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Chelley Vician
Michigan Technological University

Gerardine DeSanctic
Duke University

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Chelley Vician, School of Business, Michigan Technological University
Gerardine DeSanctis, The Fuqua School of Business, Duke University

Introduction

Though Group Decision Support System (GDSS) use has been shown to improve group performance, it's most often used with external facilitation because groups have difficulty in learning how to operate the technology and apply it to their specific tasks (Bostrum, Anson, & Clawson, 1993; Dickson, Lee-Partridge, & Robinson, 1994). However, there are many situations where a group may not have the benefit of, nor desire, external facilitation and instead chooses to run a GDSS session in user-driven mode -- that is, to operate the technology on their own. Clearly, a critical issue for investigation is how to enhance the performance of user-driven GDSS sessions through available internal group resources.

This study investigates whether the performance of user-driven GDSS sessions can be enhanced by augmenting the group's internal resources of its role system. Of particular interest is how a role behavior training intervention influences both: (1) a group's ability to perform the same task; and (2) a group's ability to adapt to and perform a change in task. Training groups to use roles is proposed in this study as a means of augmenting internal group resources in a user-driven, GDSS-supported meeting. Two methods of role behavior training (assigned and fixed roles - FR, assigned and rotated roles - RR), in particular, can help clarify member inter-relationships and technology responsibilities within the context of a GDSS-supported meeting. A laboratory experiment investigated the effects of role behavior training, within a specific task type (same, change in task), on group performance after repeated instances of GDSS technology use.

Research Framework And Model

The research framework builds upon the foundations of: educational theories of learning environments (Slavin, 1991; Palincsar, Ransom, & Derber, 1989; Johnson & Johnson, 1989; Kolb, 1984), information systems and organizational research on group-technology interaction (Pinsonneault & Kraemer, 1990; Dennis & Gallupe, 1993; Benbasat & Lim, 1993; DeSanctis & Poole, 1994), small group communication theories of meeting interactions (McGrath, 1984; Bormann, 1990; Hackman & Morris, 1975; Doyle & Strauss, 1976; Jensen & Chilberg, 1991), and role-related research (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; Biddle & Thomas, 1966; Sarbin & Allen, 1968). Specification of meeting roles and role functions necessary to coordinated, productive work in a user-driven GDSS session were prepared as an outcome of the literature synthesis. Role behavior training (hereinafter role training) is posited as a form of group structure which will positively influence group performance by clarifying individual member responsibilities and by specializing individual actions for GDSS technology use within the context of a user-driven GDSS session.

The focus of the present study can be understood in terms of an input-process-outcome model of group interaction (see Figure 1) based on the work of McGrath (1984) and Hackman & Morris (1975). We studied the effects of manipulated inputs upon outcomes without directly investigating the nature of the process interaction. The inputs to the group interaction process included control variables of group history (zero-history groups) and GDSS technology together with independent variables of group meeting role system and group task. The group meeting role system was manipulated in terms of the type of role training: (a) no training - emergent roles (control); (b) assigned and fixed roles (FR); and (c) assigned and rotated roles (RR).

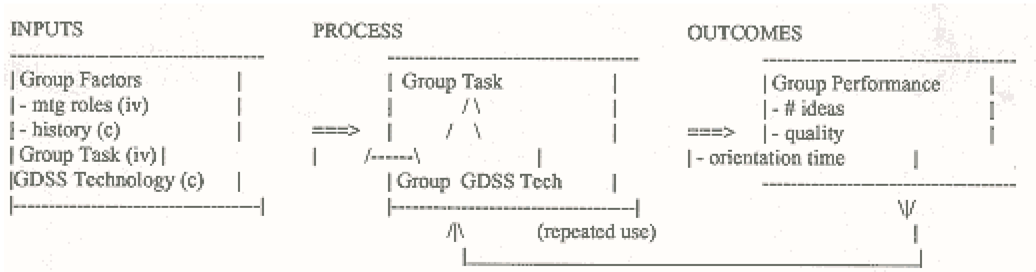

Figure 1: Research Model [Codes: c = controlled variable; iv = independent variable]

The group task was manipulated as a same (creative) and a changed (intellective) task. The group performance outcomes (dependent variables) were number of ideas generated, outcome quality, and orientation time. Orientation time is the amount of time taken by the group in diagnosis and start-up activities related to GDSS use.

Our research model argues that different configurations of a group's role system (as the result of role training) influence group interaction processes such that variations in performance outcomes will be discernible. Role training is expected to provide clarity to the group interaction process by specifying expected technology behaviors for task accomplishment and by allocating these specific behaviors to individual members. Research suggests that the presence of role training would organize group interaction processes such that improved group performance would result (Leavitt, 1951; Kelly & McGrath, 1985; Watson, 1987; Zigurs, 1987; Dickson, Lee-Partridge, Robinson, 1993). Further, research also suggests that rotating role assignments among group members in meeting episodes over time can improve group outcomes (for example, see Deming, 1986; Jessup, 1990; Marks, Mirvis, Hackett, & Grady, 1986; Heymsfeld, 1991; Ellis & Whalen, 1992; Weaver, 1992). Thus, we test the following hypotheses:

(H1) The type of role training will significantly affect group performance outcomes (including number of ideas, quality of ideas, and orientation time), after repeated instances of the same decision task;

(H1a) Groups with role training will outperform groups lacking role training when working on the same decision task (RR, FR > Control);

(H1b) Groups with rotated roles will outperform groups with fixed roles when working on the same decision task (RR>FR);

(H2) The type of role training will significantly affect group performance outcomes (including quality of solution and orientation time) after repeated instances of the same decision task, for a changed task .

(H2a) Groups with role training will outperform groups lacking role training when working on a changed task (RR, FR > Control);

(H2a) Groups with rotated roles will outperform groups with fixed roles when working on a changed task (RR>FR);

(Note: "outperform" refers to a greater number of ideas, a better quality of ideas/solution, and a lower amount of orientation time)

Method

Design: This experiment used a 3 x 2 factorial design with repeated observations on the second factor by varying the type of role training (no training, emergent roles-Control; assigned and fixed roles-FR; assigned and rotated roles -RR) and the task type (same = creativity; changed = intellective). The overall design consisted of four task trials within a single session. There were six conditions present at the fourth trial: Control-creativity, Control-intellective, FR-creativity, FR-intellective, RR-creativity, RR-intellective.

Measures-IV: The roles of chairperson, recorder, technologist, and participant were utilized in this study. Each member of the group was considered to be a participant in the meeting and this was the only role specification made explicit in the control condition. In the FR treatment, group members were randomly assigned a single role (e.g., chairperson) in the first task trial which persisted throughout the remaining task trials. In the RR treatment, group members were randomly assigned a single role in the first task trial, but were instructed to rotate the role assignments in the second and third trials such that each member performed one of the roles for one trial. In the fourth task trial of the RR treatment, the members were again randomly assigned one of the three roles to perform for the group. A creativity task was used in the first three trials by all role treatments to operationalize the same task. In the fourth trial, half of the groups used a creativity (same) task and the other half used an intellective (changed) task.

Measures-DV: The number of ideas generated was measured by a count of the non-duplicate ideas generated by each group during each creativity task trial. The outcome quality was measured by comparing the group outcomes (i.e., ideas in trial 4 for the creativity task; final ranking in trial 4 for the intellective task) to outcomes generated by a panel of campus security experts. Orientation time was measured by viewing the meeting videotapes and aggregating a count of the seconds in each task trial that group members verbalized concerns, questions, or problems with the use of the GDSS.

Subjects: A total of 217 students (23 MBA's and 194 undergraduates) in information systems and speech communication classes at a midwestern university participated in this experiment for course credit. Assignment of participants to 3-person groups was random within educational level (e.g., MBAs were in groups with other MBAs). A total of 70 groups were randomly assigned to the six conditions: 11 groups in the control condition and 12 groups per each role treatment (fixed and rotated).

Task: The "Thumbs Task" (Bouchard & Hare, 1970) was used as a warm-up and training task for using the GDSS. The creativity tasks were idea generation problems situated in the tourism, parking, cultural diversity, and campus security contexts. Each question was of the general form: "How can [task context] be increased/improved at [your University/your geographical region]?", thus the tourism context question read: "How can tourism in [your geographical region] be increased?" Each of the task context sequences for the first three trials was randomized to avoid sequence effects. The fourth task trial exclusively used the campus security context. The intellective task consisted of presenting groups with a list of alternative solutions to the campus security problem and asking for a group ranking of the solutions by their feasibility for implementation.

GDSS: The Level 1 communication features of Software Aided Meeting Management (SAMM) version 5.2 (copyright, Regents of the University of Minnesota) were used in this experiment. The specific tools used were Idea Generation and Idea Evaluation.

Procedure: Sessions lasted approximately 2 to 2.5 hours and were video and audiotaped. Subjects were seated at contiguous work areas in a decision room and instructed to complete the consent form and background questionnaire. Experiment administrators used scripted procedures to conduct each session. The procedures differed by task and role condition in that groups with the changed (intellective) task required introduction to additional SAMM features and that role treatment groups (FR, RR) required exposure to expected functional behaviors representative of each role. After subjects received brief training in SAMM tools, an experiment administrator led the group through: a series of 3, 12-minute periods of creativity task sessions; a ten-minute break period; and a fourth time period of 20 minutes for work on either the same or changed task.

Results

Preliminary analyses: Multivariate analysis (MANOVA) for the same (creative) task did not indicate that the type of role training had significant effects on performance [Wilk's lambda=.86, F(6,60)=.79, p=.582]. MANOVA for the changed (intellective) task indicated a significant effect on performance variables due to type of role training [Wilk's lambda=.72, F(4,62)=2.807, p=.033]. The univariate portion of the MANOVA indicated a significant effect for type of role training upon orientation time [F(2,32)=5.534, p=.009], but not upon quality [F(2,32)=.592, p=.559].

Same Task - DVs	C	FR	RR
number of ideas	12.36 (3.1)	10.5 (2.5)	10.92 (2.8)
outcome quality	75.27 (27.4)	74 (22.15)	77.75 (26.67)
orientation time	19 (19.6)	20 (20.6)	26 (25.6)
Changed Task - DVs	**C**	**FR**	**RR**
outcome quality	9.27 (1.9)	9.75 (1.96)	8.92 (1.78)
orientation time	106.82 (64.9)	39 (30)	56 (51)

Role training effects-same task (H1): Analysis of variance (ANOVA) results suggest that there is no significant difference indicated for differing role treatments upon number of ideas [F(2,32)=1.36, p=.27], outcome quality [F(2,32)=.07, p=.93], or orientation time [F(2,32)=.38, p=.69].

Role training effects-changed task (H2): ANOVA results suggest that there is no significant difference indicated for differing role treatments upon outcome quality [F(2,32)=.59, p=.56]. Planned contrasts indicated that, for the changed (intellective) task, groups lacking role training (control groups) encountered significantly greater amounts of orientation time than groups with role training (C>FR p=.05; C>RR p<.10; C> avg. of FR,RR p<.10). A directional t-test indicated that there was no significant difference for orientation time between the fixed role and rotated role treatments (t-value = -.99, p=.332), though the mean values were in the opposite direction from expectations.

Supplementary analyses: A repeated measures analysis and planned contrasts for the same (creative) task indicated that, at the first trial period, groups assigned roles (FR) had greater amounts of orientation time relative to both: (a) groups lacking role training (control) and (b) the average of the Control groups with Rotated Role groups [F(6,90)=1.89, p=.09]. Results from a repeated measures ANOVA and planned contrasts for the changed (intellective) task indicated that groups assigned roles (FR) had significantly less orientation time when compared with either groups lacking role training or rotated role groups across all trials [F(2,30)=9.68, p=.001].

Discussion

Although the findings from this study do not support our hypotheses that role training would have direct performance effects, there is evidence of possible indirect performance effects. The orientation time findings suggest that roles assisted the group's process of using the GDSS by reducing the amount of time spent managing the technology. The group's process of adapting the technology to a changed task was affected by the presence or absence of role behaviors. Partial support for the overall hypothesis that groups experiencing some form of role specification (when working on a changed task) will have better performance outcomes is provided by these results (H2a). These findings also suggest that role training effects are manifested over time, rather than at a specific moment in time. Further research is warranted to investigate the effect of roles in reducing confusion in early uses of group technologies (especially for more complex tasks or task/tool interaction), as well as how these early experiences transfer to later experiences.

Caution should be used in generalizing the findings of this study to different settings and populations due to the standard limitations of laboratory experiments. The strengths of this study include the use of a laboratory experiment to control effects and the simulation of longitudinal experiences in groups. Future research in this area should recognize the difficulty in demonstrating subtle role effects in groups at one point in time, the complexity of design for such studies, and that process analysis should be used along with outcome analysis to observe the effects of roles on group technology use.

References available upon request from first author.