation for these results is that a large portion of the students who were assigned to mixed conditions were unhappy with the fact they needed to schedule F2F meetings on their own time, as reported in post-experiment surveys. Thus, negative feelings regarding these F2F meetings may have undermined the meetings' outcomes, based on premature convergence or dissatisfaction. This unexpected finding is likely an insight gained from having conducted a field experiment as opposed to a laboratory experiment: It is one thing to conduct a F2F meeting during normally scheduled class times, or at a pre-appointed time and place for which one is paid for participation; it is quite another to schedule F2F meetings outside of class with no pre-appointed time or place. This enhanced realism uncovered unique insights because it more accurately reflected how students write together in asynchronous modes, compared to experiments involving artificially set meeting times and locations. These results have key strategic implications in private industry, because the more natural CW setting that was used more realistically reflects distributed CW. It likewise suggests that given the correct combination of tools and process that distributed CW teams in industry do not have to suffer process or outcome losses.

Research Limitations

The primary limitation of the proximity research was its narrow scope of focusing only on student groups conducting mixed work mode CW versus asynchronous work mode CW. For example, no research was conducted to compare all-F2F groups against all-asynchronous groups. Also, participants who conducted work both asynchronously and F2F did not have significant gains over all-asynchronous groups, which was likely due to the fact students in mixed groups generally did not enjoy scheduling their own time for F2F meetings. While this is an important finding because it mirrors the reality in which students live and work, this finding cannot as of yet be broadly interpreted for collaborative writers working in other domains, such as professional and government work.

Finally, another key limitation might be that the benefits of interspersing F2F work in asynchronous groups could be highly dependent on the nature of the task conducted. For example, a GDSS study found F2F groups had higher consensus with preference tasks than non-F2F groups (Raman, Tan, & Wei, 1993). In contrast, several GSS studies showed higher levels of consensus could be achieved in distributed GSS groups (compared to F2F groups) that conducted intellectual tasks, as opposed to preference or decision-making tasks (Hollingshead, McGrath, & O'Conner, 1993; Sia, Tan, & Wei, 1996; Tan, 1993; Tan, Raman, & Wei, 1994). These results clearly indicate the nature of the task, combined with work mode can result in different levels of consensus and overall results. For example, given these claims, it appears the research by Adkins, Romano, and Galegher (Adkins et al., 1999; Galegher & Kraut, 1994; Romano et al., 1999) may have focused on preference writing tasks. Clearly, it can be argued that CW tasks can involve preference tasks, intellectual tasks, and decision-making tasks depending on the nature of the writing experience.

Future Research

Future research on proximity can continue to focus on whether or not mixed, work-mode groups (F2F + asynchronous) have advantages over all-asynchronous, work-mode groups in forms of group work other than CW. In addition, more research involving these considerations can be extended to non-academic settings and various task types. It would also be insightful to conduct research with treatments that compare all-F2F groups to all-asynchronous groups. The other useful area of proximity / synchronicity research, where little work has been done, is in mix-groups: Where some members are always working F2F, while other members of the same group are always working in asynchronous, distributed and/or synchronous, distributed work modes.

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