

8-15-1997

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Recommended Citation

Garfield, Monica; Satzinger, John; Taylor, Nolan; and Dennis, Alan, "The Creative Road: The Impact of the Person, Process and Feedback on Idea Generation" (1997). *AMCIS 1997 Proceedings*. 267.

<http://aisel.aisnet.org/amcis1997/267>

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The Creative Road: The Impact of the Person, Process and Feedback on Idea Generation

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Abstract

Information technology can be an important tool for unleashing the creative energies of individuals and groups. A laboratory experiment was conducted to investigate how feedback, creativity techniques, and individual creativity levels influenced the number, quality, novelty and type of ideas an individual generated. We found that the use of an intuitive technique called guided fantasy led to more ideas but feedback and individual creativity levels had few effects.

1.0 Introduction / Research Framework

Businesses and researchers have long been interested in enhancing individual and group creativity. Many techniques and types of information technology have been developed to enhance creativity at both the group and individual level (Couger et. al., 1993; Gallupe, et al., 1992; MacCrimmon and Wagner, 1994; Massetti, 1995). In general, the creative process can be broken down into four principal components: *Product*, *Person*, *Process*, and *Press* (environment) (Rhodes, 1961; Fellers and Bostrom, 1993). This paper focuses on the interaction between product, person, and process.

Product. In some cases, the goal is to generate many ideas, while in others, it is to find a few high quality or novel ideas (Gallupe et. al., 1992). It may also be important to distinguish between ideas that *preserve* the current task *paradigm* (called PP ideas) and those that *modify* the current *paradigm* in new ways (called PM ideas) (Kirton, 1976; Satzinger, et al., 1996); for example, reengineering strives for paradigm modifying ideas and TQM strives for paradigm preserving ideas.

Person. People can be classified by overall aptitude for creativity and their creativity style. Individuals with higher creativity aptitudes are inherently better at generating ideas (Hellriegel and Slocum, 1974). Most people also have a preferred creativity style (Kirton, 1976). Individuals who are "adapters" usually seek to do things better by using standard rules while "innovators" expand the problem space by creating new views of a problem (Kirton, 1976). We hypothesized:

H1: Individuals who are generally more creative will produce more novel and more PM ideas.

H2: Innovators will produce more novel and more PM ideas than adapters.

Process. Many different creativity techniques and software tools have been developed for use by individuals and groups. Creativity techniques can be classified as analytical or intuitive (Couger, 1995). Analytically-oriented techniques "tend to follow a linear pattern or sequence of steps" (Miller, 1987, p. 66) while intuitive techniques "rely on a single image or symbol to provide a whole answer all at once to arrive at solutions by a leap" (Miller, 1987, p.66). Creativity techniques can impact the process of idea generation by encouraging people to think about the issues in new and different ways (Couger et al., 1993). We hypothesized:

H3: Intuitive techniques will lead to more novel ideas and more PM ideas than analytical techniques.

H4: Analytical techniques will lead to fewer novel ideas but more PP ideas than intuitive techniques.

Individual creativity tools may help by implementing specific techniques or providing general guidance (Masseti, 1995). Group Support Systems (GSS) stimulate individuals within a group by exposing them to the ideas of other group members (Dennis and Valacich, 1994). Individuals are more apt to generate ideas similar to those to which they are exposed (Satzinger, Garfield, and Nagasundaram, 1996).

H5: Individuals will produce ideas similar to the type of ideas to which they are exposed.

People and process interaction. When a creativity technique matches an individual's preferred creativity style, an amplification effect occurs as the individual generates significantly more ideas related to the technique (MacCrimmon and Wagner, 1994). Therefore:

H6: Innovators using intuitive techniques or exposed to high novelty ideas and PM ideas will increase their number of novel ideas and PM ideas.

H7: Adapters using analytical techniques or exposed to lower novelty ideas and PP ideas will increase their number of PP ideas.

2.0 Methodology

The impact of feedback, creativity technique, and individual differences were explored through a laboratory experiment using a GSS simulator. The subjects were 217 undergraduate business students enrolled in a core business course at a large state university. Individuals were randomly assigned to one of the treatment conditions.

Independent variables. There were four independent variables in this experiment. The first was creativity technique, either analytical (force field analysis: Couger et al., 1993) or intuitive (guided fantasy, called goal/wish by Couger et al., 1993). The force field technique is an analytical technique where forces contributing to or hindering solutions are used as stimuli for generating ideas. We provided subjects with a list of eight forces (such as the growth in university enrollment) that impact the parking problem. The guided fantasy technique is an intuitive technique that creates a world distant from the problem to provoke unusual solutions. We provided subjects with a Swiss Alps vacation scenario that discussed things like the various modes of transportation in the Alps and the seasonal nature of the tourism in the region.

The second independent variable was the type of feedback, either a set of paradigm preserving (PP) ideas or paradigm modifying (PM) ideas. The ideas came from an earlier experiment (Nagasundaram, 1995) that had been previously coded for quality, novelty, and paradigm relatedness (i.e., PP or PM) by two independent raters. Quality (i.e., good or not-good) indicated the feasibility of the stated idea. High novelty (novel) ideas were those that had been mentioned by only one or two subjects in the prior experiment. While paradigm modifying vs. paradigm preserving had to do with how closely the ideas related to the original question.

The remaining two independent variables were subject characteristics and were therefore not directly manipulated. An individual's overall creativity was measured by the Creative Thought and Innovative Action Inventory (CTI) (Hellriegel and Slocum, 1974) with 36 questionnaire items ($\alpha=.84$). An individual's preferred creativity style was measured by the KAI index (Kirton, 1976) with 32 questionnaire items ($\alpha=.86$).

Dependent variables. The dependent variables were the number of non-redundant ideas, number of good ideas, number of novel ideas, and number of PP and PM ideas. Subjects' ideas were captured in electronic logs. A coder determined paradigm relatedness and novelty by matching each participant's ideas with those coded in a previous experiment using the same problem (Nagasundaram, 1995). Approximately 20% of the

ideas were new to this study and did not match the existing list of ideas. The coder rated these for quality, novelty and PP or PM using the guidelines from the previous study.

Procedures. Subjects arrived at the meeting room in groups and were instructed that they would be generating ideas as a group, but actually worked as individuals. After being trained in the creativity technique they then solved a practice problem using that technique. Next they generated ideas for the task question: *How can we solve the campus parking problem?* This experiment used the GSS simulator developed by Satzinger, et. al. (1996) to control the type of feedback the participants were exposed to. The GSS simulator allowed participants to enter ideas onto a simulated "sheet of paper" on the screen. Each time a subject typed an idea, they received a set of ideas purportedly from the other group members, but actually from the simulator's database. The ideas from the database were determined by what type of treatment each individual received (i.e., high novelty-PM ideas or low novelty-PP ideas). The only other way to control for the type of feedback the individuals were exposed to would have been to use a group that had only one real participant and the rest confederates, but this is very costly and would not add much to the control of the experiment.

3.0 Results and Discussion

The data were analyzed using a 2x2 ANCOVA with KAI and CTI as covariates. Table 1 presents the means and standard deviations. Significant findings are presented in Table 2; any item not reported was not significant.

Use of the guided fantasy technique resulted in more ideas, more good ideas, more novel ideas, and fewer PP ideas. Contrary to our hypotheses, individual creativity, preferred creativity style, and the type of feedback did not significantly impact the number or type of ideas produced.

Table 1: Results for Ideas Generated: Mean (Std Deviation)

Feedback/Technique	PP/FF	PP/GF	PM/FF	PM/GF
Unique ideas	9.10 (4.79)	9.64 (4.40)	8.39 (3.12)	9.70 (5.32)
Good ideas	8.11 (4.20)	8.52 (3.89)	7.44 (3.24)	9.00 (4.83)
Novel ideas	1.94 (1.87)	2.60 (1.96)	1.65 (1.82)	2.36 (2.04)
PM ideas	3.10 (2.24)	4.62 (2.66)	2.54 (2.13)	3.50 (2.62)
PP ideas	6.00 (3.35)	5.02 (2.85)	5.85 (3.04)	6.20 (3.59)

Table 2: Significant Results

	unique ideas	good ideas	novel ideas	PM ideas	PP ideas
Technique	F(1,201)=7.46 p=.007	F(1,201)=8.05 p=.005	F(1,201)=7.87 p=.006	not significant	F(1,201)=6.04 p=.015
Technique x KAI	F(1,201)=8.82 p=.003	F(1,201)=10.03 p=.003	F(1,201)=8.50 p=.004	F(1,201)=5.08 p=.025	F(1,201)=6.22 p=.013
Technique x CTI	F(1,201)=8.25 p=.005	F(1,201)=9.65 p=.002	F(1,201)=8.73 p=.004	F(1,201)=4.33 p=.039	F(1,201)=6.18 p=.014
Technique x KAI x CTI	F(1,201)=9.42 p=.002	F(1,201)=11.48 p=.001	F(1,201)=8.91 p=.003	F(1,201)=5.72 p=.018	F(1,201)=6.42 p=.012

There were significant interaction effects between technique and an individual's overall creativity level (CTI) and preferred creativity style (KAI). Contrary to our hypotheses, the use of guided fantasy resulted in more ideas, more good ideas, more novel ideas, and more PM ideas for individuals with lower overall creativity (CTI) scores and for adapters on the KAI scale. We conclude that individuals with high overall creativity scores and those who are innovators produce a large number of good, novel and PM ideas,

regardless of the technique they use. Guided fantasy helps improve their performance, but only moderately. Conversely, individuals with low overall creativity scores and individuals who are adapters have greater difficulty producing a large number of good, novel and PM ideas. By providing a structure (guided fantasy) to help them approach the task in a different way from their usual approach to idea generation, their performance improved substantially.

This study suggests that the process component of the four P's model has a greater impact on the product than the person component. Thus, screening employees based on their preferred problem solving style (KAI score) or their overall creativity level (CTI score) may have an insignificant impact on the types of ideas the employees generate. Managers, instead, should pay closer attention to creativity techniques and matching them to the types of ideas sought.

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