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Structuring creativity with GSS: An experiment

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Structuring creativity with GSS: An experiment

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1. Introduction

An experiment was conducted involving groups that generated ideas using two different creative idea generation techniques, both manually and with a GSS. Treatments were evaluated using a new dependent measure called **paradigm-relatedness** of ideas. The research addressed two limitations of current GSS idea generation research: First, while there exist a wide variety of creativity techniques for generating ideas based on very different procedures (VanGundy, 1988), current GSS incorporate only one basic approach for idea generation. Second, GSS researchers typically evaluate the idea generation procedure using the quantity of ideas generated. Alternatives merit exploration.

2. Research Framework

Figure 1. Not available. Contact author.

The research model driving this study is presented in Figure 1. There are a variety of measures for describing the creative person who uses some creative process within some

given creative environment (press) to generate creative ideas (product). While most creativity research measures the creativity *level* of a product, this study addresses the issue of creativity *style* (Kirton, 1976). Creativity style distinguishes between propensities for different kinds of *change* with respect to a current situation. Ideas that represent modest changes to the status quo are termed paradigm preserving, while those representing varying degrees of perspective shift are called paradigm-modifying. We term this dimension of an idea, **paradigm-relatedness**.

Structures. According to Adaptive Structuration Theory (AST), groups appropriate structures that comprise the procedures and technologies they use, and adapt them to their own purposes in the course of accomplishing their tasks (Poole and DeSanctis, 1990). Creativity techniques with or without GSS-support provide structures that enable, promote, or constrain certain kinds of group interaction and communication. Analyzing these structures could help in understanding and predicting their effects.

Structures in creativity techniques and technologies. A number of structures used in GSS and creativity technologies have been identified in previous research (Nagasundaram and Bostrom, 1993). Structures can promote *paradigm-modification* (PM structures), *paradigm-preservation* (PP structures), or structures could be *paradigm-neutral*, promoting neither. Five key structures (stimulus availability, stimulus relatedness, stimulation method, participant identifiability, and simultaneity) formed the basis for hypotheses concerning the effects of different GSS/creativity technique combinations on the paradigm-relatedness of ideas. The creativity techniques investigated in this study were Brainstorming and Guided Fantasy. Brainstorming promotes idea generation through the use of four rules that help lower inhibitions and criticism in a group. Guided Fantasy helps participants step out of their current frame of thought into a fantasy frame where they are asked to temporarily suspend disbelief. They are then asked to generate ideas by relating their fantasies to the problem.

Hypotheses. Based on a structural analysis, the following hypotheses were developed relating to the paradigm relatedness and quantity of ideas generated using the two techniques with and without GSS support.

H1a The **paradigm modification** of ideas generated the GSS-supported techniques will be proportionately greater than by the Manual techniques.

H1b The **paradigm modification** of ideas generated by the Guided Fantasy techniques will be proportionately greater than by the Brainstorming techniques.

H2a The **quantity** of ideas generated by the GSS-supported techniques will be greater than by the Manual techniques.

H2b The **quantity** of ideas generated by the Guided Fantasy techniques will be lower than by the Brainstorming techniques.

3. Research Methodology

The study employed a 2X2 randomized counterbalanced full factorial repeated measures design. The two independent variables were Technology (GSS or Manual) and Creativity Technique (Brainstorming or Guided Fantasy). Each participant performed two tasks using two different technologies. The unit of analysis for this study was the individual. The participants were MBA students enrolled at the University of Georgia. The experiment was administered to zero-history groups of six. individuals that jointly worked on idea generation tasks. Groups were assigned randomly to treatments.

The tasks used in the study were the Teabag Problem (find alternative uses for teabags) and the Campus Parking Problem (find solutions to the problem of limited parking space on campus). Participants were required to only generate solutions, not to organize, evaluate, or select among them. Each group performed the two tasks in sequence using the same creativity technique, once with GSS and once without GSS support. Both task and technology treatment orders were counterbalanced among groups. The dependent measures were the paradigm-relatedness and the quantity of ideas generated. Paradigm relatedness was computed as the ratio of the number of PM ideas generated to the total number of ideas.

A custom tool, tailored to support the different needs of the techniques, was developed in Microsoft Visual Basic and used in the experiment. The GSS sessions were held in a GSS lab, and the manual sessions in an adjacent room in the same building. Participants first familiarized themselves with the technique using a warm-up task before commencing on the experimental task. After a ten minute break, participants reassembled in the other room for the second session. Participants were debriefed before departing. Participants in the manual sessions were associated with their ideas by videotaping the session. In the GSS sessions, ideas were tagged with the identities of their contributors. All sessions were facilitated by one of the authors who followed a script. Process facilitation involved reminding participants of the rules and procedures to be followed in idea generation several times during each session. The data was codified as PP or PM ideas by two coders using a codification scheme developed for each task and were analyzed using analysis of variance procedures.

4. Results and discussion

There were significant effects for technology, but none for creativity technique. Hypothesis 2a, relating technology to the quantity of ideas generated, was supported while the others were rejected. For Hypothesis 1a, the paradigm relatedness of ideas generated manually was significantly greater than that generated using a GSS. ($F(1,91) = 8.15$; $p = 0.005$), contrary to the hypothesis. For hypothesis 2a, the quantity of ideas generated using a GSS was significantly greater than when generated manually ($F(1,92) = 34.41$; $p = 0.0000$). For hypotheses 1b and 2b (the technique hypotheses), there were no significant differences in either the paradigm relatedness ($F(1,15.9) = 0.99$; $p = 0.34$; power = 0.15) or quantity ($F(1,8.07) = 0.14$; $p = 0.72$; power = 0.06) of ideas generated using either technique.

Discussion. This study was formulated on the assumption that the structures identified were the key ones and that they were faithfully appropriated by the participants. It appears that the Guided Fantasy (GF) technique was not faithfully appropriated. The successful use of GF requires a participant to be able to both generate a fantasy (i.e., achieve as perspective shift) as well as force-fit the fantasy back to the problem (i.e., link back). While most participants were able to accomplish the first step, the second step caused many difficulties. GF is a relatively complex technique that may require significantly more practice before participants may faithfully appropriate it. Learning to use Brainstorming (BS) faithfully, however, is far simpler. The presence of *restrictive* (Silver, 1988) structures, could have ensure faithful appropriation of Guided Fantasy. Participants defaulted to a technique very similar to brainstorming as a consequence of which no differences between the techniques emerged from the experiment, for the dependent measures investigated.

Contrary to expectations, anonymity in GSS did not result in greater paradigm-modification. Anonymity may be less a paradigm-modifying than a paradigm-neutral structure. The anonymous process may have allowed participants to follow their own creativity styles rather than actively promoting one particular style of idea generation.

Simultaneity may have been the more dominant structure in this study. It tends to permit participants to follow their own trains of thought for extended periods without a need to review the ideas generated by others. Participant thought processes may fall into a rut and generate paradigm-preserving ideas. In the manual process, participant thought trains are necessarily interrupted when they take turns expressing their ideas. Such chance interruptions could promote cross-fertilization among ideas more that in the GSS process, increasing the chances of paradigm-modification.

There was a sense of loss of control over the process in the GSS condition, and this was enhanced by the relatively low motivation of the participants. Without the necessary stimulation and motivation for breaking out of the paradigm in the GSS condition, participants tended to generate paradigm preserving ideas.

Conclusion

A key finding from this study is that creative idea generation requires two critical steps:

1. A shifting of perspective from the domain of the problem, and,

2. Establishing a link back from the new perspective to the problem.

We had hoped to achieve this through the use of Guided Fantasy. This did not, however, happen in this study since the technique was not faithfully appropriated. Current GSS provide no structures designed deliberately to achieve the above (other than to allow participants to view passively each othersÕ ideas). Based on this studyÕs designÕs current GSS designs may actually inhibit the generation of creative ideas. This study provides baseline data and a theoretical framework for different means of accomplishing

the two steps and incorporating the underlying structures into GSS. Some standalone packages such as IdeaFisher from IdeaFisher Systems, Inc. provide more active support for shifting perspective through an associative database of concepts that serve as cognitive springboards. No GSS support, however, is currently available for the more critical step of linking back. A technique developed by Edward de Bono provides a systematic, facilitated process of establishing the link back. This and other creativity techniques need exploration in a GSS context. This study was a first step in this direction.

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