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The effects of group membership and task experience on asynchronous computer-mediated group performance, group competencies and group member reactions

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Abstract

The effects of group membership and task experience on asynchronous computer-mediated group performance, group competencies and group member reactions

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Organizations that use computer-mediated communication (CMC) to communicate and coordinate work are ubiquitous and highly dependent on the permeation of virtual work groups throughout the organizational structure. In this era of distributed work, it is imperative to determine which factors affect the efficiency and effectiveness of asynchronous computer-mediated groupwork. Two factors are identified in the literature to potentially mediate effects on asynchronous computer-mediated groupwork: group membership and task experience. The purpose of this study is to investigate the extent to which these factors affect group performance, competencies and group members' social experiences.

A 2x2 between-subjects factorial design was used to carry out this study. Three-person groups (n=56) performed tasks corresponding to task types 2 and 4 of McGrath's (1984) circumplex: an idea generation task and a judgment task. The study ran over a period of three weeks via the CMC system FirstClass®. Four treatment conditions were constructed using FirstClass whereby group membership and task experience conditions were created by varying participants' experiences during weeks 1 and 2, prior to the performance of the criterion judgment task at week 3.

Results indicated that groups acquiring task experience as stable groups during weeks 1 and 2 performed better on the judgment task at week 3 than groups in other

treatment conditions. Analyses also confirmed that membership and task experience had a substantial effect on group competencies and member reactions. Groups with changing membership exchanged a greater amount of communication, with those groups not having acquired judgment task experience during weeks 1 and 2 producing the highest number of process-specific remarks. Participants in stable groups reported higher levels of shared knowledge and awareness of group members' ability. Members of stable groups reported higher levels of group cohesion and collective orientation while those who were in stable groups and acquiring task experience expressed the highest amount of member interdependence. Subjects in stable groups were more satisfied with the task and the process of completing it while those who also acquired task experience were more satisfied and confident in the final task solution. Results are discussed in terms of the implications of structuring asynchronous computer-mediated collaborative work environments in organizations.

For

Carlos, Hanna and Olivia Rioseco

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Chapter One: Introduction

Communication within an organization has long been recognized as a key contributing factor in reaching high levels of productivity, efficiency and employee well-being (Senge, 1990). Since the introduction of computer-mediated communication (CMC) technologies into the work environment approximately two decades ago, great expectations have attended CMC systems that allow individuals anywhere in the formal organization to gather together and focus on a specific task (Hiltz & Turoff, 1993). This is particularly true today, given that North American businesses are becoming geographically dispersed, where departments, divisions and employees are linked to one another via electronic communication networks.

Current business environments are both dynamic and turbulent, so that business needs are constantly changing in order to meet fluctuating market demand. Organizations are therefore fixated on quick and efficient delivery of product and service to market (Ahuja & Carley, 1998). For many commercial organizations, a major source of operational change is the global market. International commerce requires fast and flexible responses to growing markets of diverse populations. Many organizations respond to the pressures of this commercial climate by adopting decentralized, team-based, and distributed operational structures (DeSanctis & Jackson, 1994; Drucker, 1988) wherein work is carried out via CMC.

Organizations that use CMC to communicate and coordinate their work are ubiquitous (Ahuja & Carley, 1998) and highly dependent on the permeation of of virtual teams throughout the organizational structure. A virtual team, defined by Lipnack and Stamps (1997) is "a group of people who interact through interdependent

tasks guided by common purpose" that "works across space, time, and organizational boundaries with links strengthened by webs of communication technologies" (Lipnack & Stamps, 1997, p.7). The prevalence of computer-mediated groupwork in organizations is such that group tasks carried out via CMC are now a "fact of life" in the work place (McGrath, 1991). Consequently, organizations are faced with the constant challenge of overcoming the various types of technical and social constraints imposed on computer-mediated group process and performance. Yet, beyond our knowledge that computer-mediated groupwork is performed in, and supported by organizations, little is known about how well organizational infrastructures accommodate and facilitate computer-mediated groupwork.

As the era of distributed work is now upon us, it is imperative to determine which factors affect the efficiency and effectiveness of asynchronous computer-mediated groupwork. Two factors are identified in the literature as possible mediating factors in computer-mediated group performance, competencies and social experiences: group membership stability and task experience. A substantial body of research confirms that these factors affect the efficiency of the groupwork process, foster a supportive collaborative work community and contribute to the quality of the work produced (Cannon-Bowers, Tannenbaum, Salas & Volpe, 1995; Hollingshead, 1998a and 1998b; Littlepage, Robison, Reddington, 1997; McIntyre & Salas, 1995; Wittembaum & Stassser, 1995). Such effects, however, have not yet been empirically studied in an asynchronous computer-mediated groupwork context. That being said, the purpose of this research is twofold.

First, from a theoretical stand point, this study provides data about the effects of task experience and group membership on asynchronous computer-mediated groupwork. The following general hypotheses are tested:

- Groups with stable membership acquiring task experience as intact groups (the terms 'intact' and 'stable' are used interchangeably) will perform better on a subsequent similar group task compared to those groups who did not acquire both of these types of experience.
- Group members who acquire both task and group experience in intact groups will report higher levels of knowledge, skills and attitudinal competencies.
- Individuals who are members of groups with stable membership will report more positive attitudes toward, and satisfaction with, asynchronous computer-mediated groupwork than those participants who's groups underwent membership change.

From a more practical perspective, results from this study inform about how to overcome the constraints on process and performance of time- and space-differed work groups. Furthermore, information gained from this research speaks to the design of computer-mediated collaborative work and learning environments such that students (i.e., future workers) are better prepared for the time-differed distributed working conditions which may characterize a substantial portion of their professional work.

Chapter 2: Theoretical Background and Hypotheses

Computer-Mediated Communication

Types and characteristics

Researchers have used different terminologies such as computer conferencing, local area networks (LAN), computer mail, electronic mail (e-mail), electronic communication and groupware, to depict systems that allow people to communicate with each other via computers. For the purpose of consistency and simplicity, computer-mediated communication (CMC) is an all-inclusive term used throughout this dissertation to denote computer communication systems that allow one-to-one as well as one-to-many text-based interaction.

Computer-mediated communication refers to humans interacting with one another via computers. In the workplace, the emphasis is on text-based communication between people using computers to connect with one another in order to carry out specific job-related tasks. There are numerous incarnations of CMC systems, supporting either, or both, synchronous and asynchronous communication. Johansen (as cited in Benbunan-Fich & Hiltz, 1999) proposes a simple framework to describe the aforementioned modes of interaction according to the two dimensions upon which they are based: time and place (see Figure 1).

Figure 1. Typology of dispersion

		Time	
		Same	**Different**
Place	**Same**	*Synchronous/Proximate* Technology-enhanced classrooms; group decision support systems	*Shared physical workspace* Video taped lectures in a single location; a networked computer lab
	Different	*Synchronous/Disperse* Networked classrooms; computer conferencing	*Asynchronous/Disperse* Virtual Classroom using ALN; e-mail; computer conferencing; Web Telecourse

- *same time/same place* refers to situations where people communicating with one another are located in the same place, e.g., group decision support systems.
- *same time/different place* refers to situations where people are communicating with one another at the same time but are located in separate areas, e.g., inter-relay chat, computer conferencing.
- *different time/same place* refers to situations where people work in shifts but share a common computer terminal, electronic bulletin board or messaging system where messages are left for colleagues, e.g., a computer station, lab and authoring systems that employees use to share their work.
- *different time/different place* refers to both time- and place-differed communication where people send and receive messages at their own convenience, independent of the timing of others' activities, e.g., electronic mail, computer conferencing.

This last type of CMC, henceforth referred to as asynchronous CMC, is the mode of communication upon which this research focuses, and is therefore fully discussed in later sections of this dissertation.

Transmission and processing of computer-mediated information

Communication media vary from one another by the degree to which they allow the transmission of social and contextual cues. These types of cues include non-verbal signals (e.g., eye contact, nodding, facial expressions, gestures), paraverbal cues (e.g., voice inflection and volume), status cues (e.g., gender, age, job title, style of dress), and physical presence. A number of terms have been used to describe the extent to which various media transmit social cues, including: *formality-informality* (Morley & Stephenson, 1969), *social presence* (Short, Williams, & Christie, 1976), *cluelessness*

(Rutter & Robinson, 1981), *information richness* (Daft & Lengel, 1984; 1986) *and social context cues* (Sproull & Kiesler, 1991). These concepts all speak to the transmission and processing of information: Media that transmit more social and contextual cues are considered information rich or informal, and have greater social presence and low levels of cluelessness. The richer the communication mode (i.e., the more social and contextual cues it is able to transmit), the easier it is to accurately process the communicated information.

According to Daft and Lengel's model of media and information richness, face-to-face (FtF) conversations are the richest possible mode of communication whereas written documents and CMC are considered relatively poor (Daft & Lengel, 1984; 1986). Daft and Lengel (1984, 1986) contend that these latter modes of communication lack the contiguity and feedback mechanisms required to process information, and that difficulties in information processing are likely to lead to errors in interpretation.

Research on the effectiveness of CMC consistently shows that tasks vary in the amount of social context cues required for their effective execution. This finding is not disputed. However, the majority of CMC research consists of studies that compare CMC with FtF task performance, in which both treatment conditions are allocated the same amount of time to complete the task. Due to the simple fact that typing information is a slower activity than speaking, the effects of the medium are confounded with time pressure in the CMC conditions (Bordia et al, 1999). When time is limited, tasks requiring low levels of cooperation and interdependence (i.e., idea generating and planning) are easily carried out via CMC whereas those requiring high levels of cooperation and interdependence (i.e., decision making and conflict resolution) are more

difficult to execute (Bordia, 1997; Gallupe, Bastianutti, & Cooper, 1991; Kiesler, Zubrow, & Moses, 1985). Straus (1992) and Straus and McGrath (1994) reveal that as computer-mediated tasks become more equivocal (i.e., involve multiple interpretations), the lack of social and contextual cues negatively impacts on interaction and task outcomes. When time is not a restrictive factor, however, all types of computer-mediated tasks are performed at least as well as in FtF, including tasks involving increasing levels of equivocal and uncertain information (Adrianson & Hjelmquist, 1991; Daly, 1993; Staus & McGrath, 1994; Hollingshead, McGrath, & O'Connor, 1993; Walther & Burgoon, 1992).

Asynchronous CMC

Research efforts spanning almost two decades clearly show that asynchronous CMC is different not only from face-to-face communication, but from synchronous modes of CMC as well (McGrath, 1990, 1998; Greenberg, 1991; Hiltz, Johnson & Turoff, 1986; Hiltz & Turoff, 1993; Rice, 1984, 1990). Essentially, electronic communication that is distributed across time and space leads to different communication behaviours, patterns and structures. First, communication cycles can take a considerable amount of time to complete (Michels, 1995), and some perhaps never attain closure, due to the unstructured and unsequenced course of interactions over time (McGrath, 1990). Second, delays, circumventions, avoidance, and possibly denials of participation, cause far more anomalies in communication patterns. Third, long response-times not only impede the flow of communication but also undermine the meaning of the messages. Finally, communication between participants is affected by the tendency towards longer entries, discussions about many topics at once, as well as communication and task

coordination problems (Hiltz & Turoff, 1993; Malone & Crowston, 1990; Turoff et al, 1993).

Yet, despite these effects on communication processes, asynchronous CMC carries benefits that cannot be equaled in any other form of interaction. For example, asynchronous CMC increases the time available to read, interpret and react to messages which can result in improved reflection, critical analysis and development of new knowledge (Dehler & Hernandez-Porras, 1998; Harasim, 1990). Also, asynchronous CMC can foster more balanced and equitable participation among cohorts (Bordia, 1997; McGuire, Kiesler & Siegel, 1987; Seigel, Dubrovsky, Kiesler & McGuire, 1986). McGrath (1990, 1998) and Dubrovsky, Kiesler and Sethna (1991) found that individuals engaged in asynchronous CMC are more likely to participate without regard to status, therefore creating a far less hierarchical distribution of communication. As a result, asynchronous CMC groups are less likely to have one individual dominating the discussion (Hiltz, Johnson & Turoff, 1986) and are better able to accommodate differing points of view.

Lacking the contiguity of interaction as well as the full range of human sensory and expressive capabilities, asynchronous computer-mediated text-based interaction is often thought to be an impersonal medium devoid of social context cues and nonverbal communication. While these characteristics may have legitimate drawbacks in some contexts (i.e., negotiating and consensus-seeking tasks under strict time constraints), Boyd (1989) contends that since computers do not transmit the non-verbal cues associated with status, coercion, and so on, constraints are removed from the communication environment thus facilitating a free exchange of ideas. Similarly,

through the removal of visual channels, objective evaluation is possible because stereotypes and personal prejudices are effectively eliminated in the absence of visual cues (DeSanctis & Monge, 1998). That is to say that an individual's input is judged solely on its quality as defined by the culture of computer-mediated context. Conceivably this could lead to improved decision-making and better business solutions.

Finally, many of the aforementioned drawbacks associated with the lack of visual and contextual cues in asynchronous CMC can be overcome. As CMC becomes integrated into the workplace (or a specific work activity) and is adopted and utilized by its users, people become comfortable with this mode of communication such that they find ways to express non-verbal cues, or to compensate for the lack thereof. Research demonstrates that socio-emotional content can be communicated via asynchronous CMC. As early as 1986, when CMC was carried out via rudimentary systems relative to today's technology, Steinfield stated that: "Evidence continues to mount showing that CMC will be used for emotional interaction. People seem to work around the nonverbal cue limitations and actively provide their own text-based translations of nonverbal cues" (p.176). This finding is corroborated by recent research on computer-mediated groupwork by Hiltz and Wellman, 1997; Hollingshead, McGrath and O'Conner (1993); McGrath, Arrow, Gruenfeld, Hollingshead and O'Connor (1993); McGrath and Hollingshead (1994), and; McGrath (1998). In a recent study, Gibson (1996) reports a progression in message quality over time as a direct result of users' increased levels of comfort and familiarity with the CMC. Gibson's findings showed that communication progressed from procedural task-based participation involving a high degree of clarifying

and verifying among participants at the onset of CMC use to more critical and reflective thinking.

Asynchronous computer-mediated groupwork

The study of asynchronous computer-mediated groupwork is itself a relatively new field of inquiry, rooted in distinct yet related areas of research. To glean insight into the factors affecting asynchronous computer-mediated groupwork, the following investigation draws on the accumulated wisdom of research on synchronous and asynchronous computer-mediated communication, groupwork, and computer-mediated groupwork. There is much knowledge to be gained about computer-mediated groupwork by studying a wide variety of phenomena relevant to its function, process and effectiveness, all of which have strong theoretical links to both the groupwork and CMC literatures.

To date, much of the research on computer-mediated groupwork focuses on synchronous interaction and entails some form of comparison between computer and face-to-face groupwork treatment conditions. Although the generalizability of research findings is limited, their usefulness and transportability to asynchronous computer-mediated groupwork contexts is justified. Since the understanding of new phenomena stems from deliberate and rational extrapolations from what is already understood, the study of factors affecting asynchronous computer-mediated groupwork derives from what is known to affect face-to-face and synchronous on-line groupwork. Revealing and explaining the similarities and dissimilarities between these modes of groupwork will not only advance a greater understanding of asynchronous computer-mediated groupwork but

will also shed new light on synchronous computer-mediated and face-to-face group interaction as well.

Groupwork, irrespective of communication modality, is fundamentally a communicative process. This perspective is echoed by Hinsz, Tindale and Vollrath (1997) who suggest that work groups are essentially information processing systems whose primary function is to communicate information across group members. Based on these assumptions, research on asynchronous computer-mediated groupwork focuses on the technology which provides group members with the capacity to communicate across temporal and spatial boundaries and to increase the ease and effectiveness of their work (Galegher & Kraut, 1994). The majority of this research confirms that although high quality task work is achieved, it is no easy feat considering that the major benefit of computer-mediated groupwork is also its major shortcoming. For example, CMC systems permit group members to "meet" functionally though not in person, even when they are physically dispersed and operating at different times; yet, the very nature of computer-mediated interaction reduces the communication bandwidth, restricting the set of modalities by which group members can communicate with one another (McGrath, 1990; McGrath & Hollingshead, 1994; Galegher & Kraut, 1994). That is to say that the same characteristics of CMC that present new opportunities for groupwork can also exacerbate process losses. Group dysfunctions such as low individual commitment, absenteeism and role ambiguity (O'Hara-Devereaux & Johansen, 1994), information overload, coordination problems (Nunamaker, Dennis, Valacich, Vogel & George, 1991) and social loafing (Shepperd, 1993) are just some of the detriments to groupwork that may be exaggerated in an asynchronous computer-mediated context.

Notwithstanding these limitations and possible strains of asynchronous computer-mediated groupwork on task performance and group process, one must recognize the many advantages to carrying out groupwork via this mode. Asynchronous CMC affords group members who are unable to meet face-to-face the opportunities to carry out collaborative work. In many cases, asynchronous CMC provides participants with opportunities to engage in intellectual teamwork that otherwise would be impossible. (Hiltz & Wellman, 1997; DeSanctis & Monge, 1998; Jarvenpaa & Leidner, 1998; Dehler & Porras-Hernandez, 1998). For example, the pooling of geographically dispersed people can result in work and business solutions that could not be generated alone or without the contributions of remote team members. In terms of international commerce, culturally diverse and geographically dispersed teams working together can meet the demands of competitive global markets (Jarvanpaa & Leidner, 1998). Similarly, with regard to global virtual teams in particular, Mowshowitz (1997) and Snow, Snell, and Davison (1996) contend that groupwork carried out in time- and space-differed contexts provide the flexibility, responsiveness, lower costs, and improved resource utilization required to meet ever-changing task requirements in highly turbulent and dynamic global business environments.

It is these known benefits to organizations, as well as those which are just now burgeoning, that inspire the following research on computer-mediated groupwork. In recognition of the great promises that this mode of groupwork heralds, it is important to identify to what degree the reduction of interaction and expressiveness imposed by asynchronous CMC might affect groupwork processes, performance as well as group members' social experiences.

Factors affecting asynchronous computer-mediated groupwork

Any use of technology constantly evolves as participants appropriate features of the technology into their broader work environment (Duin and Hansen, 1996; Fulk, 1993). In the case of computer-mediated groupwork which spans both time and space, an even broader set of technological manifestations arises as group members work to understand the technology, understand each other, and construct a communicative context to support their groupwork activity (Duin & Archee, 1996). The underlying issue here is time; time for group members to familiarize themselves and gain experience with one another, the group task, the communication mode and the overall groupwork context and culture, and time to carry out the group task. Research undertaken by Bordia, DiFonzo and Chang (1999), Hesse, Wever and Altman (1988), McGrath, (1993) and Walther and Burgoon (1992), among others, stresses the importance of including time as a variable, whether manipulated or controlled, in the study of CMC groups.

There are many important issues related to the effects of time in computer-mediated groupwork. Two factors likely to play a major role in shaping and constraining group behaviour, attitudes and task performance are membership and task experience. Decades of groupwork research confirm that increased experience of a group as a group and increased experience of the group with a task both tend to routinize a group's work by lessening the degree of group member interdependence and the level of coordination and information exchange required for the execution of successful task work. With regards to asynchronous computer-mediated groupwork that extends beyond the temporal boundary of one observation, however, one must be cautious when extrapolating from previous findings on the effects of membership and task experience on groupwork, for

the majority of small group research employs groups that have no experience with each other, with the experimental task, or with the communication technology (Hollingshead & McGrath & O'Connor 1993, Hollingshead & McGrath,1995; Bordia, DiFonzo & Chang, 1999).

Although there is an extensive body of groupwork literature that speaks to various aspects of group membership (i.e., recruitment, diversity, composition, turnover, leadership) and task work (i.e., type, structure, feedback, time constraints), the effects of group membership continuity and task experience have not been systematically examined over time (McGrath, 1993). Only a small number of studies have investigated the effects of these contingencies on group performance, process and member reactions (see Littlepage, Robison, & Reddington, 1997; McGrath, 1993; Hollingshead, 1998a, 1998c), and none, to date, have explored these factors together in an asynchronous computer-mediated environment that extends beyond one data collection session.

Therefore, heeding Huber's suggestion that much of the theory of small group research must be re-evaluated in the context of new technologies (Huber, 1990), the following study examines the effects of membership continuity and task experience on asynchronous computer-mediated groupwork. The group membership factor represents the two extreme conditions under which groups may perform: Stable (unchanging) group membership and changing group membership. The task experience factor is both qualified and quantified by whether or not groups engage in task practice prior to the assessment of group performance. The concept of "practice" implied here is the same as that proposed by Cannon-Bowers et al. (1998) and refers to the rehearsal of a task so as to

achieve some level of proficiency in performing that task. The assumption is explicit: Practice of a task will improve performance of that task.

Effects of membership continuity on groupwork

As a matter of convenience and experimental control, the majority of the research on groupwork and computer-supported groupwork is carried out in laboratories, within the temporal boundary of a single meeting, and using ad hoc task groups (Bordia, 1997; Bordia, DiFonzo & Chang, 1999; Finholt, Sproull & Kiesler, 1990; Hollingshead & McGrath, 1995; Littlepage, Robison, & Reddington, 1997; McGrath & Hollingshead, 1994; McIntyre & Salas, 1995; Wittenbaum & Stasser, 1995). Yet groups, as they form and occur in a real work context, may be considered as continuing, intact social systems engaged in a series of tasks, any one of which is likely to extend beyond a single meeting (McGrath, 1990, 1991; McGrath & Hollingshead, 1994; Arrow & McGrath, 1993). Research on the degree to which groups with stable membership evolve over time during training (McIntyre & Salas, 1995; McIntyre, Morgan, Salas & Glickman, 1988) suggests that groups not only change but develop groupwork competencies which facilitate effective task performance.

With respect to a group acquiring experience as a group, McGrath (1990, 1991) and McGrath, Arrow, Gruenfeld, Hollingshead, and O'Connor (1993) assert that as a group gains experience as a group over time, it is able to routinize its division of labour, resources, and communication such that groupwork becomes more efficient. Membership continuity has been shown to reduce the within-group variance in various features of group process, task performance, and member satisfaction (McGrath, Arrow, Gruenfeld, Hollingshead, and O'Connor, 1993) which consequently leads to both the

facilitation and reduction of the level of coordination and information exchange that is required to carry out a group task successfully. Extracting from research carried out by McIntyre, Morgan Salas, and Glickman (1988) and Oser, McCallum, Salas, and Morgan (as cited in McIntyre & Salas, 1995), it appears that the degree to which a group changes or develops is determined in part by the degree to which group members have worked together as an intact group. Note that this notion of group change relates to the concepts of group experience and development, and is not synonymous with task experience. Bearing this in mind, McIntyre and Salas (1995) argue that group development is a phenomenon manifested in groups that work together as intact groups over an extended period of time.

A number of researchers have studied the "life cycle" (McGrath, 1990) of a group in the context of group development stages and have produced models depicting the phases through which groups proceed in order to attain a functional state of effective collaborative work. All of these models emphasize the need for group members to learn to work together and to realize that cooperation, communication and information sharing are vital to group success (Bate and Travell, 1994). Similarly, all models define a similar progression through which groups proceed, starting from a stage where group members are assessing each other's capabilities and getting used to sharing information and cooperating, to the stage where they are involved in truly collaborative groupwork. For example, Tuckman's (1965) model of group development describing four stages paraphrased as: "forming, storming, norming and performing" resembles Bate and Travell's four stages of group progression defined as: "cautious affiliation, competitiveness, harmonious cohesiveness and collaborative teamwork." Likewise,

McIntyre, Morgan, Salas and Glickman (1988) describe a six phase process in which groups change over time during training, starting from an initial stage of exploration and clarification and proceeding to the final stage of effective groupwork.

Despite the number of contextual factors, such as situational and organizational contingencies, that bear impact on various aspects of group development (Bate & Travell, 1994; Cannon-Bowers, Tannenbaum, Salas & Volpe's, 1995; Dyer, 1995), membership remains one of the greatest and most pervasive impetuses for group evolution. This is due to the fact that membership is central to the identity of a small group (Arrow & McGrath, 1993) particularly when groupwork is carried out over computer-mediated conferencing and is extended over prolonged period of time. When a group undergoes membership change—whether the change is brought on by arrivals, departures, absenteeism, or erratic member participation—the group's task work and performance are affected in a variety of ways (Arrow & McGrath, 1993). For example, with regard to a group's functioning, membership change affects member interaction, coordination and synergy. McGrath's (1991) analysis of the impact of membership continuity on group performance attests to the likeliness that membership change leads to alterations in the distribution and pattern of group communication. Similarly, group member reactions may shift in terms of interpersonal factors (Straus, 1992; Straus & McGrath, 1994) such as group cohesion, collective orientation, and member satisfaction. Group transformation, therefore, is not only induced by, but also shaped by, group membership. More precisely, group development is facilitated by both the stability and integrity of a group's membership. While this postulate may be simplistic, it has critical implications for group functioning and performance.

McGrath (1984) provides strong evidence that intact group membership leads to group continuity and increased performance while membership change leads to inconstancy and decreased team performance. Similarly, earlier work by Hackman and Morris (1975) and Steiner (1972) in the area of group process and productivity maintains that many ad hoc task groups are much less productive than the competencies of their individual members would suggest. For example, Diehl and Stoebe (1987) measured the quality and quantity of ideas generated in a brainstorming task and found that ad hoc groups produced fewer ideas, even fewer good ideas, than the individual members of these groups produce working alone. Similarly, Rohrbaugh (1979) found lower levels of group performance on problem-solving tasks: Ad hoc groups performed better than their average member, but not at the level of their most competent member. This suggests that groups that are formed on an ad hoc basis for the purpose of carrying out a single task do not benefit from the experience of working together, sharing information, building collective knowledge, and creating shared memory.

In contrast to the preceding findings, results drawn from Arrow and McGrath's (1993) longitudinal study investigating the effects of membership change and continuity on small group structure, process, and performance revealed that groups that underwent membership change performed well on an essay-writing task because they were more task-focused and spent less time socializing and dealing with group relationships and politics. A number of studies corroborate these findings, including research carried out by Finholt et al., (1990). Data generated by the Arrow and McGrath (1993) study also revealed that contrary to theoretically-based assumptions (see McGrath, 1991; Moreland & Levine, 1988), both CMC and face-to-face groups that experienced membership

change reported spending more time on task and less time dealing with conflict than did groups with stable membership. These results strongly suggest that regardless of communication mode, some degree of membership change may be associated with reduced conflict, greater task focus, and higher group cohesiveness on cognitive tasks that require high levels of creativity, such as essay-writing tasks. However, a factor that may have influenced the way groups with changing membership performed during this study, yet which was not addressed in Arrow and McGrath's analysis of performance results, is task experience.

Effects of task experience on groupwork

Task experience is recognized as an important contribution to both procedural and declarative knowledge (Goodman & Shah, 1992; Schmidt, Hunter, & Outerbridge, 1986). A large body of literature on training effectiveness emphasizes that experience with similar tasks can increase individual performance (Burke & Day, 1986; Guzzo, Jette, & Katzell, 1985; Hellervik, Hazucha, & Schneider, 1992). At the group level, Neale and Northcraft (1986) found that previous task experience led to higher performance on a negotiation task as did Littlepage, Robison, and Reddington (1997) on problem-solving tasks. In concurrence with these studies, improvements in performance are believed to result from task experience when procedural and/or declarative knowledge is transferred from the previous task to the current task (Goldstein, 1993).

McGrath, Arrow, Gruenfeld, Hollingshead, and O'Connor (1993) assert that as a group's experience with a given task-type increases, that task becomes easier to perform in the sense that procedures for doing it can become more routinized. According to McGrath and colleagues (1993), routinization reduces the complexity of member

interdependence and thereby reduces the degree of coordination required and the richness of information that must be exchanged. Among other things, increased task experience makes CMC technologies more effective than they would otherwise be for groupwork, particularly in distributed working contexts.

Related to the issue of group membership, Goodman and his colleagues have shown that familiarity with both the task and group members is related to the level of group performance of coal mining crews (Goodman & Leyden, 1991; Goodman & Shah, 1992). Cannon-Bowers, Tannenbaum, Salas, and Volpe (1995) on the other hand argue that higher levels of group performance can be achieved by groups with high turnover if group members acquire and develop task-specific competencies (i.e., knowledge, skills, attitudes) as a result of task experience. In task-contingent contexts (i.e., situations where group members perform a specific group task but do not work with a consistent set of teammates), group members should possess group competencies that are specific to the task but not dependent on particular teammates. Examples of task-contingent groups include air crews, medical teams, and others for which the task remains constant but group membership does not (Cannon-Bowers et al., 1995). Hence, according to Cannon-Bowers and colleagues (1995) in situations where task experience is a mediating factor of successful group performance, it is presumably more valuable than group membership.

In contrast to the preceding findings, results drawn from Moreland and Wingert (1995) suggest that group task experience as opposed to task experience is the key to improved group performance. In their study of the effects of various training methods on a group radio assembly task, task experience was insufficient for groups in a member re-assignment condition to improve group performance, and these results were attributed to

the weakness of shared memory systems in ad hoc groups. Similarly, Hollingshead's investigation into task practice effects on group performance of rule induction problems revealed that groups undergoing task-relevant training as a group prior to completing a group rule induction task performed better on the group task than those groups whose members were trained on-task individually and subsequently assigned to groups to perform the group task (Hollingshead, 1998a). Taken together, these studies suggest that group performance is facilitated by task practice as groups and not by practice as individuals.

Drawing from this discussion concerning the role of task experience on groupwork, and the somewhat contradictory perspectives that permeate the groupwork literature on this issue, a clearer understanding of the effects of task experience on computer-mediated group performance, interaction and member reactions might be attained if they are examined in relation to: a) the type of task being performed; b) membership continuity; and, c) the degree of interdependency that exists between task type, membership continuity and task experience.

Effects of group and task experience on computer-mediated groupwork

The task

The majority of researchers (e.g., Goodman, 1986; Hackman, 1968; Hackman & Morris, 1975; McGrath, 1984; Steiner, 1972; Straus, 1999) contend that small-group performance cannot be fully understood without taking into account the nature of the tasks being performed (Straus & McGrath, 1994). Therefore, the following section provides a brief description of the tasks subjects performed as well as the rationale for their inclusion in this study.

Set within an asynchronous CMC context, the current study investigates the effects of group and task practice on the performance of a group judgment task involving aesthetic or evaluative judgments for which there is no correct answer. Subjects randomly assigned to the unrelated task practice condition performed group idea generating tasks while subjects assigned to the related task practice condition carried out similar group judgment tasks. At the end of a two-week practice period, all subjects completed the final group judgment task. (See Appendix C for full descriptions of tasks used in the study.)

According to McGrath's (1984) and Wittenbaum's and Stasser's (1995) task-classification schema, the successful group performance of judgment tasks requires a high level of interdependence, therefore information-rich communication channels. Yet, because this study entails asynchronous computer-mediated groupwork which doesn't impose strict time constraints on task completion (relative to the temporal conditions of the majority of research on FtF and computer-mediated groupwork), other mediating factors are expected to affect group performance. More precisely, it is hypothesized that task experience and group membership factors (discussed below) will affect the carrying out, and completion of, the final judgment task.

Group performance

Group members who acquire experience with each other and with a particular task benefit from knowledge, skill and attitude competencies (discussed in detail below) that are specific to both the task and the team (Cannon-Bowers, Tannenbaum, Salas, & Volpe 1995; Salas & Cannon-Bowers, 1997). As both individual- and group-level competencies develop, group processes are facilitated thereby resulting in better group

performance and measured outcomes. These competencies become increasingly consequential as the requirements for member interdependence increases. Recent research in the areas of team training (Cannon-Bowers, et al., 1995; Cannon-Bowers & Salas 1997; Cannon-Bowers, Salas, Blickensderfer & Bowers, 1998), group practice (Hollingshead, 1998a; Hollingshead, 1998b; Salas & Cannon-Bowers, 1997; Littlepage et al., 1997; Moreland & Wingert, 1995), shared cognition (Hollingshead, 1998a, 1998b, 1998c; Moreland, Argote, & Krishnan, 1996; Liang, Moreland, & Argote, 1995), and shared mental models (Kraiger & Wenzel, 1997) consistently shows that groups acquiring task-related experience as intact groups perform better than those whose members do not acquire this type of experience. The implication for the present research is that in order to effectively carry out a computer-mediated task requiring a high level of interdependence (i.e., a judgment task), groups acquiring task experience as intact groups will perform better. Taking the aforementioned into consideration, the following hypothesis regarding group performance is tested.

Hypothesis 1: Groups acquiring judgment task experience as intact groups will perform better on the final judgment problem than groups in any other treatment condition.

Knowledge competencies

Knowledge competencies encompass the declarative, procedural and explanatory information held by individual members and the group required for effective task execution (Rouse, Cannon-Bowers, and Salas, 1992). In a detailed analysis of group competencies, Cannon-Bowers et al. (1995) list a number of knowledge requirements that form the basis of group functioning in a variety of groupwork contexts. According to

them, requisite group knowledge lays the foundation for the development of essential groupwork skills. Among the different knowledge forms listed, shared knowledge structures and awareness of fellow team members' knowledge and ability are highly relevant to groups acquiring task experience as intact groups. Therefore, these two knowledge competencies are discussed in detail below.

Shared knowledge. Embedded in the notion of group development is the compatibility of group members' knowledge structures about the group, the task, and individual group members. Research on group and member knowledge structures is based on different albeit related concepts (i.e., mental models, schema, transactive memory, shared cognition, distributive cognition) and is undertaken from a variety of theoretical perspectives. Taken collectively, however, it yields a comprehensive picture of how the acquisition of group knowledge through group and task experience effects group process and performance. Notwithstanding the pertinence that all of these perspectives of cognition bear on one's understanding of group knowledge, this discussion of shared knowledge is limited to the concepts of mental models and schema, since they most directly relate to the present research.

In research examining the role of mental models in group decision making tasks, Rouse, Cannon-Bowers and Salas (1992) and Cannon-Bowers, Salas and Converse (1993) report that group performance is improved by the availability of mental models (i.e., the mechanisms for forming expectations and explanations). Findings further reveal that groups generating better predictions and expectations about group and member roles, task demands and execution strategies are those in which members possess accurate mental models (or knowledge structures) and share these with their fellow group

members. These results lead Salas and Cannon-Bowers (1997) to theorize that shared knowledge structures are prerequisites to effective group interaction and performance.

Rentsch, Heffner and Duffy (1994) and Rentsch and Hall (1994) treat group member's knowledge structures as schema. Building on the definition of a schema as an individual's "knowledge structure developed from past experience used to organize new information and to facilitate understanding" (Rentsch, Heffner & Duffy, 1994, p.452), Rentsch and Hall (1994) are able to link schema similarity among group members to group effectiveness by assessing the quality of group processes and performance. Schema similarity refers to group members' schemas containing similar high quality functional group-related information (Rentsch & Hall, 1994). Essentially, Rentsch and Hall (1994) contend that members of effective groups have similar schema and that schema similarity among group members is predicted to play a significant role in group effectiveness as it facilitates group process and task performance. Since a schema is individual (i.e. belonging to one person) and not shared, it is therefore inferred that schema compatibility increases as a group spends more time together as a group, acquiring experience with a task.

Based on this accumulation of findings, the following hypothesis regarding shared knowledge is tested.

Hypothesis 2: Upon completion of the final task, individuals acquiring experience with judgment tasks in intact groups will report higher levels of shared knowledge and mutual understanding than those in any of the other treatment conditions.

Awareness of other group members' ability. In a study comparing the effectiveness of individual and group training on subsequent group performance of a

complex radio-assembly task, Liang et al. (1995) affirm that groups trained together make fewer assembly errors and have better recall about task procedures than groups whose members are trained individually. Results also show that members who are trained together as a group are more likely to specialize in recalling different aspects of assembling the radio, are more aware of one another's specialized knowledge, and express higher levels of trust for one another's knowledge about the radio.

These findings are corroborated by Moreland and Wingert's (1995) analysis of the effects of four different training programs (individual task instruction; group task instruction; team building without task instruction; and, group re-assignment) on subsequent group performance of a similar radio-assembly task. Moreland and Wingert's work reveals that groups receiving group task instruction perform better on measures of assembly errors and procedural recall than groups whose members undergo other types of training. Consonant with Liang et al.'s (1995) study, these data suggest that when group members recognize members' knowledge or expertise, they perform better as a group. Similar assertions are made by Libby, Trotman and Zimmer (1987), Littlepage and Silbiger (1992), Littlepage, Robison and Reddington (1997) and Stasser, Stewart and Wittembaum (1995).

Further investigating the effects of shared knowledge on group performance, Littlepage et al.'s (1997) and Hollingshead (1998b) investigate whether group performance of cognitive tasks is improved as a result of group members spending more time working (practicing) on similar tasks as a group. Results confirm that group experience leads to increased group performance of intellective tasks and complex rule induction problems, respectively, by facilitating the recognition and utilization of

member knowledge and expertise. These findings are consistent with Liang et al. (1995) and Moreland and Wingert's (1995) notion of transactive memory and Larson and Christensen's (1993) concept of meta-knowledge, all of which advance the idea that group members develop an understanding of the knowledge that is possessed by other group members, and that this understanding improves group performance.

Hence, Hypothesis 3: With regard to the final judgment task, individuals acquiring group judgment task experience will express higher levels of shared situated awareness of fellow group members' abilities.

Skill competencies

Group process and interaction, consisting of communication and coordination skill dimensions, are required behaviours for effective task execution (Cannon-Bowers et al., 1995). It is reasonable to assume that these skill competencies are essential in a computer-mediated groupwork context, although perhaps difficult to implement and sustain to the degree required for the completion of a judgment task.

Provided that the group membership, the task and the context remain stable, the increase in experience that occurs over time allows the group to progressively re-adapt the group-task-context fit to take advantage of the increased predictability, reduced ambiguity, and reduced coordination and information requirements (Cannon-Bowers, et al. 1995; McGrath & Hollingshead, 1994; Hollingshead, McGrath & O'Connor, 1993; McGrath, Arrow, Gruenfeld, Hollingshead & O'Connor, 1993). The accumulation of experience of a group on a given computer-mediated task leads to a routinization of performance and thereby a reduction of the levels of equivocality and of coordination and information requirements needed to carry out the task (McGrath, Arrow, Gruenfeld,

Hollingshead & O'Connor, 1993). As group norms of communication and task performance become established over time, group members require lesser amounts of time, interaction, and coordination to complete the task effectively.

These ideas suggest the following predictions regarding computer-mediated group interaction and process.

Group interaction.

Hypothesis 4: Regarding the amount of communication exchanged on the final judgment task, groups whose members have no prior experience with each other or with the task will generate more messages.

Hypothesis 5: Regarding the type of communication generated on the final judgment task, groups whose members have no prior experience with each other or with the task will produce more remarks pertaining to group process. Individuals in groups with stable membership will generate more off-task remarks.

Hypothesis 6: Regarding the effectiveness of computer-mediated communication for carrying out the final judgment task, individuals acquiring task-related experience with the same group members will report higher ratings of media effectiveness than subjects in any other treatment condition.

Group process.

Hypothesis 7: Regarding time on task, individuals who did not acquire group or task-related experience will spend more time on the final judgment task.

Hypothesis 8: Regarding group member participation, individuals who did not acquire group or task-related experience will perceive that compared to fellow group members, they participated more in the on line discussion of the final task.

Hypothesis 9: Regarding group task coordination, individuals who did not acquire group or task-related experience will report that the criterion task required more coordination between group members.

Attitudinal competencies

Attitudinal or affective factors correspond to "the appropriate attitudes on the part of team members (about themselves and the team) that foster effective team performance" (Cannon-Bowers, et al., 1995, p. 337). The term *attitude* used throughout this study refers to one's internal state or disposition which influences decisions to behave in a particular manner (Dick & Carey, 1990). Although attitudes are more commonly researched in terms of individual performance and instructional objectives (Gagne, 1995; Dick & Carey, 1990; Noe, 1986; Tannenbaum & Yukl, 1992), their effect on group functioning and performance has been affirmed (see Hemlreich, Foushee, Benson & Russini, 1986; Gregorich, Helmreich & Wilhelm, 1990). The remainder of this section focuses on group cohesion, collective orientation, and group member interdependence, three attitudinal factors that influence group process and performance.

Group cohesion. Cohesiveness is a construct which over the last fifty years has been defined and operationalized in a variety of ways (Dion & Evans, 1992; Hackman & Morris, 1978; Keyton, 1992; Langfred, 1998; Mudrack, 1989; Shaw, 1981). Central to most definitions of group cohesion is the notion of commitment of group members to each other and to the work performed by the group (Wech, Mossholder, Steel, & Bennett, 1998). The definition used for this research draws from Langfred's notion of group cohesion as "the extent to which group members feel a part of the group and their desire to remain in the group" (Langfred, 1998, p.127).

Group cohesion has long been identified as a determinant factor of groupwork performance (Seashore, 1954) and group effectiveness (McIntyre & Salas, 1995). Of relevance to computer-mediated group task work, recent research carried out by Mullen and Copper (1994) and Klein and Mulvey (1995) provide evidence that members of cohesive groups are committed to more difficult task goals, which leads to higher performance. With regard to group membership continuity, empirical work by Kramer and Brewer (1984) maintains that group members who share a previous relationship or association contribute more to the collective group pool than those who arrive to the group as strangers. These results are replicated and extended in a recent study by Thompson, Kray and Lind (1998) which affirms that groups consisting of people who know one another are more cohesive than those in which members are strangers, and that group cohesion reduces the apprehension and anxiety on the one hand, and increases cooperation, trust and commitment, on the other. Based on these findings, the following hypothesis regarding group cohesion is tested.

Hypothesis 10: Individuals who are members of groups with changing membership will express lower levels of group cohesion than those who were part of groups with stable membership. That is to say that regardless of whether or not groups acquired task-related experience, groups that remained together as intact groups throughout the study will report higher levels of group cohesion on the final judgment task.

Collective orientation. Closely related to the concept of group cohesion, collective orientation is a group member's belief that the group's goals take precedence over those of it's individual members and that a collective approach to performing a

group task is superior to an individual one (Cannon-Bowers, Tannenbaum, Salas & Volpe, 1995). It is a concept that is referred to as a member's attraction to the team as a means of task accomplishment (Driskell & Salas, 1992) and social identity (Moreland, Argote & Krishnan, 1996; Thompson, Kray & Lind, 1998), where participants of groupwork perceive themselves as group members rather than individuals.

Evidence of a relationship between collective orientation and cooperative behaviour in groups is provided by several researchers (see Davis, 1969; Deutsch, 1960; Driskell & Salas, 1992; Meeker, 1983; Rubin & Brown, 1975). Recent research on group decision making by Thompson, Kray and Lind (1998) found that groups whose members had worked together previously possess a stronger shared social identity and are more likely to cooperate. Similarly, in a study comparing the effectiveness of individual and group training on subsequent group performance, Liang, Moreland and Argote (1995) reveal that higher social identity scores as well as better group performance scores were earned by groups whose members were trained on-task together as a group prior to the performance of a complex radio-assembly group task. Taken together, these results prompt the testing of the following hypothesis.

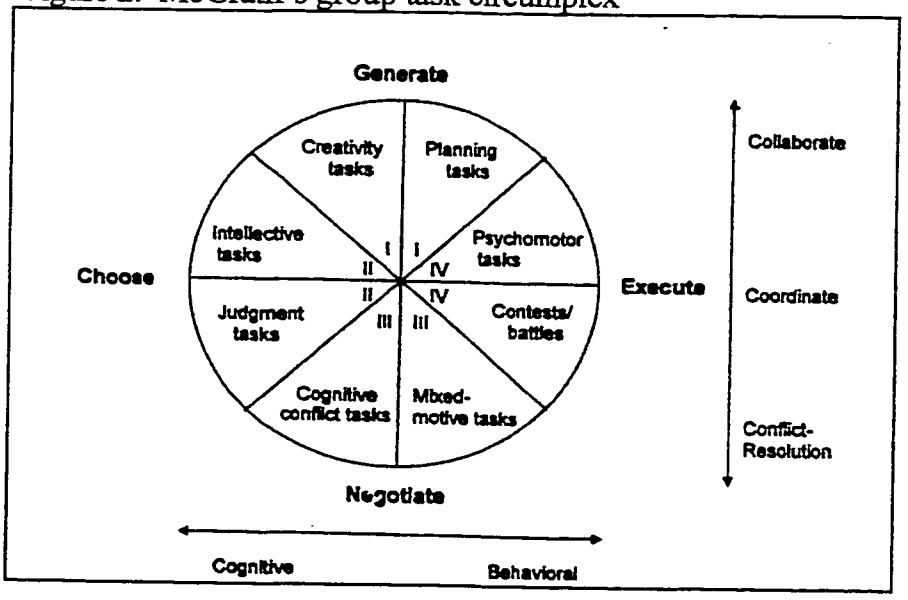
Hypothesis 11: On items measuring collective orientation, evaluations of individuals acquiring task experience as well as experience with fellow group members will show higher levels of identification with their group on the final judgment task than members of groups in other treatment conditions.

Group member interdependence. Group member interdependence is the degree to which each group member recognizes that his or her success depends on the success of others (McIntyre & Salas, 1995); that successful groupwork requires every group

member's input. In order for a group to adopt a collective attitude of interdependence, participants must appreciate that the value of each member's contributions to the group process and product depends, in part, on the contributions of other members (Straus, 1999). Once group members acknowledge the inter-relatedness of the sub-tasks comprising the overall groupwork, group member interdependence is seen as an essential characteristic of team performance (McIntyre & Salas, 1995).

Drawing from McGrath's 1984 group task circumplex (see Figure 2), Argote and McGrath (1993) treat the concept of group member interdependence in terms of the inherent level of cooperation or conflict in a group task. According to this task-classification scheme, idea generating tasks require minimal group member interdependence compared to judgment tasks which require considerable interdependence. Attentive to the nature of the task carried out, research on the effects of team training (Cannon-Bowers, et al, 1995; Salas & Cannon-Bowers, 1997; Cannon-Bowers, Salas, Blickensderfer & Bowers, 1998) and team practice (Hollinshead, 1998b)

Figure 2. McGrath's group task circumplex



suggest that for a variety of tasks, groups acquiring task experience as intact groups develop actual and attitudinal interdependence, such that information exchange, cooperation and conflict resolution are facilitated.

Based on these accumulated findings, the following hypothesis on group member interdependence is tested.

Hypothesis 12: Upon completion of the final task, individuals acquiring both group and task experience will express greater appreciation for fellow group members' perspectives.

Group members' social experiences

As noted by scores of researchers on groupwork (Cannon-Bowers et al., 1995; Guzzo & Salas, 1995; Driskell & Salas, 1992; Guzzo, 1995) and computer-mediated collaborative work (Galegher & Kraut, 1994; Hollingshead, 1998a; Straus & McGrath, 1994; Straus, 1992), group members' affective experiences are strong determinants of performance quality and process effectiveness. Similarly, group members' social experiences affect the development of group competencies.

Satisfaction with process. In their review of the empirical computer-supported groupwork literature, Pinsonneault and Kraemer (1989) conclude that compared to FtF groups, CMC groups report lower levels of satisfaction with overall task process. Recent research carried out by Benbunan-Fich and Hiltz (1999), Galegher and Kraut (1994), Straus and McGrath (1994), Warkentin, Sayeed and Hightower (1997), and Wilson, Morrison and Napier (1997), among others, affirms that groups carrying out collaborative work via CMC systems tend to be less satisfied with group process than their face-to-face counterparts. Findings indicate that when group interaction is restricted to CMC, process

satisfaction is affected by participation problems: absent members (Smith & Vanecek, 1988), communication lags (Dufner, Hiltz & Turoff, 1993), low degree of cooperation (Pinsonneault & Kraemer, 1989), and delayed feedback (Rice, 1984). In short, computer-mediated groups must work harder to accomplish the same results as face-to-face groups (Galegher & Kraut, 1994).

Suppose, however, group members are given ample time to familiarize themselves and acquire experience with the communication technology, fellow group members, the task, and the groupwork context; the previous findings about satisfaction may not entirely hold true. There is evidence that even minimal experience with group members and task work alters group process and performance (Burke & Chidambaram, 1999; Hollingshead, 1998a, 1998b; Littlepage et al., 1997; McGrath, Arrow, Gruenfeld, Hollingshead & O'Connor, 1993; Liang et al., 1995; Moreland, Argote, & Krishnan, 1996). If these changes to group process and performance are of a facilitating nature, then it is reasonable to assume that member satisfaction regarding group process would also be positively affected by membership and task experience. Based on this reasoning, the following hypothesis about group member satisfaction with the computer-mediated group process is tested.

Hypothesis 13: Regarding the final judgment task, individuals working in groups that acquired judgment task experience as intact groups will express higher levels of satisfaction with group process.

Satisfaction with task and task solution. If group members are satisfied with the computer-mediated group process of carrying out a group judgment task, it is reasonable

to expect that group member satisfaction with the task and task solution will parallel this result.

Hypothesis 14: Individuals participating in groups that acquired judgment task experience as intact groups will express higher levels of satisfaction with the final judgment task.

Hypothesis 15: With respect to the final judgment task, individuals working in groups that acquired judgment task experience as intact groups will express higher levels of satisfaction with the task solution.

Confidence in group solution. If, group members are satisfied with the group task solution, it is reasonable to expect that confidence in the group solution will parallel this result.

Hypothesis 16: Individuals acquiring judgment task experience as members of groups with stable membership will express higher levels of confidence that their group solution of the final judgment task is correct.

Chapter 3: Method

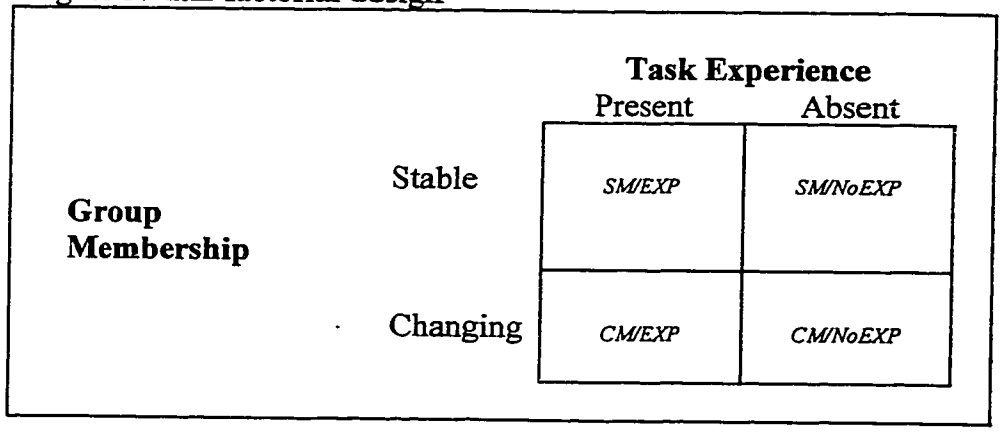
Subjects

The participants of this study were 168 undergraduate students enrolled in Contemporary Business Thinking at Concordia University. The sample was drawn from five course sections, of which 87.5% were first year students, 10.7% were second year, and 1.8 % were third year students. Computer-mediated groupwork was a course requirement worth 5% of the final grade. Participation in this study was voluntary and participants were assured that all data were confidential.

Experimental Design

A 2 (group membership) x 2 (task experience) between-subjects factorial design was used to carry out this study (see Figure 3).

Figure 3. 2x2 factorial design

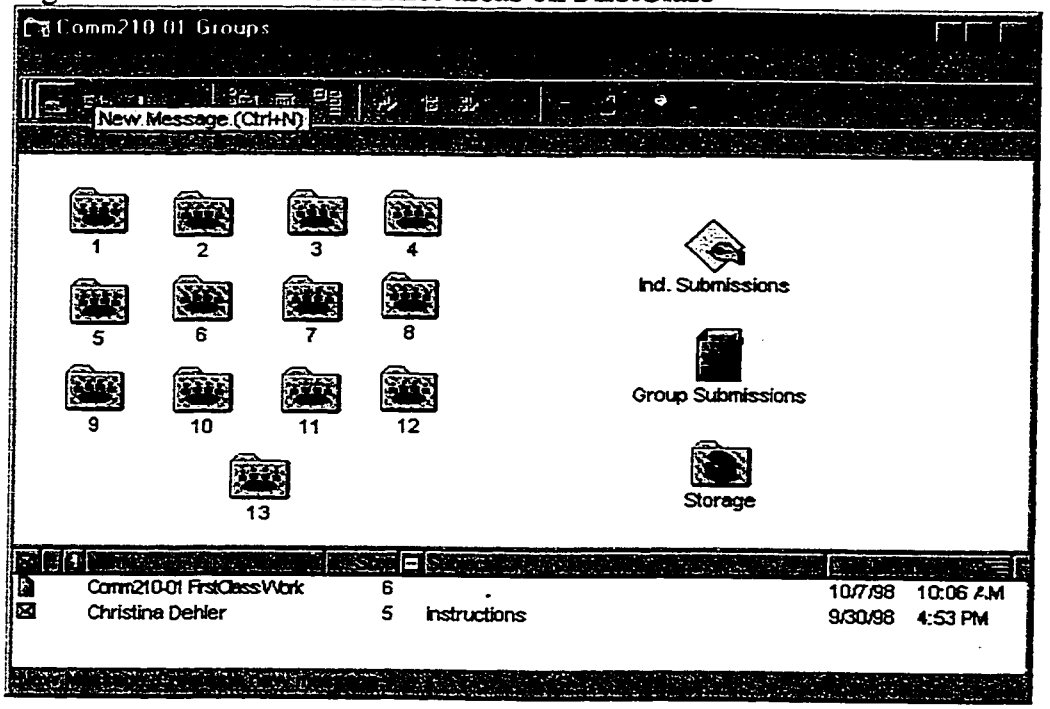


Groups were made up of three participants and performed tasks corresponding to task types 2 and 4 of McGrath's (1984) circumplex: An idea generation task and a judgment or preference task (see Figure 2). The study ran over a period of three weeks.

Groupwork Context

This study was carried out with FirstClass, a CMC system. Four treatment conditions were constructed using FirstClass whereby group membership and task experience conditions were created by varying participants' experiences during weeks 1 and 2, prior to the performance of the criterion task at week 3.

Figure 4. Protected conference areas on FirstClass



Groupwork took the form of asynchronous computer-mediated communication between group members in conference areas (see Figure 4). Each group in every treatment condition was assigned to its own protected group discussion conference area. The protection placed on this conference area ensured that only those members belonging to the group could access it. Anyone trying to access a group conference to which he or she was not assigned could not gain entry to the area. Similarly, task submission and questionnaire conference areas were created such that participants could not read one

another's responses. In this respect, the controlled yet flexible on-line community allowed for all data pertaining to the effects of treatment and non-manipulated variables on group processes and communication to be collected and recorded in an unobtrusive manner.

The Order and Type of Assigned Tasks

The order and type of task assignment for all four treatment conditions are presented in Table 1 below. During weeks 1 and 2 of the study, subjects in the related task experience condition performed judgment tasks similar to week 3's task involving aesthetic or evaluative judgments for which there is no correct answer (McGrath, 1984; Wittenbaum & Stasser, 1995). Subjects in an unrelated task experience condition performed idea generation tasks during weeks 1 and 2. At week 3, all groups (i.e., all treatment conditions) performed the same judgment task. Complete task instructions and task materials that were distributed to study participants are presented in Appendix C.

Table 1. Order of Task Assignment

Treatment conditions	Weeks		
	1	2	3
Stable membership with task experience	J_1	J_2	J_3
Stable membership without task experience	IG_1	IG_2	J_3
Changing membership with task experience	J_1	J_2	J_3
Changing membership without task experience	IG_1	IG_2	J_3

IG = Idea generation task
J = Judgment task

The generation and judgment tasks used in this study were chosen from a variety of similar tasks tested in a pilot study. These tasks were selected and revised to ensure that the students found the exercises interesting and that the level of difficulty was appropriate to the population and the time allotted for each task.

Idea generation tasks

Using an idea generating task developed by J.W. Feller (1996), at week 1 students were presented with an account of the music recording industry's excess capacity for vinyl disk production and its search for new uses of the disks so that existing plants and machinery equipped for the production of this product could be utilized. Subjects were asked to find additional uses for vinyl disks and told to meet the following criteria: a) quantity of ideas; b) ideas that have market value; and c) ideas that are practicable.

At week 2, subjects were assigned a task developed by Straus (1992). Participants were asked to generate ideas to improve the quality of the physical environment. They were told that the scoring of this task would be based on the following criteria: a) quantity of ideas; b) ideas that have the greatest possible impact on the environment; and, c) ideas that are feasible to implement.

Judgment tasks

At week 1, subjects were asked to make a decision about how to manage a vehicle purchasing and distribution problem (Scudder, 1996). The task describes a scenario in which a regional sales division is going to be given one Chevrolet Lumina Van and $1000 in repair money. Each sales representative in the regional division has been asked to make a case for why she should be provided with a new van. Subjects were to read through each case and come to a group agreement as to how this vehicle situation should be managed. Subjects were told that group solutions would be graded according to the following criteria: a) analysis of the information; and b) decision criteria.

At week 2, subjects were assigned a task developed by Hollingshead, McGrath and O'Connor (1993). Participants were asked to discuss information about the three

companies and to rank order the companies based on which one the group would prefer to invest in most, second most and least. Subjects were told that they must reach a consensus with the other group members concerning your rank order preference and that to reach a consensus, all three group members have to be in agreement about the rank order of the three companies. Groups were to continue discussing until all group members agreed on the rank order preference of the three companies. Subjects were informed that the criteria used to evaluate their decision were: a) analysis of the information; b) decision criteria; and, c) the rationale of ranking;

At week 3, subjects were asked to resolve a fictional case, developed by Straus (1992), in which a college basketball player bribed a teaching assistant to change his course grade. Upon examination of the matter, participants were to agree on one choice from a list of possible courses of action for five separate issues having to do with the treatment of the student and the teaching assistant. The task was to determine which courses of disciplinary action to choose for the student and the teaching assistant, taking into consideration that the three university factions involved, that is the athletic department, the faculty, and the college administration, have differing views on how this matter should be settled. Subjects were instructed that all group members must agree on one option to resolve each of the five issues and that brief explanations for each choice should be provided. Participants were also told that the group solution would be scored in terms of how satisfying it was to all three university factions and that decisions for each of the five issues would be judged accordingly.

Treatment Variables

The manipulated independent variables

Group membership. Participants in the stable membership condition were assigned to three person groups at week 1 and worked with the same people throughout the entire study. Subjects in the changing membership condition were assigned to new groups with different people at weeks 1, 2 and 3 such that no participant worked with the same people more than once.

Task experience. Participants in the related experience task condition carried out judgment type tasks during weeks 1 and 2 which were similar to the final task type at week 3. Subjects in the non-related experience task condition performed idea generation type tasks during weeks 1 and 2 which were dissimilar to the final judgment task type at week 3.

The non-manipulated independent variables

Data on group member characteristics including gender, age, work habits, groupwork and CMC experience, as well as attitudes toward groupwork, CMC, and computer-mediated groupwork were collected with self-report measures (see Appendix B). These included a pre-treatment questionnaire, a post-task questionnaire (administered after task completion at weeks 1 and 2), and a post-treatment questionnaire (administered after the final task at week 3).

Dependent Measures

Group Performance

Group solutions to the final judgment task were downloaded from the CMC system, and scored by the author. Adhering to Straus' 1992 task scoring system of weighted values, group solutions were based on two sets of point values: 1) the point value representing the degree of importance of each issue for each faction; and 2) the value of the different alternatives on each issue from the perspective of each faction (i.e., supporting a given faction's interest). For each group solution, each faction position received a weighted value corresponding to the alternative that was selected on each issue. (For example, a chosen alternative on one issue might be highly favourable to the faculty position yet highly unfavourable to the administration's or athletic department's position; the weighted value would therefore have a high point value for the former faction and a low point value for the latter two.) For each group solution, each faction received a score corresponding to the sum of their weighted point values across the five issues. The group score was the product of the three factions' scores. Solutions with the most balance among the perspectives of the three factions yield the highest scores. The weighted values used for scoring the judgment task are presented in Appendix B.

Group competencies

Knowledge, skill and attitudinal competencies were analyzed through self-report measures. Questionnaires used to elicit these types of data are presented in Appendix A.

Knowledge competencies

Shared knowledge. Attitudes about mutual understanding and collectiveness of thought were evaluated through post-task and post-treatment items 7, 10 and 20.

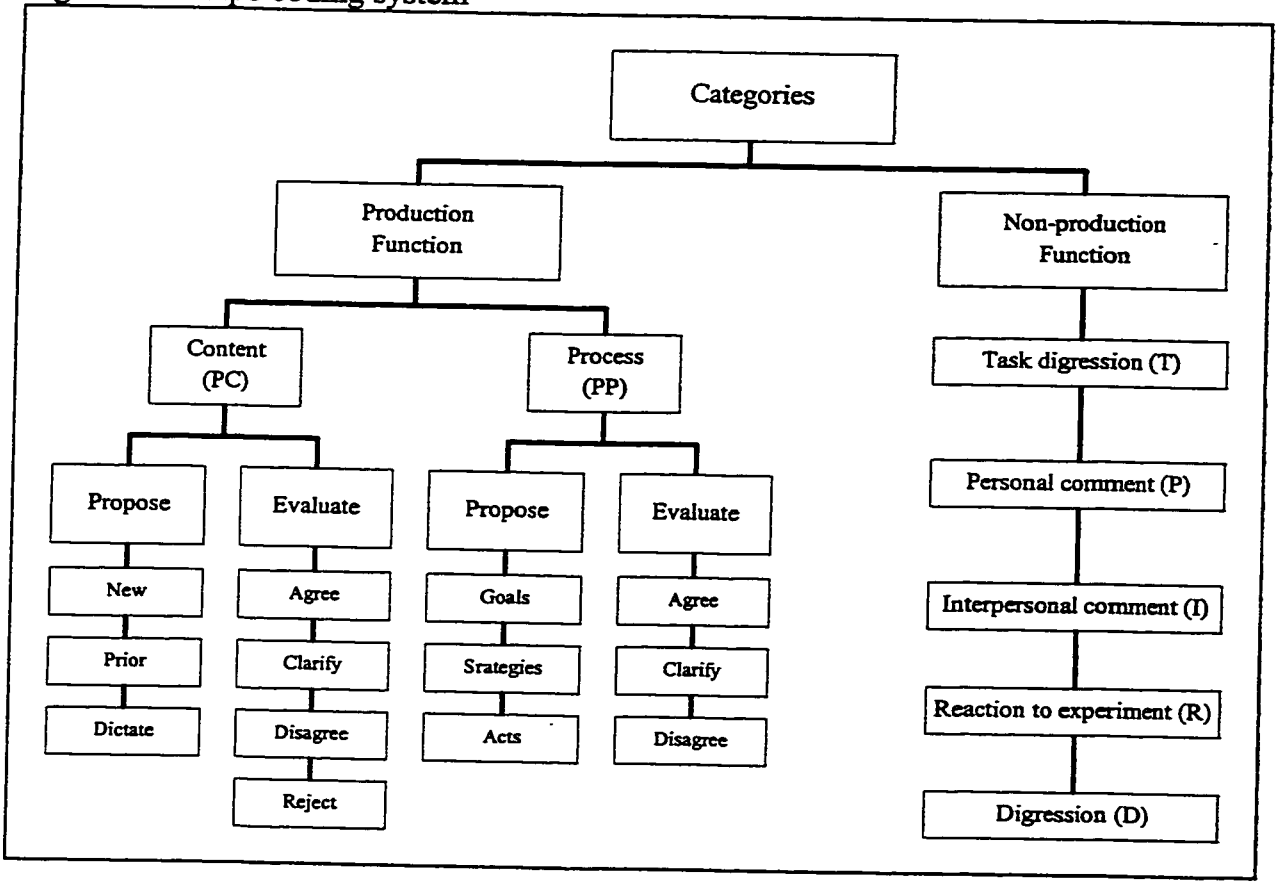
Awareness of group members' abilities. Item 13 of post-task and post-treatment questionnaires was use to gauge subjects' awareness of fellow group members' abilities.

Skills competencies. The analyses of group interactions and process draw on two types of data: self-report measures and content analyses of posted messages.

Group interaction. Perceptions of media effectiveness were measured with item 3 of the post-task and post-treatment questionnaires. Additional information about computer-mediated group interaction was also derived from a content analysis of the posted messages from the asynchronous group discussions on the final judgment task. A sample of the discussion is presented in Appendix D. Using a variation of the Time-by Event-by-Member Pattern Observation (TEMPO) process coding system (Futoran, Kelly & McGrath, 1989) group discussions were analyzed to assess the content and amount of communication (see Figure 5). TEMPO is a flexible categorizing system befitting a wide range of tasks. It is a hierarchy which first codes remarks as serving either a production or non-production function of the group. Production remarks are then classified as pertaining to either the substantive content of the task or the process of performing the task. Non-production remarks are sorted according to whether they are task digressions, digressions about other topics, personal comments, interpersonal comments or reactions to the experiment. These detailed explanations of categories as well as an example of coded discussion are presented in Appendix D.

Two graduate student raters in addition to the author coded the transcripts. Raters went through extensive training using the TEMPO system until interrater agreement was satisfactory. Agreement rates were calculated at a point where approximately one half of the transcripts were coded. Ten percent of the

Figure 5. Tempo coding system



transcripts were coded by all three raters. Agreement rates were calculated for this percentage of the coded remarks. Interrater agreement was at least 91% in all cases. The remainder of the transcripts were assigned to raters such that each rater coded transcripts that were distributed across all four treatment groups of the study.

Group process. Attitudes regarding the amount of group member coordination required to carry out a task were evaluated by item 18 on post-task and post-treatment questionnaires. Subjects' levels of participation in the computer-mediated discussion were evaluated with item 22 of the post-task questionnaire and item 24 of the post-treatment questionnaire. Items 23 and 24 of the post-task, and items 25 and 26 of the post-treatment questionnaires amassed information regarding the amount of time spend

on the task. Finally, items 25 and 26 and items 27 and 28 of the post-task and post-treatment questionnaires, respectively, produced data about how subjects were carrying out groupwork (i.e., from home, a university lab, both, or neither).

Attitudinal competencies

Group cohesion. Subjects perceptions about group cohesion at weeks 1, 2 and 3 were evaluated through items 4, 9, 15 and 16 of the post-task and post-treatment questionnaires.

Collective orientation. Items 5 and 6 of the post-task and post-treatment questionnaires were used to assess subjects' tendency to think of themselves as group members rather than individuals.

Group member interdependence. Responses to post-task and post treatment items 11, 12, 14 provided information about perceptions of group member interdependence.

Group members' social experiences

Group members' opinions about their experiences with group process and performance of the computer-mediated tasks were also evaluated with self-report measures on the post-task and post-treatment questionnaires.

Satisfaction. Items 22 and 23 of the post-treatment questionnaire measured satisfaction with the group process. Items 1, 2, 8 and 17 of the post-task and post-treatment questionnaires assessed satisfaction with the task. Item 21 of the post-treatment questionnaire measured satisfaction with the group solution. Post-treatment items 30 to 34 and 45 evaluated subjects' satisfaction with computer-mediated groupwork, and items 29, and 35 to 44, were compared with equivalent pre-treatment items to measure shifts in attitudes toward groupwork.

Confidence. Group member confidence in the group solution was assessed with item 19 of the post-task and post-treatment questionnaires.

Experimental Procedure

During the first week of classes, the author visited three sections of the Contemporary Business Thinking course. Similarly, the researcher visited two more sections of the same course during the third week of classes, for a total five sections. At these first meetings with students, the author explained what CMC is and how it is being integrated into their course as a 3-week groupwork activity worth 5% of their final grade. Participants were provided with details about how the computer-mediated groupwork would proceed and were informed that their on line group discussions would be recorded and analyzed, but that these would remain confidential. Finally, it was made clear to students that their participation in the study was completely voluntary and that if they so chose, they might opt out of the study at any time with no consequential effect on their course grade.

Students signed consent forms and completed the pre-treatment questionnaire. Once these materials were collected, students were given two handouts. The first outlined the procedures and dates of the computer-mediated work. The second handout contained information regarding where to access FirstClass, how to acquire the software, and how to get help in the event of installation problems. These documents are presented in Appendix A. The researcher read over the handouts with students and provided clarification when required. A live 30-minute demonstration of FirstClass was then performed, after which hands-on training sessions were scheduled in the university computer labs. Students were reminded that during the three weeks of computer-

mediated groupwork, all instructions and assignments would be disseminated via the FirstClass system. FirstClass training took place over the following two-week period, during which time students were required to get on line and post messages to their course conference areas. A two-week practice period ensued, which afforded students the opportunity to familiarize themselves with the computer-mediated environment and terminology.

Once the training and practice sessions concluded, the computer-mediated groupwork began. (The study began at week 5 of classes for the first three sections and at week 7 for the last two sections.) Subjects were assigned randomly to treatment conditions and to 3-person groups. Groups in the intact membership condition remained stable throughout the entire study (i.e., the same three people worked together). In contrast, groups in the changing membership condition were re-assigned to new 3-person groups at the start of every new week of the study such that no person worked with the same people more than once.

Week 1

Each subject was e-mailed his or her task with instructions on how to complete it. Subjects in the related-task experience condition received the first judgment task and those in the unrelated-task experience received the first idea generating task. At this same time, participants were informed as to which group and group conference area they belonged. Subjects were reminded not to contact fellow group members outside of the research context and asked not to discuss any aspect of this study with other participants during the time in which it was being run. This reminder was repeated to subjects each time they were asked to perform a new task. Participants had two days to complete the

task individually and submit a solution to a designated conference area, named Individual Submissions. Subjects then had the balance of the week to carry out the same task with their group in their group conference area and submit a group solution to another specified conference area, called Group Submissions. Once a group's solution was submitted, each group member completed and submitted the on line week 1 post-task questionnaire located in another specially constructed conference area that ensured confidentiality of responses.

Upon the completion of the group task and the submission of a solution (i.e., at the end of week 1), messages that had been posted to a group discussion conference relating to that task were moved out of the group discussion area's main directory and into a folder. Folders remained in the group conference areas for those groups in the intact membership condition but were stored in a separate and inaccessible area for those in the changing membership condition.

Week 2

Subjects in the changing membership treatment condition were re-assigned to new 3-person groups and to new group conference areas. All participants were e-mailed their second task (Task 2) with those in the related-task experience condition receiving the second judgment task and those in the non-related task experience receiving the second idea generating task. At this same time, subjects in the changing membership condition were informed as to which group they belonged. Subjects adhered to the same process described in week 1 above. Upon submission of the group solution, each group member completed and submitted the on-line week 2 post-task questionnaire. At the end of the

week, messages posted to group discussion conferences were moved out of these areas and stored in folders.

Week 3

Subjects in the changing membership treatment condition were re-assigned to new three-person groups and to new group conference areas. All participants were e-mailed the final judgment task (Task 3). This week's computer-mediated groupwork proceeded as it did during the previous week. Upon submission of the group solution, subjects completed and submitted the on-line post-treatment questionnaire. Once all questionnaires were submitted, subjects were given written debriefing of the study, via a personal CMC message (see Appendix E).

Chapter 4: Results

A 2x2 between-subjects factorial design investigated the effects of group membership and task experience on group performance, group competencies and group members' social experiences. The study ran over a period of three weeks. Group membership and task experience conditions were created on FirstClass by varying participants' experiences during weeks 1 and 2, prior to the performance of the criterion judgment task at week 3. All groups (n=56) performed the same final judgment task at week 3.

Of the 197 students in the original sample, 23 subjects (11.7%) withdrew from the course. Six additional students were removed from the analyses because they were not able to complete the group tasks at weeks 1 and 2, and therefore did not experience the treatment. In all, 168 students remained in the study, forming a total of 56 three-person groups, 14 groups assigned to each treatment conditions.

At week 1 and week 2, subjects performed computer-mediated group tasks and completed weekly post-task questionnaires. These instruments are presented in Appendices C and B, respectively. In the present study, these activities constitute the treatment and are not of theoretical interest. Therefore these data are not included in the following analyses. Similarly pre-treatment data are not included in this study. Analyses reported here treat only data collected during week 3.

Group performance as well as three aspects of group interaction—number of messages, message length and type of remarks exchanged—were averaged across members in a group and assessed at the group level (n=56). All other dependent variables were based on data collected from the post-treatment questionnaire and were

analyzed at the individual level (n=168). Analyses of all dependent measures were carried out via two-way analyses of variance (ANOVA) and a Pearson's correlation. In order to control for experimentwise type I error, the significance level for all F-tests was set at $p = .01$.

Group performance

Hypothesis 1 predicted that groups acquiring judgment task experience as intact groups during weeks 1 and 2 would perform better on the final judgment problem than groups in any other treatment condition. Treatment mean scores for performance of the final judgment task (Task 3) reveal that groups acquiring judgment task experience as intact groups received higher task scores compared to groups in any of the other three treatment conditions (see Table 2).

Table 2. Measures of central tendency for final task scores

Item Treatment	Mean	SD	N
Stable membership with task experience (SM/EXP)	7839.71	624.89	14
Stable membership without task experience (SM/NO EXP)	6721.36	1209.51	14
Changing membership with task experience (CM/EXP)	4823.57	1493.90	14
Changing membership without task experience (CM/NO EXP)	3230.00	1087.92	14
TOTAL	5653.66	2102.99	56

A two-way ANOVA was carried out to confirm significant differences between these treatment means. As predicted, results displayed in Table 3 below show a main effect for membership ($M_{Stable} = 7280.53$, $M_{Changing} = 4026.78$), $F(1, 52) = 112.55$, $p < .01$ as well as a main effect for task experience ($M_{Experience} = 6331.64$, $M_{No\ Experience} = 4975.68$), $F(1,52) = 19.54$, $p < .01$. These results support Hypothesis 1.

Table 3. Summary of the ANOVA for group performance

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	148216446.90	1	148216446.90	112.53	0.00
EXP	25740948.02	1	25740948.02	19.54	0.00
MEMBER * EXP	790400.16	1	790400.16	0.60	0.44
Error	68493181.50	52	1317176.57		
Total	243240976.60	55			

Knowledge competencies

Shared knowledge

Hypothesis 2 predicted that upon completion of the final task, participants acquiring experience with judgment tasks in intact groups would report higher levels of shared knowledge and mutual understanding than those in other treatment conditions. Responses to post-treatment questionnaire item 7 "Members of our group think alike", item 10 "Our group spent a lot of time overcoming differences of opinion" and item 20 "The final group solution reflects my own ideas and points of view" were combined to yield a composite score of shared knowledge. The coefficient alpha for the score, calculated at the individual level, was .69. Treatment group means are reported in Table 4 below.

Table 4. Measures of central tendency for shared knowledge

Item	Treatment	Mean	SD	N
Shared knowledge, composite				
Q7. Members of our group think alike	SM/EXP	3.51	0.71	42
Q10. Our group spent a lot of time overcoming differences of opinion	SM/NO EXP	3.40	0.70	42
	CM/EXP	3.17	0.75	42
Q20. The final group solution reflects my own ideas and points of view	CM/NO EXP	2.75	0.65	42
	TOTAL	3.21	0.76	168

A two-way ANOVA showed that individuals working in groups with stable membership reported higher levels of shared knowledge and mutual understanding than those who were members of groups with changing membership ($M_{Stable} = 3.46$, $M_{Changing} = 2.96$), $F(1,164) = 20.79$, $p < .01$ (see Table 5). Unexpectedly, task experience did not affect a significant difference in participants' responses on this construct ($M_{Experience} = 3.34$, $M_{No\ Experience} = 3.08$), $F(1,164) = 5.97$, $p > .01$. These results provide partial support for Hypothesis 2.

Table 5. Summary of the ANOVA for shared knowledge

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	10.33	1	10.33	20.79	0.00
EXP	2.97	1	2.97	5.97	0.02
MEMBER * EXP	1.11	1	1.11	2.24	0.14
Error	81.52	164	0.50		
Total	95.93	167			

Awareness of other group members' ability

Hypothesis 3 predicted that individuals acquiring group judgment task experience would express higher levels of shared situated awareness of fellow group members' abilities. To investigate this hypothesis, a two-way ANOVA was carried out on responses to item 13 of the post-treatment questionnaire "Group members were aware of one another's abilities". Groups means for this measure are presented in Table 6.

Table 6. Measures of central tendency for awareness of group member's ability

Item	Treatment	Mean	SD	N
Awareness of group member's ability				
	SM/EXP	3.64	1.03	42
Q13. Group members were aware of one another's abilities	SM/NO EXP	3.38	0.91	42
	CM/EXP	2.19	0.63	42
	CM/NO EXP	2.55	0.80	42
	TOTAL	2.94	1.04	168

Contrary to expectations, subjects acquiring task experience in groups with changing membership reported the lowest levels of awareness of group members' ability. Results of a two-way ANOVA, reported in Table 7 below, showed a main effect for membership ($M_{Stable} = 3.51$, $M_{Changing} = 2.37$), $F(1, 164) = 74.71$, $p < .01$. Task experience did not influence participants' perceptions of their awareness of other group members' ability ($M_{Experience} = 2.92$, $M_{No\ Experience} = 2.96$), $F(1,164) = 0.13$, $p > .01$. Hence these data do not support Hypothesis 3.

Table 7. Summary of the ANOVA for awareness of others' ability

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	54.86	1	54.86	74.70	0.00
EXP	0.10	1	0.10	0.13	0.72
MEMBER * EXP	4.02	1	4.02	5.48	0.02
Error	120.43	164	0.73		
Total	179.40	167			

Skill competencies

Group interaction

Number of messages. Hypothesis 4 stated that groups whose members have no prior experience with each other or with the task would generate more messages. The number of messages communicated between group members were averaged across members in a group and analyzed at the group level ($n = 56$). Contrary to what was predicted, group means, as shown in Table 8 below, indicate no differences between treatment groups in the number of messages exchanged.

Table 8. Measures of central tendency for skill competencies - group interaction

Item	Treatment	Mean	SD	N
Number of messages	SM/EXP	18.00	1.66	14
	SM/NO EXP	18.14	2.71	14
	CM/EXP	18.57	2.71	14
	CM/NO EXP	19.21	2.64	14
	TOTAL	18.48	2.45	56

A two-way ANOVA confirmed that there was in fact no significant differences between treatment groups regarding the number of messages exchanged between group members for the final task. Table 9 shows that there was neither a main effect for membership ($M_{Stable} = 18.07$, $M_{Changing} = 18.89$), $F(1, 52) = 0.22$, $p > .01$, nor for task experience $M_{Experience} = 18.28$, $M_{No\ Experience} = 18.67$), $F(1,52) = 0.55$, $p > .01$. Therefore, this Hypothesis 4 is rejected.

Table 9. Summary of the ANOVA for number of messages

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	9.45	1	9.45	1.55	0.22
EXP	2.16	1	2.16	0.35	0.55
MEMBER * EXP	0.88	1	0.88	0.14	0.71
Error	317.50	52	6.11		
Total	329.98	55			

These ANOVA results, together with the information provided by the measures of central tendency reported in Table 8 above, beckoned further investigation into the quantity of communication exchanged. Shifting the focus of analysis from the number of messages to the length of messages communicated between group members led to an interesting finding.

Message length was assessed as the number of remarks contained in each message posted to a group's conference area. A remark was defined as a unit of speech that was

coded into a particular category of TEMPO. The number of remarks were averaged across members in a group and analyses were conducted at the group level (n=56). Table 10 displays the average number and the proportion of remarks exchanged at the group level for all treatment conditions.

Table 10. Average number and percentage of remarks exchanged

Treatment	Total mean remarks (message length)	Percentage
SM/EXP	39.36	21.88%
SM/NO EXP	42.71	23.75%
CM/EXP	47.36	26.33%
CM/NO EXP	50.43	28.04%
TOTAL	44.96	100.00%

Results of a two-way ANOVA, presented in Table 11 below, showed a main effect for membership ($M_{Stable} = 41.03$, $M_{Changing} = 48.89$), $F(1, 52) = 0.13.45$, $p < .01$. There was no evidence of a main effect for task experience $M_{Experience} = 43.36$, $M_{No\ Experience} = 46.57$), $F(1,52) = 2.25$, $p > .01$. Also, groups with changing group membership produced a significantly higher percentage of remarks (54.37%) than did groups with stable membership (45.63%).

Table 11. Summary of the ANOVA for message length

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	864.29	1	864.29	13.45	0.00
EXP	144.64	1	144.64	2.25	0.14
MEMBER * EXP	0.29	1	0.29	0.00	0.95
Error	3342.71	52	64.28		
Total	4351.93	55			

Type of communication. Hypothesis 5 predicted that groups whose members have no prior experience with each other or with the task would produce more remarks pertaining to group process, while individuals in groups with stable membership would

generate more off-task remarks. To investigate this hypothesis, all remarks exchanged between group members on the final task were coded as one of three TEMPO categories: production-content, production-process, or non-production. The number of remarks for each category of communication was averaged across members in a group in order to generate overall means and percentages of communication type for the four treatment conditions (see Table 12 below).

The descriptive data reported in Table 12 reveal that groups who did not acquire group or task experience during weeks 1 and 2 produced the highest total average of remarks ($M_{CM/NO\ EXP} = 50.43$) and were the most task-focused, with 90% of remarks being classified as productive and 10% non-productive communication. Of the number of remarks categorized as productive, 46% were content-related and 44% were process-related.

Table 12. Means and percentages for type of communication

Treatment	Total mean remarks	Type of communication						N
		PC		PP		NP		
		Mean %	SD	Mean %	SD	Mean %	SD	
SM/EXP	39.36	23.10 59%	3.24	6.01 15%	1.45	10.25 26%	2.50	14
SM/NO EXP	42.71	20.45 48%	5.25	8.21 19%	1.54	14.05 33%	2.29	14
CM/EXP	47.36	24.00 51%	3.44	16.16 34%	2.32	7.20 15%	1.26	14
CM/NO EXP	50.43	22.20 44%	2.57	23.10 46%	3.06	5.13 10%	1.25	14
TOTAL	44.96	22.44 50%	3.18	13.37 30%	7.15	9.16 20%	3.87	56

PC: Production-content
PP: Production-process
NP: Non-production

A series of two-way ANOVAs were conducted at the group level (n=56) to test the difference of these treatment group means. Analyses of the different categories of communication produced the following findings.

Productive content-related communication. Regarding communication that is productive and specific to the content of the final task, results of a two-way ANOVA revealed a main effect for task experience ($M_{Experience} = 23.55$, $M_{No\ Experience} = 21.32$), $F(1,52) = 7.59$, $p < .01$ (see Table 13).

Table 13. Summary of the ANOVA for type of communication

Source	Type of remark	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	PC	25.92	1	25.92	2.93	0.09
	PP	2191.50	1	2191.50	455.69	0.00
	NP	501.48	1	501.48	137.06	0.00
EXP	PC	67.10	1	67.10	7.59	0.01
	PP	293.49	1	293.49	61.03	0.00
	NP	10.48	1	10.48	2.86	0.10
MEMBER * EXP	PC	2.12	1	2.12	0.24	0.63
	PP	79.21	1	79.21	16.47	0.00
	NP	120.60	1	120.60	32.96	0.00
Error	PC	459.48	52	8.84		
	PP	250.08	52	4.81		
	NP	190.27	52	3.66		
Total	PC	554.63	55			
	PP	2814.27	55			
	NP	822.82	55			

PC: Production-content
PP: Production-process
NP: Non-production

Groups acquiring task-related experience during weeks 1 and 2 generated more content-specific remarks during the completion of the final judgment task. In keeping with a number of studies on this issue, groups in the task-related experience treatment

conditions were able to focus on the content of the work during week 3, rather than spending time on the mechanics of getting the work done.

Table 12 shows that groups acquiring task experience as intact groups produced the highest percentage of content-related remarks. Of the total average number of remarks exchanged, 59% ($M_{CM/NO\ EXP} = 23.10$) were related to the content of the task. Groups acquiring task-experience under changing group membership conditions generated the second highest percentage of content-specific remarks, with 51% ($M_{CM/EXP} = 24.00$) of the total average number of remarks pertaining to the content of the task. These results strongly suggest that task experience plays an important role in promoting productive, content-specific communication in computer-mediated work groups.

Productive process-related communication. Results presented in Table 13 show a main effect for membership ($M_{Stable} = 7.11$, $M_{Changing} = 19.63$), $F(1,52) = 455.69$, $p < .01$, as well as a main effect for task experience ($M_{Experience} = 11.09$, $M_{No\ Experience} = 15.65$), $F(1,52) = 61.03$, $p < .01$. A significant interaction of group membership and task experience on process communication was also detected, $F(1,52) = 16.47$, $p < .01$.

As predicted in Hypothesis 5, groups who did not acquire group or task-related experience during weeks 1 and 2 generated significantly more process-related remarks during the completion of the final task than did groups in any of the other treatment conditions. In fact, of the total average number of remarks posted, 46% ($M_{CM/NO\ EXP} = 23.10$) were specific to the process of completing the task (see Table 12). Also, groups undergoing membership change generated a significantly larger number of remarks on the process of completing the final judgment task than groups with stable group membership. Table 12 shows that the 34% ($M_{CM/EXP} = 16.16$) of the total average

number of remarks generated by groups undergoing membership change while acquiring task experience, and the 46% ($M_{CM/NO\ EXP} = 23.10$) produced by group acquiring neither group nor task experience, are significantly higher than the number of process remarks generated by groups with stable group membership.

The presence of a significant interaction in these data signifies that the two independent variables—membership and task experience—combined to produce joint effects which cannot be teased out and analyzed independently. Nevertheless, it is apparent from these results that groups in which members were working with new people on a new type of task at week 3 produced a greater number ($M_{CM/NO\ EXP}=23.10$) and a higher percentage (46%) of process remarks during the completion of the final task than groups in any other treatment condition.

Non-productive communication. Results presented in Table 13 show a main effect for membership ($M_{Stable} = 12.15$, $M_{Changing} = 6.16$), $F(1,52) = 137.06$, $p < .01$ and a significant interaction of membership and task experience on non-productive communication, $F(1,52) = 32.96$, $p < .01$. As predicted in the second part of Hypothesis 5, groups with stable membership and acquiring task experience during weeks 1 and 2 produced a higher number of off-task remarks during the completion of the final task than did groups undergoing membership change. However, the presence of a main interaction in these observations signifies that task experience and membership combined to produce this main effect. This interaction indicates that during week 3, groups with stable membership produced more off-task remarks ($M_{SM/NO\ EXP}=14.05$, 33% of the total average number of remarks) when faced with the challenge of completing a new type of

task, compared to groups with changing membership ($M_{CM/NO\ EXP} = 5.1$, 10% of the total average number of remarks).

Media effectiveness. Hypothesis 6 predicted that individuals acquiring task-related experience with the same group members during weeks 1 and 2 would more strongly agree that computer-mediated communication was an effective means for carrying out the final judgment task. Media effectiveness was assessed by item 3 on the post-treatment questionnaire "This method of discussion was effective." Treatment group means of responses are presented in Table 14.

Table 14. Measures of central tendency for media effectiveness

Item	Treatment	Mean	SD	N
Q3. This method of discussion was effective	SM/EXP	3.81	0.63	42
	SM/NO EXP	3.26	0.83	42
	CM/EXP	3.29	0.77	42
	CM/NO EXP	2.95	0.79	42
	TOTAL	3.33	0.82	168

Results generated from a two-way ANOVA indicate a main effect for membership ($M_{Stable} = 3.53$, $M_{Changing} = 3.12$), $F(1,164) = 12.58$, $p < .01$, as well as a main effect for experience ($M_{Experience} = 3.55$, $M_{No\ Experience} = 3.10$), $F(1,164) = 14.06$, $p < .01$. These results, presented in Table 15 below, fully support Hypothesis 6.

Table 15. Summary of the ANOVA for media effectiveness

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	7.29	1	7.29	12.58	0.00
EXP	8.15	1	8.15	14.06	0.00
MEMBER * EXP	0.48	1	0.48	0.83	0.36
Error	95.07	164	0.58		
Total	110.99	167			

Regarding this same measure of media effectiveness, additional observations were made by comparing the aforementioned data with those produced on the issues of message length and communication type. Subjects acquiring task experience as intact groups during weeks 1 and 2 reported the highest ratings of media effectiveness and also generated the least amount of computer-mediated communication at week 3. Of the total mean number of remarks exchanged in all four treatment groups combined, 21.88% of the overall number of remarks ($M_{SM/EXP} = 39.36$, 5.60 remarks less then the total mean number of remarks exchanged in all treatment groups) was generated by these participants in their group conference areas. Furthermore, these same groups produced the highest percentage of production-content remarks (59%) and the lowest percentage of production-process remarks (15%) suggesting that compared to groups in other treatment conditions, their communication was more content-focused.

Group process

Three different aspects of group process were assessed with three distinct items on the post-treatment questionnaire.

Time on task. Hypothesis 7 predicted that individuals who did not acquire group or task-related experience during weeks 1 and 2 would spend more time on the final judgment task. To test this hypothesis, subjects replied to the question "How much time did you spend on this assignment (in hours)?". A two-way ANOVA indicates a main effect for membership ($M_{Stable} = 2.66$, $M_{Changing} = 3.11$), $F(1,164) = 7.90$, $p < .01$, as well as a main effect for task experience ($M_{Experience} = 2.67$, $M_{No\ Experience} = 3.10$), $F(1,164) = 7.09$, $p < .01$ (see Table 16).

Table 16. Summary of the ANOVA for time on task

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	8.60	1	8.60	7.90	0.01
EXP	7.71	1	7.71	7.09	0.01
MEMBER * EXP	3.15	1	3.15	2.89	0.09
Error	178.39	164	1.09		
Total	197.85	167			

Table 17 below shows that, as predicted, members participating in groups with stable membership and performing judgment tasks during weeks 1 and 2 reported spending the least amount of time on the final task ($M_{SM/EXP} = 2.58$) while participants of groups with changing membership and performing a judgment task for the first time at week 3 reported spending the most amount of time completing the final task ($M_{CM/NO\ EXP} = 3.46$).

Table 17. Measures of central tendency for time on task

Item	Treatment	Mean	SD	N
Q25. How much time did *you* spend on this assignment (in hours)?	SM/EXP	2.58	0.92	42
	SM/NO EXP	2.74	1.03	42
	CM/EXP	2.76	1.09	42
	CM/NO EXP	3.46	1.12	42
	TOTAL	2.89	1.09	168

Participation. Hypothesis 8 predicted that subjects who did not acquire group or judgment task experience would perceive that compared to fellow group members, they participated more in the computer-mediated discussion of the final task. To investigate this issue, subjects were asked to respond to the post-treatment questionnaire item 24 "How much did you participate in the discussion compared to the other group members?" on a 5-point rating scale with 1 = much less, 5 = much more, and 3 = about the same.

Treatment mean scores of participants' perceived level of participation are presented in Table 18.

Table 18. Measures of central tendency for participation

Item	Treatment	Mean	SD	N
Q24. How much did you participate in the group discussion compared to the other group members?	SM/EXP	3.14	0.57	42
	SM/NO EXP	3.29	0.71	42
	CM/EXP	3.40	0.63	42
	CM/NO EXP	3.83	0.85	42
	TOTAL	3.42	0.74	168

As predicted, participants who did not acquire group or judgment task experience perceived that compared to fellow group members, they participated more in the computer-mediated discussion of the final task ($M_{CM/NO\ EXP} = 3.83$). Results generated from a two-way ANOVA showed a main effect for membership ($M_{Changing} = 3.11$, $M_{Stable} = 2.66$), $F(1,164) = 14.16$, $p < .01$, and a main effect for task experience ($M_{No\ Experience} = 3.10$, $M_{Experience} = 2.67$), $F(1,164) = 7.06$, $p < .01$ (see Table 19).

Table 19. Summary of the ANOVA for participation

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	6.88	1	6.88	14.16	0.00
EXP	3.43	1	3.43	7.06	0.01
MEMBER * EXP	0.86	1	0.86	1.76	0.19
Error	79.67	164	0.49		
Total	90.83	167			

Coordination. Hypothesis 9 predicted that participants who did not acquire group or task-related experience would report that the criterion judgment task required a lot of coordination between group members. To investigate this issue of task coordination, each subject responded to the post-treatment questionnaire item 18 "The task required a lot of coordination among our group's members". Treatment group means are displayed in Table 20 below.

Table 20. Measures of central tendency for coordination

Item	Treatment	Mean	SD	N
Q18. The task required a lot of coordination among our group's members	SM/EXP	3.43	1.29	42
	SM/NO EXP	3.74	0.73	42
	CM/EXP	3.05	0.91	42
	CM/NO EXP	3.93	0.87	42
	TOTAL	3.54	1.02	168

In keeping with the literature on this topic, results of a two-way ANOVA for coordination revealed that members of groups who did not acquire task experience during weeks 1 and 2 reported that much coordination among team mates was necessary to complete the final judgment task ($M_{Experience} = 3.24$, $M_{No\ Experience} = 3.83$), $F(1,164) = 15.74$, $p < .01$. However, in contrast to a number of studies of group norms, process routinization and task execution, members of groups with changing membership did not express the same opinion ($M_{Stable} = 3.58$, $M_{Changing} = 3.49$), $F(1,164) = .403$, $p > .01$. These results, reported in Table 21, provide partial support for Hypothesis 9.

Table 21. Summary of the ANOVA for coordination

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	0.38	1	0.38	0.40	0.53
EXP	14.88	1	14.88	15.74	0.00
MEMBER * EXP	3.43	1	3.43	3.63	0.06
Error	155.10	164	0.95		
Total	173.79	167			

Attitudinal competencies

Group cohesion

Hypothesis 10 purported that individuals who are members of groups with changing membership would express lower levels of group cohesion than groups in the intact membership group condition. Responses to item 4 "My fellow group members

were helpful in getting the job done" , item 9 "Working with my fellow group members was frustrating", item 15 "Members of our group helped one another" and item 16 "I would like to work with the same group members again" of the post-treatment questionnaire were combined to yield a composite score of group cohesion. The coefficient alpha for the composite, calculated at the group member level, was .84. Treatment group means of this composite score are presented in table 22.

Table 22. Measures of central tendency for group cohesion

Item	Treatment	Mean	SD	N
Group cohesion, composite				
Q4. My fellow group members were helpful in getting the job done	SM/EXP	3.93	0.53	42
	SM/NO EXP	3.65	0.72	42
Q9. Working with group members was frustrating	CM/EXP	3.17	0.81	42
Q15. Members of our group helped one another	CM/NO EXP	3.17	0.88	42
Q16. I would like to work with the same group members again	TOTAL	3.48	0.81	168

As hypothesized, a two-way ANOVA showed that members of groups that remained intact throughout the three weeks of computer-mediated groupwork reported higher levels of group cohesion on the final judgment task than those individuals who were members of groups with changing membership ($M_{Stable} = 3.79$, $M_{Changing} = 3.17$), $F(1,164) = 30.08$, $p < .01$ (see Table 23). Hypothesis 10 is therefore supported.

Table 23. Summary of the ANOVA for group cohesion

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	14.44	1	14.44	30.08	0.00
EXP	0.63	1	0.63	1.30	0.26
MEMBER * EXP	1.05	1	1.05	2.18	0.14
Error	78.72	164	0.48		
Total	94.83	167			

Collective orientation

Hypothesis 11 predicted that individuals acquiring task experience as well as experience with fellow group members would show higher levels of identification with their group on the final judgment tasks than members in other treatment conditions. Post-treatment questionnaire item 5 "Every member of our group should receive the same grade" and item 6 "All my group members shared in the responsibility for the group's success or failure" were combined to generate a composite score of collective orientation. The coefficient alpha for the composite, calculated at the group member level, was .89. Group means and standard deviations for all treatment groups are reported in Table 24 below.

Table 24. Measures of central tendency for collective orientation

Item	Treatment	Mean	SD	N
Collective orientation, composite				
Q5. Every member of our group should receive the same grade	SM/EXP	3.87	0.83	42
	SM/NO EXP	3.62	0.85	42
Q6. All my group members shared in the responsibility for the group's success or failure	CM/EXP	2.98	0.81	42
	CM/NO EXP	2.71	1.17	42
	TOTAL	3.29	1.03	168

Results of a two-way ANOVA partially support this hypothesis (see Table 25). Members of intact groups expressed stronger agreement with these statements than participants assigned to groups with changing membership ($M_{Stable} = 3.74$, $M_{Changing} = 2.85$), $F(1,164) = 39.33$, $p < .01$, suggesting that these individuals developed stronger identification with, and attachment to, their group. In contrast to studies of collective orientation and social identity, task experience was not a factor in the development of these attitudinal competencies ($M_{Experience} = 3.42$, $M_{No\ Experience} = 3.17$), $F(1,164) = 3.19$, $p > .01$

Table 25. Summary of the ANOVA for collective orientation

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	33.93	1	33.93	39.33	0.00
EXP	2.75	1	2.75	3.19	0.08
MEMBER * EXP	0.00	1	0.00	0.00	0.97
Error	141.48	164	0.86		
Total	178.17	167			

Group member interdependence

Hypothesis 12 professed that upon completion of the final task, participants having acquired both group and task experience during weeks 1 and 2 would express greater appreciation for fellow group members' perspectives and points of view. Post-treatment questionnaire item 11 "Group members influenced one another's ideas", item 12 "Group members influenced one another's performance", and item 14 "Members of our group learned from each other" were combined to produce a composite mean score for the dependent measure of group member interdependence. The coefficient alpha for the composite, calculated at the group member level, was .77. Treatment group means are displayed in Table 26.

Table 26. Measures of central tendency for group member interdependence

Item	Treatment	Mean	SD	N
Member interdependence, composite				
Q11. Members influenced one another's ideas	SM/EXP	3.82	0.59	42
Q12. Members influenced one another's performance	SM/NO EXP	3.37	0.67	42
	CM/EXP	3.02	0.50	42
Q14. Members learned from each other	CM/NO EXP	2.98	0.66	42
	TOTAL	3.30	0.69	168

As predicted, subjects acquiring both group and task experience expressed greater appreciation for fellow group members' perspectives and influence over the group. Results of a two-way ANOVA, presented in Table 27, show a main effect for

membership ($M_{Stable} = 3.59$, $M_{Changing} = 3.00$), $F(1,164) = 39.72$, $p < .01$, as well as a main effect for task experience ($M_{Experience} = 3.42$, $M_{No\ Experience} = 3.17$), $F(1,164) = 7.10$, $p < .01$. Hypothesis 12 is therefore fully supported.

Table 27. Summary of the ANOVA for group member interdependence

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	14.68	1	14.68	39.72	0.00
EXP	2.63	1	2.63	7.10	0.01
MEMBER * EXP	1.72	1	1.72	4.65	0.03
Error	60.62	164	0.37		
Total	79.65	167			

Group members' social experiences

Satisfaction with process

Hypothesis 13 advanced the idea that individuals in groups that acquired judgment task experience as intact groups during weeks 1 and 2 would express higher levels of satisfaction with the process of completing this judgment task at week 3. Post-treatment questionnaire item 22 "I felt pressured trying to complete the task in the allotted time" and item 23 "I felt our group needed more time to do a good job on this group task" were combined to yield a composite score of subjects' satisfaction with the process of carrying out the final judgment task. The coefficient alpha for the composite, calculated at the group member level, was .84. Treatment group means for this composite score are reported in Table 28.

Table 28. Measures of central tendency for satisfaction with process

Item	Treatment	Mean	SD	N
Satisfaction with process, composite				
Q22. I felt pressured trying to complete the task in the allotted time	SM/EXP	3.55	0.75	42
	SM/NO EXP	3.74	0.89	42
Q23. I felt our group needed more time to do a good job on this group task	CM/EXP	4.00	0.98	42
	CM/NO EXP	4.26	1.00	42
	TOTAL	3.89	0.94	168

A two-way ANOVA showed a main effect for membership, with subjects assigned to groups with changing membership reporting higher levels of pressure to complete the task within the allotted time ($M_{Changing} = 4.13$, $M_{Stable} = 3.64$), $F(1,164) = 12.10$, $p < .01$ (see Table 29). Unexpectedly, there was no main effect for task experience ($M_{Experience} = 3.77$, $M_{No\ Experience} = 4.00$), $F(1,164) = 2.60$, $p > .01$. These results provide partial support for Hypothesis 13.

Table 29. Summary of the ANOVA for negative satisfaction with process

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	10.01	1	10.01	12.10	0.00
EXP	2.15	1	2.15	2.60	0.11
MEMBER * EXP	0.05	1	0.05	0.06	0.80
Error	135.64	164	0.83		
Total	147.85	167			

Satisfaction with task

Hypothesis 14 predicted that subjects participating in groups that acquired judgment task experience as intact groups would express higher levels of satisfaction with the criterion judgment task. Four items assessed satisfaction with the final judgment task. Positive reactions were evaluated with item 1 "I enjoyed working on this task". Negative reactions were assessed with a composite score of item 2 "Working on this task was frustrating", item 8 "The task required a lot of effort", and item 17 "The task was difficult". The coefficient alpha for the composite, calculated at the group member level, was .62. Treatment group means for positive and negative satisfaction are reported in Table 30.

Table 30. Measures of central tendency for satisfaction with task

Item	Treatment	Mean	SD	N
Positive satisfaction with task				
Q1. I enjoyed working on this task	SM/EXP	4.10	0.79	42
	SM/NO EXP	3.71	0.74	42
	CM/EXP	3.69	0.56	42
	CM/NO EXP	3.55	0.71	42
	TOTAL	3.76	0.73	168
Negative satisfaction with task, composite				
Q2. Working on this task was frustrating	SM/EXP	2.63	0.76	42
Q8. The task required a lot of effort	SM/NO EXP	2.91	0.66	42
Q17 The task was difficult	CM/EXP	3.00	0.67	42
	CM/NO EXP	3.01	0.68	42
	TOTAL	2.89	0.70	168

Tables 31 and 32 below contain the ANOVA results for positive and negative reactions to the final task, respectively. As predicted, positive reactions to the task showed a main effect for membership ($M_{Stable} = 3.90$, $M_{Changing} = 3.62$), $F(1,164) = 6.89$, $p < .01$, suggesting that the experience of working on computer-mediated group tasks with the same group members over a prolonged period of time positively affected participants reactions to the final judgment task.

Table 31. Summary of the ANOVA for positive satisfaction with task

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	3.43	1	3.43	6.89	0.01
EXP	2.88	1	2.88	5.79	0.02
MEMBER * EXP	0.60	1	0.60	1.20	0.28
Error	81.57	164	0.50		
Total	88.48	167			

Table 32. Summary of the ANOVA for negative satisfaction with task

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	2.22	1	2.22	4.63	0.03
EXP	0.86	1	0.86	1.79	0.18
MEMBER * EXP	0.76	1	0.76	1.59	0.21
Error	78.75	164	0.48		
Total	82.59	167			

Contrary to what was hypothesized, there was no main effect for experience ($M_{Experience} = 3.89$, $M_{No\ Experience} = 3.63$), $F(1,164) = 5.79$, $p > .01$. The issue of whether or not participants received prior judgment task practice during weeks 1 and 2 was not an influential factor on this measure of satisfaction; there was no significant response difference between participants who had performed judgment tasks in weeks 1 and 2, and those who did not. These results only partially support Hypothesis 14.

Satisfaction with group solution

Hypothesis 15 asserted that individuals that acquired judgment task experience as members of intact groups would express higher levels of satisfaction with the final task solution. Satisfaction with the group solution for the final judgment task was assessed with responses to item 21 of the post-treatment questionnaire "I am satisfied with the solutions my group came up with". Table 33 below displays the treatment group means for this measure of satisfaction.

Table 33. Measures of central tendency for satisfaction with task solution

Item	Treatment	Mean	SD	N
Q21. I am satisfied with the solutions that my group came up with	SM/EXP	4.14	0.52	42
	SM/NO EXP	3.67	0.69	42
	CM/EXP	3.83	0.66	42
	CM/NO EXP	3.19	0.86	42
	TOTAL	3.71	0.77	168

As predicted, results of a two-way ANOVA showed a main effect for membership ($M_{Stable} = 3.90$, $M_{Changing} = 3.51$), $F(1,164) = 13.49$, $p < .01$ and a main effect for task experience ($M_{Experience} = 3.99$, $M_{No\ Experience} = 3.43$), $F(1,164) = 27.37$, $p < .01$ (see Table 34).

Table 34. Summary of the ANOVA for satisfaction with group solution

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	6.48	1	6.48	13.49	0.00
EXP	13.15	1	13.15	27.37	0.00
MEMBER * EXP	0.29	1	0.29	0.61	0.44
Error	78.79	164	0.48		
Total	98.71	167			

Results of a post-hoc analysis using Tukey's multiple caparison test revealed a number of significant mean differences between treatment groups $F(3, 164) = 13.82$, $p < .05$. The data indicate that subjects acquiring judgment task experience as intact groups during weeks 1 and 2 reported a significantly higher level of satisfaction with the task solution at week 3 ($M_{SM/EXP} = 4.14$) compared to participants who participated in intact groups but did not acquire task experience ($M_{SM/NO\ EXP} = 3.67$). Furthermore, subjects acquiring neither group nor task experience during weeks 1 and 2 reported significantly lower levels of satisfaction with the task solution at week 3 ($M_{CM/NO\ EXP} = 3.19$) compared to participants carrying out the computer-mediated groupwork in any of the other three treatment conditions ($M_{SM/EXP} = 4.14$, $M_{SM/NO\ EXP} = 3.67$, $M_{CM/EXP} = 3.83$). It can therefore be implied that both membership and task experience affected a significant difference in subjects' satisfaction with the final task solution.

Confidence in group solution

Hypothesis 16 predicted that individuals acquiring judgment task experience as members of groups with stable membership would express higher levels of confidence that their group solution of the final judgment task was correct. As expected, participants acquiring judgment task experience as members of groups with stable membership expressed higher levels of confidence in their group solution of the final task than

individuals in any of the other three treatment conditions. Treatment group means are reported in Table 35.

Table 35. Measures of central tendency for confidence in group solution

Item	Treatment	Mean	SD	N
Q19. I am confident that the solutions our group came up with are correct	SM/EXP	3.98	0.56	42
	SM/NO EXP	3.50	0.63	42
	CM/EXP	3.50	0.67	42
	CM/NO EXP	3.05	0.79	42
	TOTAL	3.51	0.74	168

Subjects acquiring judgment task experience as intact groups during weeks 1 and 2 expressed higher levels of confidence in the group solution of the final task ($M_{SM/EXP} = 3.98$) compared to individuals who had undergone different groupwork conditions ($M_{SM/NO\ EXP} = 3.50$, $M_{CM/EXP} = 3.50$, $M_{CM/NO\ EXP} = 3.05$).

An ANOVA (see Table 36) on subjects' responses to item 19 "I am confident that the solutions our group came up with are correct" confirmed a main effect for membership ($M_{Stable} = 3.74$, $M_{Changing} = 3.27$), $F(1,164) = 20.10$, $p < .01$ and task experience ($M_{Experience} = 3.74$, $M_{No\ Experience} = 3.27$), $F(1,164) = 20.10$, $p < .01$. These findings support Hypothesis 16.

Table 36. Summary of the ANOVA for confidence in group solution

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	9.05	1	9.05	20.10	0.00
EXP	9.05	1	9.05	20.10	0.00
MEMBER * EXP	0.01	1	0.01	0.01	0.91
Error	73.88	164	0.45		
Total	91.99	167			

Reactions to computer-mediated groupwork

A comparison of subjects' responses to the post-treatment questionnaire item 30 "I like computer-mediated groupwork" revealed a main effect for membership (M_{Stable} =3.70, $M_{Changing}$ = 3.39), $F(1,164) = 6.14$, $p < .01$. Interestingly, the acquisition of task-related experience was not an influential factor on this measure of satisfaction ($M_{Experience}$ = 3.63, $M_{No\ Experience}$ = 3.46), $F(1,164) = .47$, $p > .01$ (see Table 37).

Table 37. Summary of the ANOVA for satisfaction with C-M groupwork

Source	Sum of Squares	df	Mean Square	F	Sig.
MEMBER	4.20	1	4.20	6.14	0.01
EXP	1.27	1	1.27	1.86	0.17
MEMBER * EXP	0.32	1	0.32	0.47	0.50
Error	111.62	163	0.68		
Total	117.41	166			

Descriptive data provided in Table 38 reveal that subjects carrying out computer-mediated groupwork in groups with stable membership over the three week period expressed higher levels of satisfaction with computer-mediated groupwork ($M_{SM/EXP}$ = 3.83, $M_{SM/NO\ EXP}$ = 3.57) while those who did not work with the same group members on more than one occasion expressed lower levels of satisfaction ($M_{CM/EXP}$ = 3.43, $M_{CM/NO\ EXP}$ = 3.34).

Table 38. Measures of central tendency for satisfaction with C-M groupwork

Item	Treatment	Mean	SD	N
Q30. I like computer-mediated groupwork	SM/EXP	3.83	0.99	42
	SM/NO EXP	3.57	0.70	42
	CM/EXP	3.43	0.77	42
	CM/NO EXP	3.34	0.82	41
	TOTAL	3.54	0.84	167

These finding suggest that some attributes associated with being part of an intact group over a prolonged period of time was a factor affecting participants' satisfaction with computer-mediated groupwork.

Correlation between dependent measures

In order to ascertain the relationships between the dependent measures in this study, a Pearson correlation was performed on all dependent variables investigated in this study. Correlation coefficients are presented in Table 39. Results reflect significant correlations at $p = .01$ between the final task score and all but one of the dependent measures (coordination).

Threats to internal validity

Possible threats to internal validity were history and testing. Since the data were collected through an asynchronous mode of computer-mediated communication over an extended period of time, the possibility exists that factors external to the study may have influenced subjects' performance and perceptions. Likewise, the pre-treatment as well as the weekly post-task questionnaires may have sensitized subjects to attitudes concerning groupwork and group process. Therefore, the possibility exists that performance and responses to questionnaire items may be an effect of experience with these tests.

Threats to external validity

A possible limiting factor to the generalizability of this study is that significant effects demonstrated by participants may not extend beyond the population from which the subjects is drawn (i.e., Commerce and Administration undergraduates). Also, the pre-

Table 39. Pearson correlation matrix for dependent measures

	Final task score	Shared knowledge (composite)	Awareness of others' ability	Media effectiveness	Time on task	Participation	Coordination	Cohesion (composite)	Collective orientation (composite)	Interdependence (composite)	Satisf (+) with task	Sastif (-) with task (composite)	Satisf (-) with process (composite)	Satisfaction with group solution	Confidence in group solution	I like computer-mediated groupwork.
Final task score	1.000	.290**	.439**	.322**	-.229**	-.273**	-.076	.345**	.380**	.428**	.247**	-.207**	-.252**	.326**	.345**	.202**
	.	.000	.000	.000	.003	.000	.324	.000	.000	.000	.001	.007	.001	.000	.000	.009
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Shared knowledge (composite)	.290**	1.000	.443**	.241**	-.309**	-.303**	-.148	.417**	.361**	.429**	.318**	-.457**	-.480**	.578**	.500**	.244**
	.000	.	.000	.002	.000	.000	.056	.000	.000	.000	.000	.000	.000	.000	.000	.001
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Awareness of others' ability	.439**	.443**	1.000	.349**	-.147	-.257**	-.077	.461**	.481**	.736**	.386**	-.321**	-.381**	.331**	.397**	.375**
	.000	.000	.	.000	.058	.001	.320	.000	.000	.000	.000	.000	.000	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Media effectiveness	.322**	.241**	.349**	1.000	-.026	-.196**	-.133	.402**	.365**	.497**	.506**	-.243**	-.357**	.411**	.477**	.526**
	.000	.002	.000	.	.743	.010	.086	.000	.000	.000	.000	.002	.000	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Time on task	-.229**	-.309**	-.147	-.026	1.000	.339**	.187*	-.169*	-.201**	-.127	-.057	.281**	.239**	-.122	-.144	-.134
	.003	.000	.058	.743	.	.000	.015	.029	.009	.102	.464	.000	.002	.115	.063	.084
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Participation	-.273**	-.303**	-.257**	-.196**	.339**	1.000	.163*	-.562**	-.488**	-.384**	-.193*	.032	.129	-.323**	-.322**	-.177*
	.000	.000	.001	.010	.000	.	.035	.000	.000	.000	.012	.680	.096	.000	.000	.022
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Coordination	-.076	-.148	-.077	-.133	.187*	.163*	1.000	-.041	.025	-.167*	-.222**	.292**	.160*	-.158*	-.147	-.077
	.324	.056	.320	.086	.015	.035	.	.595	.743	.031	.004	.000	.038	.040	.058	.320
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Cohesion (composite)	.345**	.417**	.461**	.402**	-.169*	-.562**	-.041	1.000	.667**	.683**	.383**	-.168*	-.273**	.523**	.504**	.297**
	.000	.000	.000	.000	.029	.000	.595	.	.000	.000	.000	.030	.000	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Collective orientation (composite)	.380**	.361**	.481**	.365**	-.201**	-.488**	.025	.667**	1.000	.533**	.321**	-.146	-.229**	.418**	.406**	.298**
	.000	.000	.000	.000	.009	.000	.743	.000	.	.000	.000	.060	.003	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Interdependence (composite)	.428**	.429**	.736**	.497**	-.127	-.384**	-.167*	.683**	.533**	1.000	.459**	-.254**	-.306**	.502**	.489**	.427**
	.000	.000	.000	.000	.102	.000	.031	.000	.000	.	.000	.001	.000	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Satisf (+) with task	.247**	.318**	.386**	.506**	-.057	-.193*	-.222**	.383**	.321**	.459**	1.000	-.430**	-.363**	.464**	.468**	.573**
	.001	.000	.000	.000	.464	.012	.004	.000	.000	.000	.	.000	.000	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Sastif (-) with task (composite)	-.207**	-.457**	-.321**	-.243**	.281**	.032	.292**	-.168*	-.146	-.254**	-.430**	1.000	.596**	-.319**	-.370**	-.246**
	.007	.000	.000	.002	.000	.680	.000	.030	.060	.001	.000	.	.000	.000	.000	.001
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Satisf (-) with process (composite)	-.252**	-.480**	-.381**	-.357**	.239**	.129	.160*	-.273**	-.229**	-.306**	-.363**	.596**	1.000	-.514**	-.509**	-.317**
	.001	.000	.000	.000	.002	.096	.038	.000	.003	.000	.000	.000	.	.000	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Satisfaction with group solution	.326**	.578**	.331**	.411**	-.122	-.323**	-.158*	.523**	.418**	.502**	.464**	-.319**	-.514**	1.000	.785**	.355**
	.000	.000	.000	.000	.115	.000	.040	.000	.000	.000	.000	.000	.000	.	.000	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
Confidence in group solution	.345**	.500**	.397**	.477**	-.144	-.322**	-.147	.504**	.406**	.489**	.468**	-.370**	-.509**	.785**	1.000	.286**
	.000	.000	.000	.000	.063	.000	.058	.000	.000	.000	.000	.000	.000	.000	.	.000
	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	167
I like computer-mediated groupwork.	.202**	.244**	.375**	.526**	-.134	-.177*	-.077	.297**	.298**	.427**	.573**	-.246**	-.317**	.355**	.286**	1.000
	.009	.001	.000	.000	.084	.022	.320	.000	.000	.000	.000	.001	.000	.000	.000	.
	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167

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

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

treatment and weekly questionnaires may have sensitized the subjects to some of the phenomena being studied, and may, through this focusing of participants' attention to attitudes about groupwork and group processes, have effected the outcome of their computer-mediated group performance. Finally, the generalizability of these results may be limited by the tasks performed by subjects in this study.

Chapter 5: Discussion

Group Performance

The results of this study add to previous research demonstrating that the more group members practice together as a group, the better they perform as a group on an asynchronous computer-mediated judgment task. The fact that groups acquiring judgment task experience in stable groups during weeks 1 and 2 scored substantially higher on the final task at week 3, compared to those who had not acquired these same types of experience, provides compelling evidence of the importance that gaining experience with a task as an intact group has on group performance. This finding, together with the evidence that groups who acquired neither group nor task experience performed the worst on the final task, further corroborates the work of Goodman and Leyden (1991), Goodman and Shah (1992), Hollingshead (1998b) and Moreland and Wingert's (1995) which contends that group task experience is the key to improved group performance. Groups who were able to acquire experience with the task as well as with fellow group members over a period of two weeks were able to routinize their division of labour, resources, and communication such that the computer-mediated groupwork during the final week became more efficient. Considering the significant correlations between the final task scores and all but one of the dependent measures (coordination) the remainder of this section addresses the effects of membership and task experience on group competencies and social experiences, and draws important links between these and group performance.

Knowledge competencies

Group experience allows individuals to more accurately judge the skills and knowledge of fellow group members (Moreland, Argote, & Krishnan, 1996). A main effect for membership on measures of shared knowledge and awareness of other's abilities seem to support this notion. According to Brown, Ash, Rutherford, Nakagawa, Gordon, and Campione (1993), as individuals' experience with the same group members increases, reciprocal interaction takes place within activities (e.g., CM groupwork) in which cognitions are shared. These activities provide the opportunity for group members' skills and cognition to be distributed across the group, such that an individual's "solo" cognitive network overlaps with ideas contributed by other members (Derry, DuRussel, and O'Donnell, 1998). This overlapping of individuals' cognitions or shared knowledge, which typically increases with opportunities for interaction, is facilitated by group experience with the same people. Interaction between people's cognitions leaves certain cognitive residues (Perkins, 1993) in the form of improved ability or increase in knowledge, and these changes in personal competencies, in turn, affect group members' ensuing activities, resulting in subsequent altered joint processes, performance and products. Essentially, a spiral-like development of the distributed cognitive system occurs whereby the group's distributed cognition and one's own personal competencies are reciprocally developed by one another (Salomon, 1993).

While responses to questionnaire items certainly do not confirm outright the development of distributed or shared cognitions between group members, subjects' perceptions of shared knowledge and awareness of other's abilities do strongly suggest that the building and sharing of knowledge did take place in asynchronous computer-

mediated groupwork environments. This implies that when people work together in a computer-mediated group over a prolonged period of time, the greater the potential that they will develop a collective group knowledge and an awareness of fellow group members' abilities. Thus, computer-mediated task work that is contingent on groups having these types of knowledge competencies will be better performed by groups with stable membership.

Despite the significant positive correlation between responses on measures of shared knowledge and awareness of other's abilities, $r = .44$, $p < .01$, only a main effect for group membership was detected on these dimensions of knowledge competency. Contrary to theories of shared and collective knowledge, task experience was not a mediating factor. An explanation for this result could lie with the fact that the judgment tasks carried out during weeks 1, 2 and 3 were dissimilar in content. Theories of transactive memory, distributed cognition, shared mental models and group schema include strong associations with task content. Had the judgment tasks been similar in content as well as type, a main effect for task experience may have resulted in addition to the main effect for membership. A review of the data analysis seems to give credence to this argument for the task experience factor almost reached levels of significance, suggesting that perhaps with a series of tasks that were highly related in content, and with more sensitive instruments and tests of significance, a main effect for experience would have materialized.

Skills competencies

Amount of communication

Groupwork treatment conditions did not affect the number of messages produced. A possible explanation could be that prior to the data collection, all subjects received extensive training on the CMC system used in this study as well as sufficient time to practice and to become familiar with this mode of communication. With a few notable exceptions (e.g., Burke & Chidambaram, 1999; Walther, 1992) the majority of studies on computer-mediated groupwork include minimal training and practice components in their experimental designs. Therefore this unexpected result could be due to the fact that all participants were experienced with FirstClass at the onset of the computer-mediated groupwork and that the lack of treatment effects on the number of messages exchanged indicates that individuals' familiarity with the medium allowed them to take advantage of its unique characteristics and functionality.

Asynchronous CMC allows for long and well constructed messages, granting time for reflection and synthesis. This implies that more can be expressed in one single message communicated asynchronously than could ever be transmitted synchronously. When variables such as group stability and task experience are factored in, both promoting development, automation and routinization, the amount of communication transmitted might well decrease as a mark of increasing efficiency.

With regard to the amount of overall remarks exchanged between group members, groups who remained stable over the duration of this study did generate significantly fewer remarks than groups who's membership changed weekly. This result corroborates Cannon-Bowers et al. (1995) claim that group members interacting together across

different types of tasks require group-specific competencies for effective group interaction. They contend that when group members perform together across a variety of tasks, the effectiveness of their interaction will be enhanced when members are familiar with each other. Group familiarity fosters coordination and helps members anticipate each other's behaviour, leading to increased group effectiveness and improved performance. In this study, familiarity with group members had a significant effect on group interaction: Stable groups generated significantly fewer remarks, and scored highest on the final judgment task.

Type of communication

Productive content-related communication. In keeping with the literature on the development of groupwork skills and competencies (e.g., Arrow & McGrath, 1993; Cannon-Bowers et al, 1995; McIntyre & Salas, 1995), participants experienced with the task-type focused more on the content of the task. Findings from this study suggest that subjects who acquired judgment task experience during weeks 1 and 2 developed knowledge specific to the type of task being performed. According to Cannon-Bowers et al. (1995), this task information, relating to specific competencies for carrying out this specific task, is assimilated by individual group members and can influence team performance regardless of the particular group members involved. Such competencies include an understanding of the task, good communication skills, positive attitudes towards groupwork, and strong coordination and planning skills. It is possible that in this study, groups having developed an accurate model of the task as well as a good understanding of the mechanisms and procedures for task accomplishment required less

communication about the process of doing the task, therefore explaining the occurrence of more content remarks generated by groups experienced with judgment tasks.

Productive process-related communication. While the lack of both group stability and task experience can be associated with the production of greater amounts of process-related remarks, a significant interaction of these two variables indicates that membership and task experience combined to produce a joint effect. In this investigation, when group membership was stable, the lack of task experience brought about significantly less process remarks compared to when group members were new to each other at week 3. Furthermore, unstable group conditions produced significantly fewer process remarks when group members were familiar with the task than when subjects were not experienced with the task. This pattern of communication may in fact be evidence of group members compensating for either group and/or task knowledge deficiencies.

Recent research investigating the kinds of knowledge structures most strongly associated with effective group performance (e.g., Cannon-Bowers et al., 1995; Hollingshead, 1998b; Moreland, Argote and Krishnan, 1996; Rentsch, Heffner and Duffy, 1994; and Rouse et al., 1992) emphasizes that knowledge and skills competencies are closely related. A number of studies have found that the sharing of accurate mental models (Cannon-Bowers, Salas, & Converse, 1993; Rouse, Cannon-Bowers, & Salas, 1992) and the distribution of knowledge and transactive processes in groups (Hollingshead, 1998b; Littlepage, Robinson, Reddington, 1997; Moreland & Winger, 1995; Moreland, Argote, & Krishnan, 1996) allow groups to execute various task-related activities more effectively and efficiently. For example, regarding task knowledge, group members must hold accurate models of task characteristics and processes for task

completion so that expectations for performance are formed, shared and parlayed into effective task execution. Skill knowledge, on the other hand, allows group members to adjust task strategies so that they are optimal with respect to their group members' performance. In computer-mediated groupwork situations in which group members are lacking either task or group knowledge, it would be expected that a large degree of the group interaction would involve seeking and validating this knowledge. Under such conditions, participants engaged in computer-mediated groupwork would do well to spend time establishing procedures for carrying out task activities as well as setting norms for communication. The results support this interpretation.

Non-productive communication. Members in stable groups produced the highest number of non-productive remarks. Of these, many took the form of interpersonal comments (e.g., "Good job." "Great idea!" "Sorry." "You're amazing." "Thanks.") that offered social support to fellow group members while others were task digressions (e.g., "I hope you guys agree with me." "This is what I think." "What should we do?") and personal comments (e.g., "How was your weekend?" "I had a ton of homework last night." "I'm going away for the weekend.") which detracted from task accomplishment. Furthermore, members of stable groups who did not acquire judgment task experience during weeks 1 and 2 generated more non-production remarks during the completion of the final task at week 3, indicating an interaction between membership and task experience. This implies that group development in combination with a lack of task familiarity induced a significantly greater amount of off-task communication.

According to a number of studies dealing with the effects of experience and change on group interaction and task performance (e.g., Arrow & McGrath, 1993; Diehl

& Stoebe, 1987), these findings exemplify typical behaviours of group members experienced with working together. McGrath's (1991) Time, Interaction, and Performance (TIP) theory contends that work groups are time-based, multi-functional, and multi-task social systems. Groups carrying out groupwork within a specified time frame, simultaneously and continuously engage in three functions: 1) task performance, 2) member-support, and 3) group well-being. Member-support and group well-being are strongly associated with the development of relationships between group members. As groups engage in activities relating to any one of McGrath's (1984) four task types (generating, choosing, negotiating and executing), these three functions are applied within the groupwork context. The more challenging the task and the more unfamiliar group members are with one another, the more difficult it is for groups to complete the groupwork. In order to avoid detrimental effects on performance, group members operating under these conditions tend to offer one another increased social support.

Media effectiveness, time on task, and participation

Participants who became experienced with their group while carrying out judgment tasks expressed more positive opinions towards the effectiveness of asynchronous CMC for carrying out this type of group task. These same individuals also reported spending less time on the final task, and perceived a more equal distribution of participation among group members. These findings suggest that the increase in group and task experience that occurred over time allowed groups to continuously re-adapt the group-task-technology fit to take advantage of the increased predictability, reduced ambiguity, and reduced coordination and information requirements (Cannon-Bowers et

al., 1995; McGrath & Hollingshead, 1994; McGrath & O'Connor, 1993; McGrath, Arrow, Gurenfeld, Hollingshead & O'Connor, 1993).

A significant correlation between these measures and the final task score leads to the assumption that subjects' accumulation of experience with computer-mediated judgment tasks as members of intact groups lead to a routinization of performance and thereby a reduction of the levels of equivocality and of coordination and information requirements needed to carry out the final judgment task (McGrath, Arrow, Gurenfeld, Hollingshead & O'Connor, 1993). As group norms of communication and task execution became established over time, group members required lesser amounts of time, interaction, and coordination to complete the final task effectively, therefore imparting to subjects the perception that CMC was effective for the completion of this judgment task.

Coordination

Coordination implies the discussion and planning of procedures and processes in order to complete a task. Participants acquiring judgment task experience expressed a lower need for group member coordination in completing the final judgment task. Contrary to the majority of research on group coordination (e.g., Cannon-Bowers et al., 1995; McIntyre & Salas, 1995; McGrath et al., 1993), subjects in stable groups did not report the same reduced need for coordination. These findings suggest that subjects who acquired judgment task experience during weeks 1 and 2 acquired key information about the work and task-specific responsibilities required to carry out the task via asynchronous CMC. Cannon-Bowers et al. (1995) contend that this type of information can be parlayed into improved coordination and planning skills such that task execution becomes more efficient. Therefore, results seem to indicate that groups having developed an accurate

model of the task as well as a good understanding of the mechanisms and procedures for task accomplishment required less coordination among group members.

Two peculiarities in these results for coordination require further examination. First, although significant correlations were established between coordination and the other dependent measures that comprise this group skills construct, no substantial relationship was detected between coordination and final task scores or media effectiveness. This raises a critical issue: If the aforementioned rationale regarding the acquisition of task experience is valid, then a significant correlation should accrue between coordination and final task scores. Second, the fact that membership did not affect this measure of coordination is quite peculiar. A reduced need for task coordination is a typical consequence of group members' experience with one another (Cannon-Bowers et al., 1995; McGrath, 1984, 1990, 1991; McIntyre & Salas, 1995). Given these results, more research is required in order to better understand the nature of coordination skills in CMC because it is a competency upon which effective and efficient computer-mediated groupwork is believed to heavily rely (Burke & Chidambaram, 1999; Carlson & Zmud, 1994; DeSanctis & Monge, 1998; Jarvenpaa & Leidner, 1998).

Attitudinal competencies

Group cohesion and collective orientation

In keeping with the literature on group cohesion (e.g., Driskell & Salas, 1992; Dutton, Dukerich, & Harquail, 1994; Moreland, Argote & Krishnan, 1996; Thompson, Kray, & Lind, 1998; Wech Mossholder, Steel, & Bennett, 1998), a significant positive relationship was detected between group measures of cohesion and collective orientation $r = .68$, $p < .01$. A membership effect on both of these measures indicates that there is a

strong association between group cohesion and collective orientation when it comes to carrying out judgment tasks via asynchronous CMC. Regardless of whether or not groups acquired task experience, familiarity with the group was a mediating factor on subjects' responses to measures of group cohesion and collective orientation.

Concurrent with bodies of research in the areas of group development (Bate & Travell, 1994; Cannon-Bowers et al, 1995; Dyer, 1995; McGrath, 1990; McGrath et al., 1993; McIntyre & Salas, 1995) and membership continuity (Argote & McGrath, 1993; Goodman & Leyden, 1991; Goodman & Shah, 1992; Kramer & Brewer, 1984; Owen, Mannix & Neale, 1998) findings reported in this study affirm that groups consisting of people who worked together over a period of time were more cohesive than those in which members had no experience with one another. Members of stable groups also expressed higher levels collective orientation, reflecting a greater inclination to cooperate with fellow group members. According to Dutton, Dukerich, & Harquail (1994) the stronger a collective orientation, the higher the tendency for group members to cooperate with each other and direct additional effort toward task accomplishment.

With regard to group process and task performance, stable (more cohesive) groups scored considerably higher on the final judgment task than groups with changing membership. These results substantiate previous research by Mullen and Copper (1994) and Klein and Mulvey (1995) in which cohesive groups were found to be committed to tasks with higher degrees of difficulty and complexity. Recent work by Gully, Devine, & Whitney (1995) reveal that commitment and responsibility to the group fostered the development of group processes and competencies required for the effective performance of tasks with high degrees of task interdependence.

Group member interdependence

In support of McGrath and Argote's (1993) claim that effective performance of tasks involving high levels of cooperation and conflict resolution (i.e., judgment tasks) requires considerable interdependence between group members, this study demonstrated that subjects who expressed the highest levels of group member interdependency performed best on the final judgment task. A significant correlation between interdependence and final task scores, $r = .428$, $p < .01$, substantiates these findings. Theories of shared mental models (Cannon-Bowers, Salas, & Converse, 1993; Rouse, Cannon-Bowers, & Salas, 1992), schema (Rentsch & Hall, 1994; Rentsch, Heffner, & Duffy, 1994) distributed cognition (Brown et al., 1993; Derry, DuRussel, & O'Donnell, 1998; Perkens, 1993; Salomon, 1993) and transactive memory (Moreland & Winger, 1995; Moreland, Argote, & Krishnan, 1996) all suggest that group performance is enhanced when group members are able to anticipate the behaviour of fellow group members through familiarization with task-specific and group-member specific characteristics. Therefore, the implication drawn from this study is that computer-mediated groups acquiring judgment task experience as intact groups developed actual and attitudinal interdependence, such that information exchange, cooperation and conflict resolution were facilitated, thus leading to higher task solution scores.

Social experiences

Satisfaction with the task and task process

Reports of satisfaction with the task and the process of carrying it out indicate that stable group membership positively affected subjects' level of satisfaction on these two

measures. A test of Pearson's correlation reveals a significant correlation between these two measures and final task scores. Subjects assigned to groups with changing membership, regardless of whether or not they acquired judgment task experience, expressed lower levels of satisfaction with the final task. These same subjects also reported a greater time pressure to complete the final task. This pressure to accomplish the task may be associated with subjects not being able to develop working relationships or shared mental models with their fellow group members. That is to say that members of groups with changing membership were unable to develop the knowledge, skills and attitudinal competencies that their counterparts in stable groups did. Hence these participants, who, due to the lack of group familiarity, were not as adept at completing the judgment task, generated the lowest group scores on the final task and expressed lower levels of satisfaction with the task and with the process of completing it, compared to participants who were members of stable groups.

Satisfaction and confidence with task solution

This study revealed that group membership and task experience generated positive influences on subjects' satisfaction and confidence with the task solution. Significant correlations between these two measures and final task scores provide further evidence that the computer-mediated group performance of tasks involving high levels of cooperation and conflict resolution is positively affected by group members' prior experience with the task and the group. In this investigation, the individual and group competencies developed as a result of acquiring task-related experience in stable groups not only increased the quality of the final task solution but also positively influenced subjects' levels of satisfaction and confidence with the final task solution. Adding to the

body of research on the effects of group and task experience on groupwork conducted by Burke & Chidambaram (1999); Bordia (1997, 1999); Calson and Zmud (1994); Cannon-Bowers et al. (1995); DeSanctis & Monge (1998); Hollingshead, (1998a, 1998b); Jarvenpaa & Leidner (1998); Liang, Moreland, & Argote (1995); Littlepage et al. (1997); McGrath et al. (1993); McIntyre & Salas (1995); Moreland & Winger (1995); Moreland, Argote, & Krishnan (1996); Walther (1992), this study corroborates recent findings about the potential effects of group and task experience on levels of satisfaction and confidence in carrying out difficult computer-mediated tasks.

Satisfaction with computer-mediated groupwork

Reports of satisfaction with the computer-mediated groupwork showed that subjects assigned to groups with changing membership, regardless of whether or not they acquired judgment task experience, expressed lower levels of satisfaction with computer-mediated groupwork. Unlike subjects who were assigned to new groups every week, members of stable groups were able to develop specific knowledge, skills and attitudinal competencies that facilitated the completion of the final judgment task via CMC. For example, within the context of this study, members of stable groups benefited from shared knowledge, awareness of other group members' abilities, higher levels of group cohesion and collective orientation, all of which had positive effects on group performance as well as levels of satisfaction with the group task, process and solution.

Task experience might have produced an effect on subjects' reported levels of satisfaction towards computer-mediated groupwork had the tasks been designed so that the content of each task built upon that which preceded it. That would have created a

task experience condition in which the type and the content of the task operated in a complementary fashion.

Finally, for 96.3% of the students participating in this research, this was the first time they had engaged in computer-mediated groupwork. The fact that there were no overwhelmingly positive or negative responses to this measure of satisfaction indicates that students were somewhat indifferent in their feelings towards this type of activity. If the groupwork had been carried out over a longer period of time, reactions towards computer-mediated groupwork may be been different. Bordia (1997, 1999), Burke and Chidambaram (1999) and DeSanctis and Monge (1998), among other researchers, contend that experience with CMC changes users perceptions of it. Drawing on McGrath's (1991) TIP theory, behaviours as well as attitudes can change as a function of experience with CMC. Given the observed effects of membership and task experience, it is reasonable to assume that over a longer period of observation, these two factors would have more greatly impacted participants reactions to computer-mediated groupwork.

Conclusion

Advances in communication technologies which enable and support collaboration among workers from different locations in the organizational structure are changing the way we organize and carry out our work. Consequently, computer-mediated groupwork, carried out over time- as well as geographically-dispersed working contexts, is fast becoming an essential part of the job. Virtual organizations, best described in terms of their de-centralized, team-based and distributed structures (Ahuja & Carley, 1998; DeSanctis & Jackson, 1994) manifest of the growing trend towards using CMC to coordinate and perform work-related tasks. As the era of distributed collaborative work

is now upon us, it is imperative to determine how groupwork is best carried out in an asynchronous CMC mode and to identify those contextual factors that increase the efficiency of the working process, foster a supportive collaborative community and contribute to the quality of the work produced.

With this in mind, this study investigated the effects of group membership and task experience on group performance, competencies and social experiences. Findings revealed that both variables mediated a positive influence on group performance of judgment tasks. Similarly, familiarity with the task and group members led to higher ratings of media effectiveness as well as higher levels of satisfaction and confidence with the final group product. The fact that membership and task experience effects were also demonstrated on a variety of issues pertaining to knowledge, skills and attitude competencies suggests that the effects of group continuity and task practice on computer-mediated groupwork are robust. Future research should address whether these results are generalizable across tasks, populations and performance contexts. It would also be beneficial to operationalize the self-report measures used in this study in order to further understand and substantiate the present findings.

From a theoretical perspective, this study adds corroborating evidence to small group research (e.g., Argote & McGrath, 1993; Arrow & McGrath, 1993; McGrath, 1984, 1990,1991,1998; McGrath et al., 1993) and to team training and performance literatures (e.g., Cannon-Bowrers et al., 1995, Guzzo, Jette & Katzell, 1995; Hollingshead,1998a; McIntyre & Salas, 1995). For the study of computer-mediated groupwork it also provides important new information about the relevance of group membership continuity and task experience to the performance of complex tasks.

Although empirical research on asynchronous computer-mediated groupwork carried out over time remains sparse, results of this study suggest several avenues for future research. Possible topics include examining the impact of membership and task experience on the development of individual as well as group competencies; further exploring issues of computer-mediated shared knowledge and distributed cognition; and, investigating whether there is a threshold at which point group familiarity begins to bear negative effects on computer-mediated group interaction and determining if there is a specific time within the group's development that membership change or other forms of intervention would be beneficial. Finally, on the issue of computer-mediated groupwork specifically, technological advances, increases in computer literacy and organizational re-structuring will provide endless opportunities for interesting and purposeful research. As organizations come to rely more heavily on computer-mediated groupwork, it becomes essential to understand how various organizational and personal factors implicated in a distributed work context affect the work environment, job requirements, process and performance.

From a more practical standpoint, this investigation informs us about computer-mediated groupwork contexts and how to prepare workers for the types of on-line activities in which they will engage. Computer-mediated groupwork in organizations is typically carried out among the same people, over a prolonged period of time and requires sustained interaction (Burke & Chidambaram, 1999). In this study, membership continuity positively affected group performance, competencies and social reactions to computer-mediated groupwork. Recent research by Hollingshead (1998a) on the effects of team practice on group skills and knowledge has concluded that groupwork

necessitates group task practice. The implication for computer-mediated groupwork in organizations is that practice of tasks in intact groups would likely be an effective training method when the same group of people are going to be performing similar tasks in their jobs. Training and work environments that expose work groups to the general principles and procedures underlying computer-mediated tasks, that present them with a variety of relevant examples and give them the opportunity and time to work on several similar problems would likely lead to improved group performance. These same strategies also extend to preparing future workers for computer-mediated collaborative work. Students would be best served by engaging in work environments that most resemble those in which they will eventually be working. The rate at which CMC use in organizations is increasing (see Straus, Weisband & Wilson, 1998) clearly suggests that a substantial portion of students' future workload will include the use of CMC to coordinate and perform work-related tasks with fellow workers.

To ensure that training does not compartmentalize people, skills and knowledge into specific task or group activities, this type of training should be used as a facilitative or first step measure. With this approach, workers can acquire job-relevant computer-mediated groupwork skills in intact groups so that much of the work required to carry out the assigned task is facilitated by group and task experience. Subsequent training would extend beyond the familiar groupwork context, incorporating new tasks and altering group membership so that knowledge, skills and attitudinal competencies are further developed. The objective is to design training and job environments that facilitate the transfer of skills and knowledge to new contexts (e.g., new tasks, new people, new CMC systems) so that workers can easily adapt to a variety of computer-mediated groupwork

situations. Learning in the workplace is about helping workers acquire the competencies they require to perform their jobs. Yet it is also about helping workers re-define their jobs so that their responsibilities increase as their skills develop.

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Appendix A

Consent Form

Computer-mediated communication (CMC) and Groupwork

Christina Dehler is exploring how students react to the use of computer conferencing (CC) for learning. This study will contribute to our understanding of CC course design and development. It will provide instructors with a detailed evaluation of the CC component of their course from a student perspective. As well, the instructor will have a better understanding of individual student use of the conferencing system and how students think this contributed to their learning in the course. It is hoped this information will help instructors improve their integration of CC into their courses.

Your instructor is participating in this study. I am asking you to voluntarily take part. If you agree to participate, rest assured that all information collected for the purposes of this research project will be kept confidential.

Your participation is voluntary; you are under no obligation to take part in this study. Also, you may choose to discontinue your participation at any time. If you choose to discontinue participation, no data you have provided will be used in the study. Furthermore, your decision will in no way affect your grade in this course.

If you agree to participate, please read and sign this consent form and complete the questionnaire. At the end of the semester, you will be asked to fill out another questionnaire which will focus on an evaluation of the CC component of the course. We would also like to have access to your achievement results in this course. Finally, we would like to collect your course-related online messages; this would involve only messages to the course conferences, not any private communications.

Once this information has been compiled, a brief summary of results will be made available to you and a more complete explanation of the study will be provided if you so desire. I will also be pleased to discuss the results once my dissertation is complete. Any questions or concerns you have with respect to this research should be addressed to Christina Dehler via e-mail at dehler@vax2.concordia.ca, or via FirstClass at Christina Dehler.

Student Consent to Participate in Research

This is to state that I agree to participate in data collection for research conducted by Christina Dehler for her doctoral dissertation in Educational Technology. I have read the above description and understand the agreement. I freely consent and agree to participate in the collection of data for this research project.

_____I agree to participate. _____I do not agree to participate.

Name (please print) _____ Student ID _____

I would like a copy of the study findings when they are available. ___Yes ___No

Signature _____ Date _____

FirstClass Information

Accessing FirstClass from a remote site

Option 1: Purchase FirstClass Client 5.5 software
"Installation and Getting Started Kit" in the bookstore for $5.50

Option 2: Download FirstClass Client 5.5
http://mercato.concordia.ca

NOTE: If you download FirstClass from the Internet, insert the following information into your connection set-up
Server: 132.205.29.150
Connect via: tcp-ip

Accessing FirstClass from school

1) Loyola Internet Lab, CC212. Get a lab account in CC207. Takes 24 hours to activate.
2) SGW Internet Lab, H511-1. Get a lab account in H925. Takes 24 hours to activate.
3) SGW Lab H980. Get lab account in H925. Takes 24 hours to activate.
4) Lab on 9th Floor of GM building. No account required.

Logging in with your accounts

Your **Username** is the first letter of your name plus your full last name
Example: 1. John Smith = jsmith
2. Gervais de Montbrun = gdemontbrun

Your **Password** is your Concordia student ID number

Public accounts are also available for browsing
Username: public
Password: public

Technical services Hotline 848-7368
support@mercato.concordia.ca

My e-mail is: dehler@vax2.concordia.ca
Christina Dehler on FirstClass
Voice mail: 828-2923

Instructions

COMM210-G Groupwork on FirstClass

Remember that ALL task work is to be carried out via FirstClass.
All groupwork is be carried out in your Group conference area.

Nature of the task work

Your task work is divided into two components: An individual component and a group component. The individual component involves your looking over the task and submitting your solution to the **Ind-Submissions** conference area. The **Ind-Submissions** area (represented by a pen and paper icon) is located in the **COMM210-G-GROUPS** conference area. The group component entails your working through the same task with your group, reaching a group solution and posting it to the **Gr-Submissions** conference area. This is also located in the **COMM210-G-GROUPS** conference area (represented by a check-mark icon).

Schedule

WEEK 1	
Day 1 (Thur. Oct 22)	You receive your task
Day 2 (Fri. Oct 23)	You submit the individual component
Day 3-7 (Sat. Oct 24 - Wed. Oct 28)	You work with your group on-line (via FirstClass)
Day 7 (Wed. Oct 28)	Your group submits its group solution
	Everyone completes a post-task questionnaire
WEEK 2	
Day 1 (Thur. Oct 29)	You receive your task
Day 2 (Fri. Oct 30)	You submit the individual component
Day 3-7 (Sat. Oct 31 - Wed. Nov 4)	You work with your group on-line (via FirstClass)
Day 7 (Wed. Nov 4)	Your group submits its group solution
	Everyone completes a post-task questionnaire
WEEK 3	
Day 1 (Thur. Oct 29)	You receive your task
Day 2 (Fri. Oct 30)	You submit the individual component
Day 3-7 (Sat. Oct 31 - Wed. Nov 4)	You work with your group on-line (via FirstClass)
Day 7 (Wed. Nov 4)	Your group submits its group solution
	Everyone completes a post-task questionnaire

Individual Component

You are free to submit your individual task component anytime during Day 1 and 2. When you are completing the individual component, please do not discuss the task with anyone in your class (including your fellow group members) until you have submitted your individual solution to the Ind-Submissions conference area.

Group Component
The group component of this groupwork is to be carried out via **FirstClass only**. Please do not discuss any aspect of your task work outside of the FirstClass computer-mediated environment (i.e., don't discuss the task work with your teammates in person or over the telephone). Also, do not discuss your groupwork with anyone else in the class (either in person or via FirstClass).

All computer-mediated groupwork is to be carried out in your group conference area by posting messages to that area. When discussing any aspect of this task work, please do not exchange any personal e-mail with your teammates or engage in "live chats' with your fellow group members. Your group discussion is to proceed through you and your group members' posting messages to your group area. These posted messages will remain in your group area so that all group members can read and respond to them.

Task Work Process

Group areas have been set up and each student has been assigned to a group area. Only you and your fellow group members can access your particular group area. All other students are denied access. Messages informing you of what group you belong to are sent to you personally on FirstClass. You can also figure out what group you belong to by trying to access the different group areas. You will only be granted access to one area -- your group area.

On Day 1, you'll receive two messages on FirstClass: One containing the individual component of your task work and another informing you of what group you belong to.

On Day 3, you will receive another e-mail containing the group component of your task work. You will begin your group discussion.

On Day 7, one member of each group will submit a group solution to the appropriate area. Every student will complete a post-task questionnaire via FirstClass.

Once you have submitted your individual component of the task work to the appropriate area, start off your group discussion by posting a message to your group area. The message remains posted for all your group members to read and respond to. Your computer-mediated or "on-line" discussion is not going to proceed through live chats with one another but rather by a series of posted messages (to which every group member responds). The point of posting messages to your group area as opposed to sending messages to each other is that a thread or line of discussion will be created in your group area that will allow all members of the group to carry on a cohesive discussion of the problem at hand. As the discussion builds, you move toward reaching a group solution.

Good luck and have fun.
Christina

Note: This information is posted in your COMM210-G-Groups conference area.

Appendix B

Pre-treatment Questionnaire

ALL YOUR RESPONSES WILL REMAIN CONFIDENTIAL

Part A

Please answer the following questions by marking an 'x' in the appropriate space or providing the information requested.

1. Student ID: _____

2. Age ___18-24 ___25-30 ___31-35 ___36-40 ___41 plus

3. Gender ___male ___female

4. First Language (mother tongue) ___English ___French ___Other

5. Occupation _____

6. What program are you in _____

7. What year of the program ____

8. How well do you type
   ___ I have to search for all the keys visually to find them
   ___ I can touch-type the lettered keys without looking
   ___ I can touch-type both letters and numbers without looking

9. I do my own typing using a computer for word processing
   ___ never ___ sometimes ___frequently ___ all the time

10. I own or have easy access to a computer with modem? ___yes ___no

11. I have easy access to the Internet. ___yes ___no

Part B

Please rate your experience with the following activities by marking an 'x' in the space that best corresponds to your response. Please choose only one response for each statement.

12. Have you used a groupware or computer-mediated communication system?
    ___ A lot ___Frequently ___Occasionally ___A few times ___Never

13. How often have you participated in groupwork?
    ___ A lot ___Frequently ___Occasionally ___A few times ___Never

14. Have you ever participated in computer-mediated groupwork?
    ___ A lot ___Frequently ___Occasionally ___A few times ___Never

Part C

Please respond to the following statements by marking an 'x' in the space that best corresponds to your response. Please choose only one response for each statement.

15. I try to be with people.
___Usually ___Often ___Occasionally ___Rarely ___Never

16. I let other people decide what to do.
___Usually ___Often ___Occasionally ___Rarely ___Never

17. I tend to put everything off until the last minute.
___Usually ___Often ___Occasionally ___Rarely ___Never

18. I find it difficult to speak my thoughts clearly to other people.
___Usually ___Often ___Occasionally ___Rarely ___Never

19. I let other people strongly influence my actions.
___Usually ___Often ___Occasionally ___Rarely ___Never

20. I try to include other people in my plans.
___Usually ___Often ___Occasionally ___Rarely ___Never

21. I like to work in a planned and orderly fashion.
___Usually ___Often ___Occasionally ___Rarely ___Never

22. I am easily led by people.
___Usually ___Often ___Occasionally ___Rarely ___Never

23. I try to avoid being alone.
___Usually ___Often ___Occasionally ___Rarely ___Never

24. I try to participate in group activities.
___Usually ___Often ___Occasionally ___Rarely ___Never

25. I find it difficult to express my thoughts in writing.
___Usually ___Often ___Occasionally ___Rarely ___Never

26. I like to share my work with other people.
___Usually ___Often ___Occasionally ___Rarely ___Never

27. I try to be the dominant person when I am with people.
___Usually ___Often ___Occasionally ___Rarely ___Never

28. I try to influence other people's actions.
___Usually ___Often ___Occasionally ___Rarely ___Never

29. I try to have other people do things the way I want them done.
___Usually ___Often ___Occasionally ___Rarely ___Never

30. I take charge of things when I'm with people.
___Usually ___Often ___Occasionally ___Rarely ___Never

31. I like to schedule my work carefully.
___Usually ___Often ___Occasionally ___Rarely ___Never

Part D

Please indicate your level of agreement with the following statements by marking an 'x' in the space that best corresponds to your response. Please choose only one response for each statement.

32. I like groupwork.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

33. I like computer-mediated groupwork.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

34. Group members trust one another.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

35. When a group assignment counts for a portion of the course grade, every member of the group should receive the same mark for that group assignment.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

36. The mark the group receives depends on every group member's input.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

37. Group members share equally in the responsibility for the group's success or failure.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

38. Groupwork involves spending a lot of time overcoming differences of opinion.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

39. Group members influence one another's ideas.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

40. Group members influence one another's performance.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

41. Group members have an awareness of one another's abilities.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

42. Members of a group learn from each other.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

43. Successful groupwork requires every group member's input.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

Post-task Questionnaire

ALL YOUR RESPONSES WILL REMAIN CONFIDENTIAL

Part A

Please indicate your level of agreement with the following statements by circling the number that best corresponds to your answer. Please choose only one response for each statement.

With regard to the group component of Week 2's task

1. I enjoyed working on this group task.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

2. Working on this group task was frustrating.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

3. This method of discussion was effective.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

4. My fellow group members were helpful in getting the job done.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

5. Every member of our group should receive the same grade.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

6. All my group members shared in the responsibility for the group's success or failure.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

7. Members of our group think alike.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

8. The group task required a lot of effort.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

9. Working with my fellow group members was frustrating.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

10. Our group spent a lot of time overcoming differences of opinion.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

11. Group members influenced one another's ideas.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

12. Group members influenced one another's performance.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

13. Group members were aware of one another's abilities.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

14. Members of our group learned from each other.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

15. Members of our group helped one another.
Strongly Disagree 1 2 3 4 5 Strongly Agree

16. I would like to work with the same group members again.
Strongly Disagree 1 2 3 4 5 Strongly Agree

17. The group task was difficult.
Strongly Disagree 1 2 3 4 5 Strongly Agree

18. The group task required a lot of coordination among our group's team members.
Strongly Disagree 1 2 3 4 5 Strongly Agree

19. I am confident that the solutions our group came up with are correct.
Strongly Disagree 1 2 3 4 5 Strongly Agree

20. The final group solution reflects my own ideas and points of view.
Strongly Disagree 1 2 3 4 5 Strongly Agree

21. I am satisfied with the solutions that my group came up with.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Part B

Please answer the following questions by marking an 'x' in the appropriate space or providing the information requested.

22. How much did you participate in the discussion compared to the other group members?

Compared to participant Guest___ I participated
___much less ___less ___about the same ___more ___much more

Compared to participant Guest___ I participated
___much less ___less ___about the same ___more ___much more

23. How much time did you spend on this group assignment (in hours)? ___

24. How does your total number of hours worked on this group task break down:
___hours of online work ___ hours of off-line work

25. Did you carry out any of Week 2's computer-mediated groupwork from home? ___Yes ___No

26. Did you carry out any of Week 2's computer-mediated groupwork from any of the Concordia University computer labs? ___Yes ___No

Please feel free to use the space below to expand on any of your responses to the previous questions and/or comment on any aspect of Week 2's group task.

THANK YOU VERY MUCH

Post-treatment Questionnaire

ALL YOUR RESPONSES WILL REMAIN CONFIDENTIAL

Part A

Please indicate your level of agreement with the following statements by circling the number that best corresponds to your answer. Please choose only one response for each statement.

Regarding the final Week 3 group assignment 'Disciplinary Action Case - Group Component',

1. I enjoyed working on this task.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

2. Working on this task was frustrating.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

3. This method of discussion was effective.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

4. My fellow group members were helpful in getting the job done.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

5. Every member of our group should receive the same grade.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

6. All my group members shared in the responsibility for the group's success or failure.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

7. Members of our group think alike.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

8. The task required a lot of effort.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

9. Working with my fellow group members was frustrating.
   Strongly Disagree 1 2 3 4 5 Strongly Agree

10. Our group spent a lot of time overcoming differences of opinion.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

11. Group members influenced one another's ideas.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

12. Group members influenced one another's performance.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

13. Group members were aware of one another's abilities.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

14. Members of our group learned from each other.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

15. Members of our group helped one another.
    Strongly Disagree 1 2 3 4 5 Strongly Agree

16. I would like to work with the same group members again.
Strongly Disagree 1 2 3 4 5 Strongly Agree

17. The task was difficult.
Strongly Disagree 1 2 3 4 5 Strongly Agree

18. The task required a lot of coordination among our group's team members.
Strongly Disagree 1 2 3 4 5 Strongly Agree

19. I am confident that the solutions our group came up with are correct.
Strongly Disagree 1 2 3 4 5 Strongly Agree

20. The final group solution reflects my own ideas and points of view.
Strongly Disagree 1 2 3 4 5 Strongly Agree

21. I am satisfied with the solutions that my group came up with.
Strongly Disagree 1 2 3 4 5 Strongly Agree

22. I felt pressured trying to complete the task in the allotted time.
Strongly Disagree 1 2 3 4 5 Strongly Agree

23. I felt our group needed more time to do a good job on this group task.
Strongly Disagree 1 2 3 4 5 Strongly Agree

Part B

Please answer the following questions by marking an 'x' in the appropriate space or providing the information requested.

Regarding the final group assignment 'Disciplinary Action Case - Group Work',

24. How much did you participate in the group discussion compared to the other group members?
___much less ___less ___about the same ___more ___much more

25. How much time did *you* spend on this assignment (in hours)? ___

26. How does your total number of hours worked on this assignment break down?
___hours of online work ___ hours of off-line work

27. Did you carry out any of Week 3's computer-mediated groupwork from home? ___Yes ___No

28. Did you carry out any of Week 3's computer-mediated groupwork from any of the Concordia University computer labs? ___Yes ___No

Please feel free to use the space below to expand on any of your responses to this questions and/or comment on any aspect of Week 3's group task.

Part C

The following set of questions deals with your attitudes towards groupwork and computer-mediated communication. Taking into consideration your last two weeks of computer-mediated groupwork, please indicate your level of agreement with the following statements by marking an 'x' in the space that best corresponds to your response. Please choose only one response for each statement.

29. I like groupwork.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

30. I like computer-mediated groupwork.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

31. Computer-mediated groupwork requires a lot of time
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

32. Computer-mediated groupwork is difficult
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

33. Computer-mediated groupwork is easier than traditional face-to-face groupwork
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

34. Computer-mediated groupwork requires a lot of work
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

35. Group members trust one another.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

36. When a group assignment counts for a portion of the course grade, every member of the group should receive the same mark for that group assignment.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

37. The mark the group receives depends on every group member's input.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

38. Group members share equally in the responsibility for the group's success or failure.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

39. Groupwork involves spending a lot of time overcoming differences of opinion.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

40. Group members influence one another's ideas.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

41. Group members influence one another's performance.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

42. Group members have an awareness of one another's abilities.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

43. Members of a group learn from each other.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

44. Successful groupwork requires every group member's input.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

45. It was difficult completing the computer-mediated groupwork in the allotted time.
___Strongly Disagree ___Disagree ___Undecided ___Agree ___Strongly Agree

Please feel free to use the space below to comment on any aspect of the computer-mediated task work you carried out during the last couple of weeks.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

Appendix C

Week 1 Judgment Task
(Individual component)

THE VAN TASK

Instructions
The individual component of this task involves your looking over the problem and submitting your initial reactions and/or solutions to the **Ind. Submissions** conference area. The **Ind. Submissions** area (represented by a pen and paper icon) is located in the **COMM210-01-GROUPS** conference area.

You have until Thursday (Oct 8) evening to post your individual solution. You are free to submit your individual task component anytime during this 2-day period.

Please don't discuss any aspect of this task with anyone else in your class.

THE TASK
You are a group of executives with a cosmetics firm who have been assigned the task of dealing with the transportation situation of a number of regional sales divisions. Due to a downturn in the economy, the company can only provide one new car per region. It is to the company's advantage to eliminate older vehicles that have been depreciated. Today, you will be making a decision about how to best manage the vehicles in Region 1. The only new resources that you can give Region 1 is one Chevrolet Lumina Van and $1000 in repair money. Each representative has been asked to make a case for why she should be provided a new van.

How should this vehicle situation be managed? Please provide enough explanation to justify your decision.

Your solution will be scored for analysis and decision criteria.

- Erica is 47 years old, divorced with one adult daughter, and has been with the company 17 years. She has a 2-year old Ford Van with 24,000 miles. She earned $105,00 last year and has the smallest territory. She believes that when a new Chevrolet becomes available that she should get it because she has the most seniority and she doesn't like her present van. She prefers a Chevrolet as she had before the company supplied her with her present Ford.

- Jill is 33 years old, married, has two children ages 3 and 5, and has been with the company 11 years. Jill has a small territory and earned $75,000 last year. She has a 4-year old Dodge Van with 52,000 miles. Jill believes that she deserves a new van because her van is older and the person with the most seniority has a fairly new vehicle. She has taken excellent care of her Dodge van and has kept it looking like new. It has never had a mechanical problem. She believes that a person deserves to be rewarded for keeping a vehicle in good condition. She prefers not to drive a Ford.

- Elaine is 35 years old, divorced, has a 5 year-old daughter, and has been with the company 6 years. She has an extremely large territory and made $103,000 last year. She has a 5-year old Ford Van with 90,000 miles. Elaine believes that she deserves a new van because she has to cover the largest territory with a fairly old van. She feels that she should have a new one because she doesn't want to be stranded so far from home, as she once was on a particularly long trip to Minneapolis. She doesn't like Ford or Chevy vans.

- Charlene is 28, single, and has been with the company 5 years. She has the second largest territory and made $79,000 last year. She has a 3-year old Ford Van with 60,000 miles. Charlene believes that she deserves a new van because hers has inadequate heating and cooling. The cold air is very bad at times because a previous repair on a door was not done correctly. She thinks this is one reason that she gets so many colds. She does not care about the make of the vehicle, but she insists on good tires, good brakes, and reasonable comfort.

- Beth is 25, divorced, no children, and has been with the company 3 years. She has a small territory and earned $39,000 last year. She has a 5-year old Chevrolet Van with 120,000 miles. Beth believes that she deserves a new van because of the aggravation that she has had with her van over the past 3 years. Beth has the poorest vehicle in the crew. It was in a wreck before she got it. She has had several breakdowns over the past 3 years. She doesn't care about the make of the vehicle that she drives.

Week 1 Judgment Task
(Group component)

THE VAN TASK

Before proceeding with the group component of this task, you must first submit your individual component to the Ind. Submissions area.

Instructions
The group component of this task involves your discussing the problem on-line with your group members and submitting a group solution to the **Group Submissions** conference area. The **Group Submissions** area (represented by a check-mark) is located in the **COMM210-01-GROUPS** conference area. Please submit one group solution per group.

You have until Tuesday (Oct 13) evening to post your group solution. Your group is free to submit its group solution anytime during this 5-day period.

Please restrict all of your group discussion to your designated group area. Post all messages to your group conference area. Do not send e-mail to your fellow group members' accounts, nor discuss your groupwork outside of the FirstClass communication system.

Please don't discuss any aspect of this task with anyone else in your class.

THE GROUP TASK
You are a group of executives with a cosmetics firm who have been assigned the task of dealing with the transportation situation of a number of regional sales divisions. Due to a downturn in the economy, the company can only provide one new car per region. It is to the company's advantage to eliminate older vehicles that have been depreciated. Today, you will be making a decision about how to best manage the vehicles in Region 1. The only new resources that you can give Region 1 is one Chevrolet Lumina Van and $1000 in repair money. Each representative has been asked to make a case for why she should be provided a new van.

Your group must come to an agreement on how this vehicle situation should be managed.

When submitting your group solution, please provide enough explanation to justify your group's decision.

Your group solution will be scored for analysis and decision criteria.

- Erica is 47 years old, divorced with one adult daughter, and has been with the company 17 years. She has a 2-year old Ford Van with 24,000 miles. She earned $105,00 last year and has the smallest territory. She believes that when a new Chevrolet becomes available that she should get it because she has the most seniority

and she doesn't like her present van. She prefers a Chevrolet as she had before the company supplied her with her present Ford.

- Jill is 33 years old, married, has two children ages 3 and 5, and has been with the company 11 years. Jill has a small territory and earned $75,000 last year. She has a 4-year old Dodge Van with 52,000 miles. Jill believes that she deserves a new van because her van is older and the person with the most seniority has a fairly new vehicle. She has taken excellent care of her Dodge van and has kept it looking like new. It has never had a mechanical problem. She believes that a person deserves to be rewarded for keeping a vehicle in good condition. She prefers not to drive a Ford.

- Elaine is 35 years old, divorced, has a 5 year-old daughter, and has been with the company 6 years. She has an extremely large territory and made $103,000 last year. She has a 5-year old Ford Van with 90,000 miles. Elaine believes that she deserves a new van because she has to cover the largest territory with a fairly old van. She feels that she should have a new one because she doesn't want to be stranded so far from home, as she once was on a particularly long trip to Minneapolis. She doesn't like Ford or Chevy vans.

- Charlene is 28, single, and has been with the company 5 years. She has the second largest territory and made $79,000 last year. She has a 3-year old Ford Van with 60,000 miles. Charlene believes that she deserves a new van because hers has inadequate heating and cooling. The cold air is very bad at times because a previous repair on a door was not done correctly. She thinks this is one reason that she gets so many colds. She does not care about the make of the vehicle, but she insists on good tires, good brakes, and reasonable comfort.

- Beth is 25, divorced, no children, and has been with the company 3 years. She has a small territory and earned $39,000 last year. She has a 5-year old Chevrolet Van with 120,000 miles. Beth believes that she deserves a new van because of the aggravation that she has had with her van over the past 3 years. Beth has the poorest vehicle in the crew. It was in a wreck before she got it. She has had several breakdowns over the past 3 years. She doesn't care about the make of the vehicle that she drives.

Week 1 Idea Generation Task
(Individual component)

VINYL DISK PROBLEM

Instructions
The individual component of this task involves your looking over the problem and submitting your initial reactions and/or ideas to the **Ind. Submissions** conference area. The **Ind. Submissions** area (represented by a pen and paper icon) is located in the **COMM210-01-GROUPS** conference area.

You have until Thursday (Oct 8) evening to post your individual solution. You are free to submit your individual task component anytime during this 2-day period.

Please don't discuss any aspect of this task with anyone else in your class.

THE PROBLEM
In the production of intermediate and final goods some organizations run into the situation of having excess production capacity or not having enough capacity. These types of situations present challenges for organizations as they must make decisions about how to best solve this problem. The music recording industry is currently facing such a dilemma.

Most people know what an album looks like. Many of us play albums every day. The 12 inch grooved vinyl disk has been the prevalent recording media used by the music recording industry for a number of years. Year after year the number of albums sold had risen steadily. Given the growing market, the music recording industry had steadily increased its production capabilities for vinyl disks.

However, recently the widespread acceptance of both cassette tapes and compact disks (CDs) has drastically reduced the sales of albums. Now that the demand for musical recordings on albums has dropped dramatically, the industry has excess capacity for vinyl disk production. Instead of cutting back this production and reducing the number of jobs in this area the industry would like to find additional uses for vinyl disks.

How else might vinyl disks be used? Follow these instructions when generating ideas.

1. Generate as many ideas as possible.
2. Strive for ideas that will have market value.
3. The ideas should also be feasible.
4. Be specific in stating your ideas.

Your ideas will be scored for quantity, marketability, and feasibility.

Week 1 Idea Generation Task
(Group component)

VINYL DISK PROBLEM

Before proceeding with the group component of this task, you must first submit your individual component to the Ind. Submissions area.

Instructions
The group component of this task involves your generating ideas on-line with your group members and submitting a final group list to the **Group Submissions** conference area. The **Group Submissions** area (represented by a check-mark) is located in the **COMM210-01-GROUPS** conference area. Please submit one group list of ideas per group.

You have until Tuesday (Oct 13) evening to post your group solution. Your group is free to submit its group solution anytime during this 5-day period.

Please restrict all of your group discussion to your designated group area. Post all messages to your group conference area. Do not send e-mail to your fellow group members' accounts, nor discuss your groupwork outside of the FirstClass communication system.

Please don't discuss any aspect of this task with anyone else in your class.

THE GROUP TASK
In the production of intermediate and final goods some organizations run into the situation of having excess production capacity or not having enough capacity. These types of situations present challenges for organizations as they must make decisions about how to best solve this problem. The music recording industry is currently facing such a dilemma.

Most people know what an album looks like. Many of us play albums every day. The 12 inch grooved vinyl disk has been the prevalent recording media used by the music recording industry for a number of years. Year after year the number of albums sold had risen steadily. Given the growing market, the music recording industry had steadily increased its production capabilities for vinyl disks.

However, recently the widespread acceptance of both cassette tapes and compact disks (CDs) has drastically reduced the sales of albums. Now that the demand for musical recordings on albums has dropped dramatically, the industry has excess capacity for vinyl disk production. Instead of cutting back this production and reducing the number of jobs in this area the industry would like to find additional uses for vinyl disks.

How else might vinyl disks be used? Working with your group, try to think of as many ideas as you can.

Follow these instructions when generating ideas.

1. Generate as many ideas as possible.
2. Strive for ideas that will have market value.
3. The ideas should also be feasible.
4. Be specific in stating your ideas.

Your group's ideas will be scored for quantity, marketability, and feasibility.

Week 2 Idea Judgment Task
(Individual component)

ALPHA BETA GAMMA TASK

Instructions
The individual component of this task involves your looking over the problem and submitting your initial reactions and/or solutions to the **Ind. Submissions** conference area. The **Ind. Submissions** area (represented by a pen and paper icon) is located in the **COMM210-01-GROUPS** conference area.

You have until Thursday (Oct 15) evening to post your individual solution. You are free to submit your individual task component anytime during this 2-day period.

Please don't discuss any aspect of this task with anyone else in your class.

THE TASK
Your task is to read the available information about three companies and to rank order them based on which company you would prefer to invest in most, second most and least. Once you have made your choice, please provide a brief rationale as to why you ranked the companies the way you did.

Your ranking will be scored for analysis and decision criteria.

The Alpha Company
Alpha earned $6.4 billion in 1996. It is a diversified health care, animal health, consumer products and chemical company. Drug sales accounted for half of the company's earnings. Currently, drugs have the highest profit margins of any product category. However, legislature is pending that may increase governmental control over insurance reimbursements of drugs to drug companies, which would greatly reduce profit margins. Alpha expects to have a 20% increase in its earnings over the next 5 years. It has an "AA - very good" debt rating, signifying that it has low debt. (The best debt rating is AAA - excellent; the worst is BBB.) The current CEO at Alpha has been in his position for 3 years. Alpha's current ratio of managers to workers is 1:15, which is lower than the national average. The company has an average employee turnover rate, the average length of employment at Alpha is 8.1 years. The national average is 5.2 years. Its aggressive research and development spending in the early 1990's is paying off. It developed 9 promising drugs during that time. One of these drugs is an antidepressant that will be used for treating bulimia and obesity. Sales for this drug are expected to reach $1 billion in 2001. Alpha is also planning on selling its less profitable chemical companies to invest more money in the research and development of pharmaceuticals. The United States and Canada account for 95% of the company's sales. Alpha is planning to expand its operations to Europe. The European drug regulations are less strict than American drug regulations. The company, however, has received some bad press on one of its drugs for fears that it may make one prone to acts of violence or suicide. However, these allegations have not yet been proven. Three claims have been brought (as of July

1997) against Alpha for its dysfunctional heart valves. The compensation paid to each has ranged from $500,000 to $1,000,000.

Beta Incorporated

Beta Incorporated earned 4.4 billion in 1996. It is the leading U.S. household products marketer with dominant market shares in detergents, soaps, disposable diapers and shampoo. The company also has a sizable food business which has significant market positions in coffee, vegetable oils, peanut butter and orange juice. Household and food products have relatively small profit margins, but have a high and stable volume of sales. Beta Inc. expects to have a 12% increase in its earnings over the next 5 years. It has an "A - good" debt rating, signifying that it has relatively low debt. (The best debt rating is AAA -excellent; the worst is BBB.) The current CEO at Beta has been in his position for 2 years. Beta's current ratio of managers to workers is 1:8, which is the national average. The company has a relatively low turnover rate, the average length of employment at Beta is 7.3 years. The national average is 5.2 years. The goal of Beta Inc's management is to expand European markets and joint ventures in Korea and China. The company expects foreign markets to account for 20% of its income by 2001. Beta Inc. plans to expand both its U.S. and foreign food business. It also plans to increase its research and development spending on new low calorie food products, which is a quickly growing market in the U.S. It has also developed a cholesterol free, fat substitute which could also be a major product breakthrough, given the current health conscious trend in the U.S. This fat-free substitute could be used in the place of any fat in products from tv dinners to desserts to snack foods to dairy products. It is very likely that it will be approved by the U.S. Food & Drug Administration. A comprehensive research study has shown that most consumers have very positive attitudes toward the company and trust the company's products. They report being very willing to try any new product launched by the company. Beta Inc. spends more money on advertising than any other company in the United States. Each of the company's products gets better advertising exposure than its competitors.

Gamma Corporation

Gamma earned $9 billion in 1996. It is the leading and most profitable cigarette manufacturer worldwide. It has the largest selling brand in the world. Cigarettes have one of the highest profit margins of any product category (aside from pharmaceuticals). However, federal taxes on cigarettes and liquor are expected to increase 10% in the next 5 years. Cigarette sales accounted for 60% of the Gamma's profits. It is also the largest food marketer in the U.S. and owns the nation's second largest brewer. Gamma expects to have an 18% increase in its earnings over the next 5 years. It has an "AAA - excellent" debt rating, signifying that it has no debt. (The best debt rating is AAA - excellent; the worst is *BBB.)* The current CEO at Gamma has been in his position for 6 years. Gamma's current ratio of managers to workers is 1:12, which is lower than the national average. The company has a low turnover rate, the average length of employment at Gamma is 5.3 years. The national average is 5.2 years. Gamma already has an excellent foreign presence. It owns several international food companies including Europe's largest and the world's third largest maker of coffee and chocolate. Money for research and development in the last several years has spent on the research and development of new markets, not

new products. This trend is expected to continue. Worldwide consumption of cigarettes grew 2% in 1996 and is expected to continue, particularly in Asian and Eastern European countries. Gamma plans to continue investing in its Eastern European and Asian markets. Its exports of cigarettes and food products to Japan and Russia increased 20% in 1996 and are expected to increase 25% each year for the next five years. The company also wants to develop markets in Hungary, Czechoslovakia, China, and Malaysia. However, domestic consumption of cigarettes fell 2% in 1996 and the trend is expected to continue. Current suit of the cigarette companies by the relatives of a woman who smoked for 30 years and eventually died of lung cancer is pending in the U.S. No decision has been reached yet.

Week 2 Idea Judgment Task
(Group component)

ALPHA BETA GAMMA TASK

Before proceeding with the group component of this task, you must first submit your individual component to the Ind. Submissions area.

Instructions
The group component of this task involves your discussing the problem on-line with your group members and submitting a group solution to the **Group Submissions** conference area. The **Group Submissions** area (represented by a check-mark) is located in the **COMM210-01-GROUPS** conference area. Please submit one group solution per group.

You have until Tuesday (Oct 20) evening to post your group solution. Your group is free to submit its group solution anytime during this 5-day period.

Please restrict all of your group discussion to your designated group area. Post all messages to your group conference area. Do not send e-mail to your fellow group members' accounts, nor discuss your groupwork outside of the FirstClass communication system.

Please don't discuss any aspect of this task with anyone else in your class.

THE GROUP TASK
your group task is to discuss the information about the three companies and to rank order the companies based on which company you, as a group, would prefer to invest in most, second most and least. Once you have reached a group consensus on the ranking, please provide a brief rationale as to why your group ranked the companies the way it did.

Your group solution will be scored for analysis and decision criteria.

The Alpha Company
Alpha earned $6.4 billion in 1996. It is a diversified health care, animal health, consumer products and chemical company. Drug sales accounted for half of the company's earnings. Currently, drugs have the highest profit margins of any product category. However, legislature is pending that may increase governmental control over insurance reimbursements of drugs to drug companies, which would greatly reduce profit margins. Alpha expects to have a 20% increase in its earnings over the next 5 years. It has an "AA - very good" debt rating, signifying that it has low debt. (The best debt rating is AAA - excellent; the worst is BBB.) The current CEO at Alpha has been in his position for 3 years. Alpha's current ratio of managers to workers is 1:15, which is lower than the national average. The company has an average employee turnover rate, the average length of employment at Alpha is 8.1 years. The national average is 5.2 years. Its aggressive research and development spending in the early 1990's is paying off. It

developed 9 promising drugs during that time. One of these drugs is an antidepressant that will be used for treating bulimia and obesity. Sales for this drug are expected to reach $1 billion in 2001. Alpha is also planning on selling its less profitable chemical companies to invest more money in the research and development of pharmaceuticals. The United States and Canada account for 95% of the company's sales. Alpha is planning to expand its operations to Europe. The European drug regulations are less strict than American drug regulations. The company, however, has received some bad press on one of its drugs for fears that it may make one prone to acts of violence or suicide. However, these allegations have not yet been proven. Three claims have been brought (as of July 1997) against Alpha for its dysfunctional heart valves. The compensation paid to each has ranged from $500,000 to $1,000,000.

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Week 2 Idea Generation Task
(Individual component)

CLEARNING UP THE ENVIRONMENT

Instructions
The individual component of this task involves your looking over the problem and submitting a list of ideas to the **Ind. Submissions** conference area. The **Ind. Submissions** area (represented by a pen and paper icon) is located in **the COMM210-01-GROUPS** conference area.

You have until Thursday (Oct 15) evening to post your individual solution. You are free to submit your individual task component anytime during this 2-day period.

Please don't discuss any aspect of this task with anyone else in your class.

THE TASK
Currently there is a great concern about cleaning up the environment. There are many sources that create waste or pollution or use up resources that are vital to the maintenance of the planet. In the following exercise, your task is to generate ideas to clean up the environment.

Follow these instructions when generating your ideas.

1. Generate as many ideas as possible.
2. Strive for ideas that will have a significant impact on the environment.
3. The ideas should also be feasible.
4. Be specific in stating your ideas.

Your group's ideas will be scored for quantity, impact, and feasibility.

Week 2 Idea Generation Task
(Group component)

CLEARNING UP THE ENVIRONMENT

Before proceeding with the group component of this task, you must first submit your individual component to the Ind. Submissions area.

Instructions
The group component of this task involves your generating ideas on-line with your group members and submitting a final group list to the **Group Submissions** conference area. The **Group Submissions** area (represented by a check-mark) is located in the **COMM210-01-GROUPS** conference area. Please submit one group list of ideas per group.

You have until Tuesday (Oct 20) evening to post your group solution. Your group is free to submit its group solution anytime during this 5-day period.

Please restrict all of your group discussion to your designated group area. Post all messages to your group conference area. Do not send e-mail to your fellow group members' accounts, nor discuss your groupwork outside of the FirstClass communication system.

Please don't discuss any aspect of this task with anyone else in your class.

THE GROUP TASK

Currently there is a great concern about cleaning up the environment. There are many sources that create waste or pollution or use up resources that are vital to the maintenance of the planet. In the following exercise, your group's task is to generate ideas to clean up the environment.

Follow these instructions when generating ideas.

1. Generate as many ideas as possible.
2. Strive for ideas that will have a significant impact on the environment.
3. The ideas should also be feasible.
4. Be specific in stating your ideas.

Your group's ideas will be scored for quantity, impact, and feasibility.

Week 3 Judgment Task
(Individual component)

DISCIPLINARY ACTION CASE

Instructions
The individual component of this task involves your looking over the problem and submitting a list of ideas to the **Ind. Submissions** conference area. **The Ind. Submissions** area (represented by a pen and paper icon) is located in the **COMM210-01-GROUPS** conference area.

You have until Thursday (Oct 22) evening to post your individual solution. You are free to submit your individual task component anytime during this 2-day period.

Please don't discuss any aspect of this task with anyone else in your class.

THE TASK
In the following exercise, you are asked to settle a situation in which a college student bribed an instructor to change his grade in a course. The following pages describe the circumstances and the possible courses of action. Your task is to determine which courses of disciplinary action to choose for the student and the teaching assistant (T.A.). You should consider the consequences of the different actions when making your decision.

There are several departments on campus that have preferences for how this matter should be settled. The solution that you come up with will be scored in terms of how satisfying it is to the different departments. The more your solution takes into account the concerns of all parties, the more points you will earn.

Disciplinary Action Case
This case involves determining the disciplinary actions for a situation in which a college student athlete has been found guilty of bribing an instructor to change his grade in a course. This event took place at a prestigious liberal arts college in the eastern U.S. The student, Jack, is a star athlete on the college basketball team. He leads the team in points, assists, blocked shots, and rebounds. He is very popular and has drawn larger crowds at the game than in previous seasons, substantially increasing the college's revenues due to athletics. In fact, Jack is such a good player and is so popular that the school has received a great deal of positive attention from the press, enhancing the college's reputation and attracting student enrollment.

Jack had been concerned about a grade in one of his courses. He needed a B or better on the midterm exam to get a B in the course and remain eligible to play basketball. He received a D on the midterm. To maintain his eligibility, he offered $200 to the course's graduate student teaching assistant to change his exam grade to a B. The teaching assistant, Tom, accepted the offer.

Another teaching assistant learned of the incident and reported both Jack and Tom to the administration. When confronted, Jack and Tom admitted to what they had done.

As the disciplinary action committee, your group's task is to choose the best courses of disciplinary action. There are five issues to settle in the case. Three issues pertain to disciplining Jack; including what to do about Jack's grade in the course, his status on the basketball team, and his status as a college student. The other two issues pertain to disciplining Tom; these issues include deciding what to do about Tom's status as an instructor and his status as a graduate student. When considering the alternatives for each issue, you should consider the consequences of the various options. In addition, be sure that you do not choose an illogical combination of alternatives (e.g. if you decide to suspend him from the academic program for one semester, then he cannot be suspended from playing basketball for only one game; if you decide to expel Tom from school, then he cannot work for the college as a teacher). The following information describes the different departments' preferences and the possible courses of disciplinary action for each of the five matters.

The athletic department does not condone cheating, however, it does not want to lose Jack from the team due to a suspension or expulsion. With Jack on the team, the school has a good chance at wining the conference championship. Without Jack, the college is unlikely to win the championship. In addition, the money brought in from attendance at the games due to Jack's popularity has increased this department's resources, which it does not want to lose. On the grounds that extreme punishment for either Jack or Tom would only hurt the school and serve no useful purpose, the athletic department supports a lenient course of disciplinary action.

The college faculty wishes to uphold the highest academic and ethical principles. After all, the main purpose of the college is as an academic institution. The faculty believes that cheating is reprehensible; is it the academic equivalent of theft and fraud, and the harshest punishment should be given to both Jack and Tom. In addition, a harsh and publicized disciplinary action will send a message to others that cheating is not tolerated at this college. This message will have a positive effect on the college's reputation for high academic standards. If the punishment is too light, then a precedent of lenience will be set for cases in the future, conveying the message that cheating is condoned, or it will convey a message that different standards apply to different students.

The college's administration wants a solution that takes into account the preferences of both the athletic department and faculty positions and protects the college's public image. The administration wants to ensure the continued success of the athletic program. It also wants to uphold the college's academic standards and principles. Both the athletic and academic programs have contributed to the college's positive reputation. The administration is concerned that this matter be handled very carefully or the college may jeopardize its reputation, future enrollment, and financial support from other institutions and alumni.

Your task is to decide how to settle this matter. You must choose one option to resolve each of the five issues. Please record your decisions and the rationale for each decision using the form/format provided below. Remember, the more your solution takes into account the concerns of all parties, the more points you will earn.

Issues and possible courses of action

Issue 1: Jack's grade in the course

Possible courses of action:

1a. Give Jack his original grade on the exam (a D).
1b. Give Jack a failing grade on the exam.
1c. Give Jack a failing grade in the course.

Issue 2: Jack's status on the basketball team

Possible courses of action:

2a. Make no change in Jack's basketball eligibility.
2b. Suspend Jack from the next basketball game.
2c. Suspend Jack from the basketball team for the rest of the season.
2d. Suspend Jack from the basketball team for an indefinite length of time and require that he appeal to be reinstated.
2e. Kick Jack off the team.

Issue 3: Jack's status as a college student

Possible courses of action:

3a. Make no change in Jack's college status.
3b. Give Jack a warning, stating that if he is involved in another incident involving cheating in the future, he will be expelled.
3c. Suspend Jack from college (classes and athletics) for the rest of the semester.
3d. Suspend Jack from the college for an indefinite length of time and require that he appeal for re-admittance.
3e. Expel Jack from the college.

Issue 4: Tom's status as an instructor (note: If Tom is restricted from teaching, he loses a source of income that helps pay his way through graduate school.)

Possible courses of action:

4a. Make no change in Tom's teaching status.

4b. Give Tom a reprimand to be placed in his permanent record, which will be seen by potential employers after is finished with school.

4c. Suspend Tom from teaching for the rest of the semester

4d. Suspend Tom from teaching for an indefinite length of time and require that he appeal to be reinstated.

4e. Do not allow Tom to teach again during his time remaining in graduate school

Issue 5: Tom's status as a graduate student

Possible courses of action:

5a. Make no change in Tom's college status

5b. Give Tom a warning, stating that if he is involved in another incident involving cheating in the future, he will be expelled.

5c. Suspend Tom from the college for the rest of the semester.

5d. Suspend Tom from the college for an indefinite length of time and require that he appeal for re-admittance.

5e. Expel Tom from the college.

Group Decisions Form

Preference for Issue 1: Jack's grade in the course

Option: _____

Why did you choose this option? _____

Preference for Issue 2: Jack's status on the basketball team

Option: _____

Why did you choose this option? _____

Preference for Issue 3: Jack's status as a college student

Option: _____

Why did you choose this option? _____

Preference for Issue 4: Tom's status as teaching assistant

Option: _____

Why did you choose this option? _____

Preference for Issue 5: Tom's status as graduate student

Option: _____

Why did you choose this option? _____

Week 3 Judgment Task
(Group component)

DISCIPLINARY ACTION CASE

Before proceeding with the group component of this task, you must first submit your individual component to the Ind. Submissions area.

Instructions
The group component of this task involves your discussing the problem on-line with your group members and submitting a group solution to the **Group Submissions** conference area. The **Group Submissions** area (represented by a check-mark) is located in the **COMM210-01-GROUPS** conference area. Please submit one group solution per group.

You have until Tuesday (Oct 27) evening to post your group solution. Your group is free to submit its group solution anytime during this 5-day period.

Please restrict all of your group discussion to your designated group area. Post all messages to your group conference area. Do not send e-mail to your fellow group members' accounts, nor discuss your groupwork outside of the FirstClass communication system.

Please don't discuss any aspect of this task with anyone else in your class.

THE GROUP TASK
Below is the same exercise you completed in the first phase of this week's assignment. You and your fellow group members are now asked to settle the same situation in which a college student bribed an instructor to change his grade in a course. The following pages describe the same circumstances and the same possible courses of action. Your group task is to determine which courses of disciplinary action to choose for the student and the teaching assistant (T.A.). Your group should consider the consequences of the different actions when making its decision.

There are several departments on campus that have preferences for how this matter should be settled. The solution that you come up with will be scored in terms of how satisfying it is to the different departments. The more your solution takes into account the concerns of all parties, the more points you will earn.

Disciplinary Action Case
This case involves determining the disciplinary actions for a situation in which a college student athlete has been found guilty of bribing an instructor to change his grade in a course. This event took place at a prestigious liberal arts college in the eastern U.S. The student, Jack, is a star athlete on the college basketball team. He leads the team in points, assists, blocked shots, and rebounds. He is very popular and has drawn larger crowds at the game than in previous seasons, substantially increasing the college's revenues due to

athletics. In fact, Jack is such a good player and is so popular that the school has received a great deal of positive attention from the press, enhancing the college's reputation and attracting student enrollment.

Jack had been concerned about a grade in one of his courses. He needed a B or better on the midterm exam to get a B in the course and remain eligible to play basketball. He received a D on the midterm. To maintain his eligibility, he offered $200 to the course's graduate student teaching assistant to change his exam grade to a B. The teaching assistant, Tom, accepted the offer.

Another teaching assistant learned of the incident and reported both Jack and Tom to the administration. When confronted, Jack and Tom admitted to what they had done.

As the disciplinary action committee, your group's task is to choose the best courses of disciplinary action. There are five issues to settle in the case. Three issues pertain to disciplining Jack; including what to do about Jack's grade in the course, his status on the basketball team, and his status as a college student. The other two issues pertain to disciplining Tom; these issues include deciding what to do about Tom's status as an instructor and his status as a graduate student. When considering the alternatives for each issue, you should consider the consequences of the various options. In addition, be sure that you do not choose an illogical combination of alternatives (e.g. if you decide to suspend him from the academic program for one semester, then he cannot be suspended from playing basketball for only one game; if you decide to expel Tom from school, then he cannot work for the college as a teacher). The following information describes the different departments' preferences and the possible courses of disciplinary action for each of the five matters.

The athletic department does not condone cheating, however, it does not want to lose Jack from the team due to a suspension or expulsion. With Jack on the team, the school has a good chance at wining the conference championship. Without Jack, the college is unlikely to win the championship. In addition, the money brought in from attendance at the games due to Jack's popularity has increased this department's resources, which it does not want to lose. On the grounds that extreme punishment for either Jack or Tom would only hurt the school and serve no useful purpose, the athletic department supports a lenient course of disciplinary action.

The college faculty wishes to uphold the highest academic and ethical principles. After all, the main purpose of the college is as an academic institution. The faculty believes that cheating is reprehensible; is it the academic equivalent of theft and fraud, and the harshest punishment should be given to both Jack and Tom. In addition, a harsh and publicized disciplinary action will send a message to others that cheating is not tolerated at this college. This message will have a positive effect on the college's reputation for high academic standards. If the punishment is too light, then a precedent of lenience will be set for cases in the future, conveying cheating is condoned, or it will convey a message that different standards apply to different students.

The college's administration wants a solution that takes into account the preferences of both the athletic department and faculty positions and protects the college's public image. The administration wants to ensure the continued success of the athletic program. It also wants to uphold the college's academic standards and principles. Both the athletic and academic programs have contributed to the college's positive reputation. The administration is concerned that this matter be handled very carefully or the college may jeopardize its reputation, future enrollment, and financial support from other institutions and alumni.

Instructions on Completing the Group Task

As a committee, your group task is to agree on how to settle this matter. You all must agree on one option to resolve each of the five issues. Please record your decisions and the rationale for each decision using the form/format provided below. Remember, the more your solution takes into account the concerns of all parties, the more points you will earn. When you have completed your group assignment, submit it to the **Group Submissions** area.

Issues and possible courses of action

Issue 1: Jack's grade in the course

Possible courses of action:

1a. Give Jack his original grade on the exam (a D).
1b. Give Jack a failing grade on the exam.
1c. Give Jack a failing grade in the course.

Issue 2: Jack's status on the basketball team

Possible courses of action:

2a. Make no change in Jack's basketball eligibility.
2b. Suspend Jack from the next basketball game.
2c. Suspend Jack from the basketball team for the rest of the season.
2d. Suspend Jack from the basketball team for an indefinite length of time and require that he appeal to be reinstated.
2e. Kick Jack off the team.

Issue 3: Jack's status as a college student

Possible courses of action:

3a. Make no change in Jack's college status.
3b. Give Jack a warning, stating that if he is involved in another incident involving cheating in the future, he will be expelled.
3c. Suspend Jack from college (classes and athletics) for the rest of the semester.
3d. Suspend Jack from the college for an indefinite length of time and require that he appeal for re-admittance.
3e. Expel Jack from the college.

Issue 4: Tom's status as an instructor (note: If Tom is restricted from teaching, he loses a source of income that helps pay his way through graduate school.)

Possible courses of action:

4a. Make no change in Tom's teaching status.
4b. Give Tom a reprimand to be placed in his permanent record, which will be seen by potential employers after is finished with school.
4c. Suspend Tom from teaching for the rest of the semester
4d. Suspend Tom from teaching for an indefinite length of time and require that he appeal to be reinstated.
4e. Do not allow Tom to teach again during his time remaining in graduate school

Issue 5: Tom's status as a graduate student

Possible courses of action:

5a. Make no change in Tom's college status
5b. Give Tom a warning, stating that if he is involved in another incident involving cheating in the future, he will be expelled.
5c. Suspend Tom from the college for the rest of the semester.
5d. Suspend Tom from the college for an indefinite length of time and require that he appeal for re-admittance.
5e. Expel Tom from the college.

Group Decisions Form

Preference for Issue 1: Jack's grade in the course

Option: _____

Why did you choose this option? _____

Preference for Issue 2: Jack's status on the basketball team

Option: _____

Why did you choose this option? _____

Preference for Issue 3: Jack's status as a college student

Option: _____

Why did you choose this option? _____

Preference for Issue 4: Tom's status as teaching assistant

Option: _____

Why did you choose this option? _____

Preference for Issue 5: Tom's status as graduate student

Option: _____

Why did you choose this option? _____

Scoring System for Final Task

Point values and weights for scoring decision making task

Issue	Faction		
	Faculty	Athletic Department	Administration
1. Player's grade			
Weighted options/points	1	1	1
A	1	3	2
B	2	2	3
C	3	0	1
2. Player's athletic status			
Weighted options/points	--	4	4
A	0	4	4
B	0	3	3
C	0	2	2
D	0	1	1
E	0	0	0
3. Player's academic status			
Weighted options/points	2	3	2
A	0	4	1
B	1	3	3
C	2	2	2
D	3	1	2
E	4	0	0
4. T.A.'s job status			
Weighted options/points	3	--	3
A	0	0	0
B	1	0	1
C	2	0	2
D	3	0	3
E	4	0	4
5. T.A.'s academic status			
Weighted options/points	2	--	2
A	0	0	0
B	1	0	1
C	2	0	2
D	3	0	3
E	4	0	4

Appendix D

TEMPO Coding Categories

1. Production function categories

1.1 Production function - Content (PC)

Proposes, discusses, or evaluates task content

Examples: "I think we should keep solutions 4 and 5, and I agree with S. on number one." "I chose option 5c because accepting a bribe is a serious offence and he should be punished severely." "But to expel Tom would be a harsher punishment than Jack received and it wouldn't be fair." "I still disagree with you."

1.2 Production function - Process (PP)

Proposes, discusses or evaluates strategies or goals for completing the task, or contributes statements to keep the group moving.

Examples: "We have to wrap this up." "I'll come back [check the group area] in an hour and if you haven't posted a reply, I'll check again tomorrow morning." "I trust you will regard my suggestion." "Who's going to submit this assignment?" "I submitted the solutions." "Where are you V.?"

2. Non-production function categories

2.1 Task digressions (T)

Comments, and any responses they invoke, about the task that do not further the process.

Examples: "I hope you guys agree with me." "This was my response to the case." "I believe the punishment should fit the crime."
A: "I'm glad sports aren't as big a deal here in Canadian universities as they are in the US."
B: "Yeah, me too."

2.2 Personal comments (P)

Comments about oneself that do not move the task forward.

Examples: "I have been so busy with everything I lost track of this deadline." "I have a ton of work to do tonight." "I don't have access to this program at home." "I didn't have much of a chance to get back to you sooner."

2.3 Interpersonnal comments (I)

Response to someone else's personal comment or comment about the group or otherwise interpersonal in nature. Includes praise for another members' contribution.

Examples: "Hey guys," "I'm happy I heard from you guys." "I think we did a good job on this project." "I'm sorry." "Thanks, V."

2.4 Reactions to experiment (R)

Comments about the experiment or setting.

Examples: "This was fun." "I really like this." "This is cool." "This is a waste of time." "I resent having to do this."

2.5 Digressions (D)

Comments that have nothing to do with the task or experiment or are not personal or interpersonal.

Examples: "Hey, did either of you go to the Stingers game on Saturday?" "Have you guys read Chapter 3 yet?"

Sample of Computer-Mediated Messages

Monday, October 26, 1998 7:36:59 PM 11 of 17
From: S.
Subject: Reply to your interpretations
To: Group 4

I agree with R.`s option for issues 4 & 5. Tom as the T.A is in the position of authority and should have known better than to have dealt with the situation the way he did. His punishment can be more harsh than that of Jack`s. As for option issue 3, Like V. I still believe that a warning is appropriate. If Jack is suspended for the rest of the semester he cannot make up he`s grade for the rest of the course.(Which poses a conflict in R.`s solution to issues 1 and 2.

I think this solution should satisfy everybody, but let me know so we can send it in.
S.

Tuesday, October 27, 1998 6:06:09 PM 12 of 17
From: R.
Subject: About S.'s opinion
To: Group 4

About S.'s opinion, I think we should keep my solutions to 4 and 5, and I agree with him on number one. I admit (albeit grudgingly) that for number 3, Jack should be given a warning(since it is his first offense) and a chance to redeem himself later on. And I don't object to suspending Jack from the team indefinitely and demanding that he apply to be reinstated. I agree with S. that we submit that combination of options. Where are you V.?
I'll come back in an hour and if you haven't posted a reply, I'll check again tomorrow morning.

Wednesday, October 28, 1998 3:27:56 PM 13 of 17
From: V.
Subject: Sorry Guys!
To: Group 4

I have been so busy with everything I lost track of this deadline. I am sorry. I didn't feel that Jack should get such a serious punishment especially since he wants a future in basketball. Although I do not condone cheating or bribing I strongly believe in giving people a secong chance. He just might have have done it out of desperation and fright of losing his dream. Although it was unethical of Tom, and I do believe that as a student teacher he should have set him straight and refused his offer. This is why I believe in putting this incident on Tom's record and keeping Jack on probation.
Let me know how you feel,
V.

Wednesday, October 28, 1998 5:52:23 PM 14 of 17
From: R.
Subject: Let's get this wrapped up!
To: Group 4

I still disagree with you. Accepting a bribe is a serious offense. I think though, suspending him from school and asking that he appeal to be reinstated is harsh enough. If you put it on his permanent record it will follow him around for the rest of his life and that seems a little harsh considering his motive was probably to earn money for school.

I think we should go with S.'s suggestion for the submission.

Friday, October 30, 1998 11:55:59 AM 15 of 17
From: V.
Subject:
To: Group 4

Hey guys,
You're right we have to wrap this up, I do feel that we have a difference of opinion however we must come to a conclusion. I can't help but feel that they both deserve second chances and maybe my choice of having it be put on their record is too harsh but I don't feel they should be suspended after their first mistake. I guess a compromise is required so the majority should win. An answer should be given in soon. I will let you send this answer in because I do not have access to this program at home.
I trust you will regard my suggestion.
Thanks V.

Friday, October 30, 1998 5:04:29 PM 16 of 17
From: R.
Subject: I submitted our solutions
To: Group 4

I submitted our solutions.

Tuesday, November 03, 1998 9:21:39 PM 17 of 17
From: S.
Subject: Good job
To: Group 4

Guys,
I think we did a good job on this project. I guess I'll see you in class.

Appendix E

Debriefing

Computer-mediated communication is a mainstay in North American business. Computer-mediated groupwork is now a "fact of life" in the work place. Employees are connecting with one another via their computers, despite geographical and time differences, to work collaboratively on tasks and projects. Research has shown that the effectiveness of computer-mediated groupwork is affected by two factors: Group membership and task experience. A number of studies indicate that these two factors affect the efficiency of the groupwork process, the working environment and the quality of the work produced.

The purpose of this study is to investigate these issues. The effect of membership and task experience on computer-mediated group performance, interaction and attitudes was assessed by having participants perform groupwork under different conditions. Some participants were assigned to a group with the same group members throughout the three weeks of computer-mediated groupwork while others were assigned to a new group with different group members every week. Also, during the first two weeks of the study, some participants carried out decision making tasks while others performed idea generating tasks. All participants performed the same group task (Disciplinary Action Case) during the third and final week of the study. Your group's solutions and computer-mediated discussion regarding the final task will indicate the effects of membership and task experience on group performance, group skills and attitudes towards computer-mediated groupwork.

Thank you for your participation in this study. If you are interested in learning more about computer-mediated groupwork, the following references will be helpful:

McGrath, J.E., Arrow, H., Gruenfeld, D.H., Hollingshead, A.B. & O'Connor, K.M. (1993). Group, tasks, and technology. The effects of experience and change. *Small Group Research*, 24(3), 406-420.

McGrath, J.E. & Hollinshead, A.B. (1994). Groups interacting with technology. Thousand Oaks: Sage.

DeSanctis, G., & Monge, P. (1998). Communication process for virtual organizations. *Journal of Computer-Mediated Communication*, 3(4).
Available: http://www.ascusc.org/jcmc/vol3/issue4/desactis.html