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Individual and Group Electronic Brainstorming in an Industrial Setting

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Verbal Brainstorming

- Verbal brainstorming
  - Group of individuals in a room generating ideas
  - Problems:
    - Blocking
    - Evaluation apprehension
    - Social loafing

Electronic Brainstorming (EBS)

- EBS proposed to mitigate negative effects
  - Involves groups of people brainstorming via a computer
    - No blocking
    - Little evaluation apprehension
    - Possible decrease in social loafing
- Studies have shown EBS superior to verbal brainstorming

EBS

- Studies assessing EBS and electronic individual (nominal) brainstorming have mixed results
  - EBS seems to be superior for large groups of people
  - Otherwise, nominal is just as good (if not better)

Limitations of Past Research

- Research only done on college students in lab setting
  - What about real-world industrial settings?
- Brainstorming topics not very realistic
  - What about problems that are “wickedly” difficult (ill defined with no ‘right’ solution) and complex?
- Research done with small number of people per group
  - What about larger teams with diverse skills and knowledge bases?
- Research done in short, one-time session
  - What about real-world situations where people brainstorm over several days?

Current Study

- Employees at SNL brainstormed on a topic over the course of 4 days
  - Brainstorming groups consisted of 30+ people
  - Topic was a “wickedly” difficult one proposed by Sandia’s president
  - Quantity and quality of ideas assessed

Hypothesis

- **EBS would be more effective than nominal brainstorming**

Method

- 120 employees/contractors volunteered to participate
  - 69 actually submitted ideas
- Participants randomly assigned to nominal or group condition
  - 30 in group condition
  - 39 in nominal condition
- Participants were recruited via advertisement

Procedure

- Participants asked to logon to website and create *anonymous* user ID
- Participants asked to logon and submit ideas to question at least once a day for 4 days
- Participants in group condition could see other's responses

Displaying the submitted ideas, note that this is the top of a long list, with the standard menu at the bottom of the list, ShowAvailableIdeas.php

“Wickedly” Difficult Question

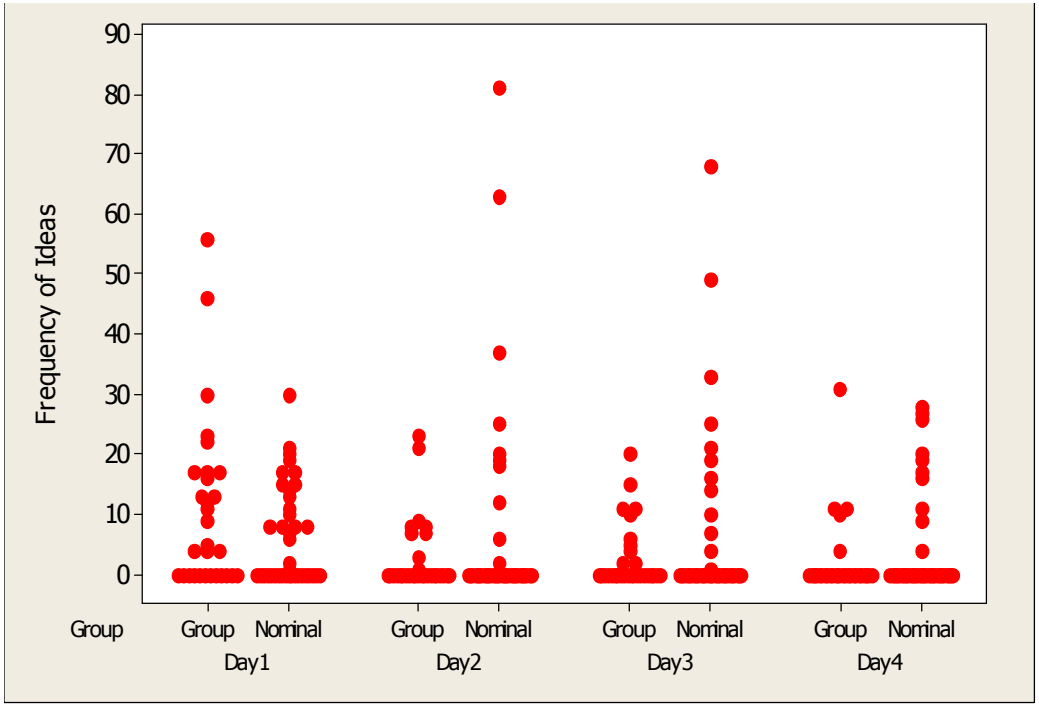
- All participants brainstormed about “wickedly” difficult problem raised by president Tom Hunter
  - 4 parts to question
    - Empowerment
    - Definition of “we”
    - Leadership
    - Model of management

Results

- Quantity analysis of ideas
  - Number of ideas
  - Number of cumulative ideas
  - Number of words and sentences
- Quality analysis of ideas
  - Independently assessed by 2 raters
    - Originality – novelty of idea
    - Feasibility – ease of implementation
    - Effectiveness – ability to solve problem

Quantity Analysis

- **NO significant effect by group for number of ideas, cumulative ideas, words or sentences**



Number of Ideas by Day of Study

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Quality Analysis

- Each response was evaluated by 2 raters
- Maximum averaged rating was used
- Compared nominal vs. EBS responses for 3 quality dimensions
  - Originality
    - Nominal responses superior to EBS responses ($p<.001$)
  - Feasibility
    - Nominal responses superior to EBS responses ($p = .02$)
  - Effectiveness
    - Nominal responses superior to EBS responses ($p = .01$)

Summary

- **Current experiment expanded literature:**
  - **Industrial setting**
  - **Large group of 30+ people**
  - **“Wickedly” difficult real-world question**
  - **Brainstorming period of 4 days**

- **Nominal brainstorming as effective as group brainstorming (at very least)**
  - **No difference in quantity of responses**
  - **BUT difference in quality of responses**
    - **Perhaps more important?!**
  - **Perhaps 30 people too large for successful group brainstorm**

Future Research

- Different computer-mediated technologies and interfaces
- Other “wickedly” difficult questions
- Alternate industrial settings

Thank You and Any Questions?

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