Bisociative Thinking as a Theoretical Framework for Group Decision Support Systems

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ABSTRACT

Emergent idea creation is an important function in organizations for stimulating innovation, and is often accomplished through group activities such as brainstorming using Group Decision Support Systems (GDSS). Research has attempted to provide some best practices related to the various components of GDSS, with mixed results. This article focuses on the advantages of one type of GDSS, Electronic Brainstorming Systems. We offer a model that suggests bisociative thinking process can improve the quality of idea creation from an EBS. A research design to test the model is provided as well implications for organizations and manager.

Literature Review

Introduction

A systematic approach to knowledge, innovation, and new idea creation, may be the most important competence of the future for creating and sustaining competitive advantages that stimulate growth in the global economy. As part of the knowledge and innovation research themes, opportunity recognition is central to the success of entrepreneurial ventures and wealth creation. For entrepreneurs the ability to identify opportunities is an essential requirement for being able to generate excessive rents necessary to justify the high risk of new venture development, as well as, anticipate technological disruptions and discontinuities in existing markets. For managers, opportunity recognition is essential to re-inventing the organization and creating a culture of perpetual organizational renewal. By recognition we mean the detection, discovery, uncovering or finding of opportunities, rather than the recall, recollection, or remembering of past ventures. Developing a brainstorming model for inspiring an organized, institutionalized, and disciplined approach to clarify the "fuzzy front end" of idea creation can be essential to opportunity recognition.

Emergent idea creation is an important function in organizations for stimulating innovation, and is often accomplished through group activities such as brainstorming using Group Decision Support Systems (GDSS). Research has attempted to provide some best practices related to the various components of GDSS, with mixed results. This article focuses on the advantages of one type of GDSS, Electronic Brainstorming Systems. We offer a model that suggests bisociative thinking process can improve the quality of idea creation from an EBS. This paper explores the influence of bisociative thinking on patterns of opportunity recognition, staged in an experiential and emergent learning process. Data are collected using a quasi-

experiment procedure for brainstorming new ideas for an industry or organization to determine if the bisociative thinking process makes a difference in the quality of ideas generated. Conclusions related to efficacy of the model are provided as well implications for organizations and manager.

Idea Creation

Emergent idea creation is an important function in organizations for stimulating innovation, and is often accomplished through group activities such as brainstorming and brainwriting. Brainstorming is a decision-making technique used to describe the verbal generation of ideas by a group. (Brahm & Kleiner, 1996). According to Osborn (1962) it is 44 percent more effective than traditional problem solving methods. A similar group technique, brainwriting, emphasizes the silent generation of ideas in writing, which are then shared, to invigorate new ideas. Brahm and Kleiner (1996) concluded that brainwriting will produce more ideas than brainstorming, although not necessarily more unique or better quality. Paulus and Yang (2000) maintained that the quality of creative and innovative ideas using brainwriting depends on the idea exchange process. This may be attributed to the fact that while some participants have concerns about oral expression in front of groups, others have difficulty expressing ideas in writing. Considerable research suggests this process is enhanced using computer-base systems.

Group Decision Support Systems (GDSS) or group support systems (GSS) are defined as computer-based systems that support groups of people engaged in a common task and that provide an interface to a shared environment (Aiken et al, 1995). These systems are designed to help groups become more productive by supporting the exchange of ideas, opinions, and preferences have dramatically increased group productivity (Aiken, Vanjani, & Krosh, 1995;

Reinig et al, 1996). GSS increases quality involvement in providing feedback while decreasing the corresponding time and effort required for the process (Dishman & Aytes, 1996). They can increase the time necessary for meetings, foster collaboration, communication and negotiation among group participants. These systems combine communication, computing, and decision support technologies to facilitate formulation and solution of unstructured problems in a group setting (DeSanctis and Gallupe, 1987; Aiken et al., 1995). GSS groups also generate a greater quantity of ideas (Massey & Clapper, 1995), although after considering redundancy not necessarily more unique ideas.

GDSS have evolved beyond the original orientation toward decision making to include such terms as Electronic Meeting Systems, Computer-supported Collaborative Work (CSCW), and Groupware, as well as Electronic Brainstorming (EBS). EBS makes use of computers to allow members to interact and to exchange ideas, define a problem's scope, identify possible solutions and develop a heuristic classification scheme (Kay, 1995).

There are four key factors related to creativity and exchange of new ideas using GDSS: process, environment, and people. Although this paper focuses on improving the process of idea generation, the other factors of creativity in an electronic environment are discussed, as well.

Process

Research indicates that face-to-face (verbal) brainstorming meetings are less efficient at generating ideas than when working alone (nominal brainstorming) (Paulus & Yang, 2000). For example, Pinsonneaeault, Barki, Gallupe, & Hoppen (1999) found that nominal brainstorming significantly outperforms EBS (anonymous and non-anonymous) and verbal. Part of the productivity loss observed in interactive brainstorming groups could be due to the inhibited

performance of people who are uncomfortable with group interaction (Camacho & Paulus, 1995).

More recently, Dennis and Williams (2005) suggests that in most cases, groups using EBS produce more ideas than groups using verbal brainstorming. Their results comparing groups using EBS to groups using nominal group brainstorming were mixed, however. Dennis and Williams also found that group size is a significant factor in predicting the performance of EBS relative to verbal brainstorming and nominal group brainstorming. As group size increases, the relative benefit of EBS increases. EBS groups outperform verbal groups when group size reaches four people. EBS groups outperform nominal groups when group size reaches 10 people (Dennis & Williams, 2005).

According to other research, EBS has been proposed as a superior approach to both nominal and verbal brainstorming (Kay, 1995; Valacich, Dennis, & Connolly, 1994). Features of electronic communications such as parallel and anonymous contributions, as well as group memory, can improve idea generation by overcoming process losses like production blocking. Parallelism is the ability for all members to exchange information simultaneously. Parallel systems produce more ideas, experience more equality of participation, and higher levels of satisfaction. Parallel input overcomes the process losses of air time fragmentation, production blocking, and evaluation apprehension, permitting much larger groups to collaborate (Reinig, Briggs, Shepherd, Yen, and Nunamaker, 1996; Satzinger, 1999; Dishman & Aytes, 1996; Gallupe et al., 1994). Anonymity enables members to make contributions without attaching their names. Consequently participants may experience less criticism anxiety, particularly important when there are hierarchical relationships among group members (Satzinger, 1999). Group memory records all remarks typed into the computer for future reference and sharing. It provides

feedback and stimulation from other group member inputs which limits unproductive group dynamics such as social loafing. By introducing social comparison with a graphical feedback tool and increasing the salience of that social comparison with facilitation techniques, the productivity of EBS groups can increase (Shepherd, Briggs, Reinig, Yen, & Nunamaker, 1996).

Aiken et al, (1997; 1996) found that among EBS techniques, gallery writing was superior to individual poolwriting, because it was able to show users all of the groups comments at the same time. Although more raw comments were generated using poolwriting, participants were more satisfied with gallery writing. There was no significant difference in quality comments and the number of unique quality comments (1996).

Massetti (1996) experimentally investigated the effectiveness of a type of GDSS, called individual creativity support systems (ICSS). She found that subjects using ICSS software did not generate more ideas than subjects using conventional software or no software, but subjects using software did outperform subjects using a pen and paper. The generative application did not outperform the exploratory on the perceive novelty of ideas produced; and the exploratory application did not outperform the generative on perceived value. Satisfaction with the conventional or exploratory applications did not differ. Fluency did not affect software satisfaction, perceptions of computer comfort or better decision support did not vary between the software conditions. Satisfaction with the generative software was relatively low while performance was high, which suggests that the applications provided meaningful decision support, not just charming subjects into performing more creatively. She suggests that ICSS may be used to frame thought so that ideas produced reflect specific qualities. Low ratings on likability and usability did not appear to negatively affect performance. For future research, she suggested examining the efficacy of ICSS for enhancing creativity over time and the relationship

between ICSS technology and creativity training, and the degree of analysis required in the task. Also, future innovations that could enhance the process include multilingual GDSS and incorporating artificial intelligence into GDSS such as computer-aided speech recognition and intelligent information retrieval agents.

Another aspect of electronic brainstorming is how the problem should be presented to the group; whether as an intact problem (one all-encompassing question, presented simultaneously) or decomposed problems (sequentially presented series of separate questions, each focusing on one aspect of the problem). According to research (Dennis, Valacich, Connolly, & Wynne, 1996) groups using the decomposed process generated 60% more ideas. This difference was attributed to the ability of time constraints to increase the rate of idea generation and the ability of problem decomposition to refocus member's attention more evenly across the entire problem.

Other relevant dynamics of idea creation productivity include divergent and convergent processes and paradigm relatedness, but not have been thoroughly explored. Divergent thinking is associated with creativity and the attempt to expand or broaden views. Divergent activities of element finding and problem finding make sense of the problem, rather than immediately seeking a solution to a problem that is not well understood. Identifying elements relevant to the discussion question is one of the earliest divergent activities related to the early sense making phase of brainstorming. Convergent thinking is associated with the application of standard knowledge and the attempt to narrow the focus.

Changing a person's paradigm can encourage creativity. A paradigm is a set of assumptions, a way people perceive the world and a way of explaining and filtering their external environment. Brainstorming may be limited by paradigm rigidity. Creative output can be divided into paradigm preserving ideas, paradigm stretching ideas and paradigm breaking idea.

Creativity can be measured by their degree of originality, feasibility, or fitness and the degree of paradigm relatedness (Satzinger, 1999). Paradigm relatedness can be viewed on a continuum from paradigm preserving ideas, to paradigm stretching ideas and finally, paradigm breaking idea. Paradigm preserving ideas tend to be directly related to the problem and its prevailing paradigm, accepting the underlying assumptions of the problem. Paradigm modifying solutions may alter the framework of the original problem.

Environment

A GDSS environmental setting usually entailed a group seated at personal computers, connected to a local area network. A group facilitator controls the meeting by engaging participants in the use of the software, preparing questionnaires, and other administrative tasks. Common task include voting, grouping, and ranking. The software is sometimes linked to databases, models and statistical analysis packages. Using technology previously limited, four basic settings were typical:

- a decision room with a small group meeting face to face
- a small group whose members are dispersed in a limited geographic area and connected using a LAN, meeting asynchronously using a computerized bulletin board, or synchronously using a real-time document editor
- a large group in a face-to-face meeting, using a large number of computers in a large auditorium
- a computer-mediated conference with a large group dispersed geographically; technology applications such as computer, audio, and video conferencing are used as communication media; participants send their input to a central database or electronic mailbox

People

The process of GDSS offers advantages of anonymity, parallel communication, automated record keeping, and greater structure. The disadvantages are slow communication, resistance to change, lack of media richness, possible increase in conflict, and loss of some key participants who rely on strong interpersonal skills or lack keyboard skills, misuse of technology, and cost. For example, Aiken et al, (1995) suggest that when tasks are structured or routine, or for very small groups (fewer than eight people) GDSS may not be cost effective. The advantage of parallel communications outweighs the disadvantage of slow typing speeds for larger groups.

One disadvantage to GSS such as EBS has been that users feel emotionally unfulfilled despite better productivity (Reinig, Briggs, Shepherd, Yen, and Nunamaker, 1996). Users have a loss of the affective reward, a function of excitation transfer, often associated with a challenging meeting where they struggle and succeed. This leads to user resistance to adopting GSS technology. By developing an instrument to measure affective reward, they found no difference in the sense of competition or the goal difficulty. They suggested that by creating a sense of competition by pitting participants against one another rather than a mythical group would generate higher affective reward. Engaging in high competition has shown to result in dramatic improvements in productivity during electronic brainstorming without jeopardizing affective reward, as long as the goal is attainable.

There is a difference between satisfaction with the meeting output and the affective reward experienced by the participants. Furthermore studies report higher quality outcomes and higher satisfaction for groups using GSS. The excitation transfer that results from physiological group behaviors may be eliminated in GSS. Affective reward impacts the adoption and diffusion of new technology.

Sutton and Hargadon (1996) also suggested that the effectiveness model should be expanded to include whether the output meets the standards of the appropriate audience, whether it enhances its capability to do competent work in the future; and it contributes to member's growth and well being. Furthermore, research suggests that permanent groups enhance organizational effectiveness more than temporary groups.

Asquith (1997) suggests that the greater efficiency of nominal versus verbal brainstorming is attributed to group size. Pooled results from eight or twelve individuals produced more unique ideas than groups of equal size. As group size increased the number of unique ideas decreased. Group participants report greater level of enjoyment than those that work alone. The preferred group size was eight rather than four or twelve. Individuals in small groups expended more effort in thinking of ideas.

Other research (Aiken, Krosp, Shirani, & Martin, 1994) compared groups averaging 8 people to groups of 48. They found no significant difference in perceived satisfaction, evaluation apprehension, or production blocking in either group size using EBS. There was a significant difference between small and large verbal groups. There was also a significant difference between small verbal groups and large groups using EBS suggesting the benefits of EBS are greater for larger groups. Valaich et al, (1994) also found large groups using EBS outperformed equivalent nominal groups in idea generating tasks. This was attributed to the elimination of production blocking.

Bisociative Thinking

This paper present the proposition that bisociative thinking can improve the productivity of people engaged in the creative process, particularly related to the quality and uniqueness of idea generation. Recent business researchers have described bisociative thinking as the ability to

combine matrices of information (Smith & Di Gregorio, 2002). In terminology borrowed from psychology, bisociation is the mental mixture of concepts from two contexts or categories of objects that are normally considered separate categories by the literal processes of the mind. Koestler (1964) first defined the term bisociation is "distinct from the routine skills of thinking on a single plane and the creative act, which…always operates on more than one plane." These planes are otherwise described as frames of reference, associative contexts, types of logic, codes of behavior, and universes of discourse. When two independent matrices of perception or reasoning interact with each other the result is "…their fusion in a new intellectual synthesis…which can produce intellectually challenging effects." (Koestler p. 59). These matrices articulate any ability, habit, skill, or any pattern of ordered behavior governed by a code of fixed rules. The more independent the matrices, the more unexpected and impressive the achievement, and the more novel the discovery. In contrast to organizational learning, which is the acquisition of a new skill, bisociation is the combination, re-shuffling and re-structuring of skills. The term bisociation is meant to point to the independent, autonomous character of the matrices, which are brought into contact in the creative act, whereas associative thought operates among members of a single pre-existing matrix.

Koestler contrasted bisociation which involves making entirely new connections among ideas with the more familiar and mundane associative (purely logical) thinking which involves previously established connections among ideas. Koestler maintained that bisociation applies to all forms of creativity, but only described applications in art, theater, music, science and humor. Limited attention has been given to bisociative thinking in business literature.

Proposed model

This model addresses the primary issues of process, people and environment. The model's theoretical framework of bisociative thinking is innovative contribution to an Internet-based Electronic Brainstorming Software. This system incorporates the best practices of GDSS idea creation systems as presented earlier in this paper. As an EBS, it particularly provides a better process for larger, dispersed groups than a verbal process. It provides for a nominal, gallery writing approach as well. It establishes a flexible environment that can be face-to-face, synchronously online, or asynchronously offline. The system includes anonymous contributions, parallel communication, automated record-keeping, and process structure. Organizations can incorporate divergent and convergent process elements of competition and reward, establish permanent groups of appropriate size and cognitive and personality characteristics.

The proposed Strategic Visioning Model introduces a systematic multi-dimensional approach to the innovative process, called Bisociation Brainstorming™. Using environmental scanning techniques, stakeholders identify trends and assign scores relative to their probability of occurrence and relevance to their particular industry. A Cross Impact Matrix articulates the interaction of these environmental factors taken two or more at a time. This higher-order thinking technique for brainstorming identifies possible opportunities and threat that are prioritized based on the relative value of the associated trends. New ideas are subsequently generated that take advantage of promising opportunities or avoid potential threats.

The structure of the SVS seminar is based on the best practices of the previous research. These brainstorming and brainwriting approaches use an EBS that is uniquely designed based on the best practices of past research, such as alternating between poolwriting and gallery writing techniques, divergent and convergent approaches; and nominal (individual) and verbal (group)

environments. In addition to utilizing best group decision support systems and practices, this model establishes a more potent and interactive approach to the idea generation process.

This system addresses the need in an EBS environment to consolidate and organize, browse, understand ideas, judge the merits, merge similar ideas, eliminate redundant or irrelevant ideas, consult members' opinion in a short time. Because brainstorming encourages creative, diverse and uncensored ideas, many comments are raw and unpolished. The frustration and time with this task may cause satisfaction and productivity to decline and unique ideas lost. Parallelism and anonymity facilitate rapid development of ideas. Convergent tasks such as idea organization create problems of equivocality during synthesis, consolidation and consensus building can not be resolved by passive groupware design. It needs a more proactive and intelligent groupware solution. The purpose of the following research design is to test whether the Strategic Visioning Model is an effective alternative for group decision making and brainstorming.

Methodology

Sample

The sample for this study is made up from 90 undergraduate business administration students from a comprehensive four year university. Students from Group I and Group II are seniors enrolled in the Competitive Strategy (i.e. Strategic Management/Business Policy) capstone class. Students from Group III are juniors and seniors from the introductory Entrepreneurship class. Although this is a sample of convenience, there demographic differences between the groups are insignificant in terms of age, gender, and grade point average.

The only significant difference between Group III and the other two is the significantly higher percentage of management majors.

Procedure

Participants in all groups received a standard power point presentation on the environmental scanning processes, particularly covering the four basic macro-environmental categories (political, economic, social, and technology) definitions and examples of trends, opportunities, and threats/challenges. Groups I and Group III received additional instruction on the bisociation process and use of a cross impact matrix to facilitate the interaction of trends process. Group II received additional instruction on the SWOT analysis process related to opportunities and threats/challenges, but without using the bisociation process.

Participants were assigned to research and bring one trend from each of the four macro-environmental and present them to the group. Each member of the group rated each of the other member's trends based on high, medium, and low probability of occurrence in the future. The top three trends from all classes were calculated and summarized on index cards and provided to the participants to develop opportunities. Group I used the brainwriting technique with bisociation. Each member of the five-member sub group was randomly assigned a matrix category, with the sixth category left blank. Group II used brainwriting without bisociation. Each member was assigned to develop one opportunity each. Group III used brainstorming technique with bisociation. The groups completed six opportunities as a group. Participants then choose the top 3 opportunities to identify a new idea, e.g. strategy, product, or technology. Students were given 45 minutes to complete the exercise. They were free to assume any industry or environmental context for their brainstorming activities.

Analysis

The output of participants and groups are summarized and evaluated based on the quality of their contributions. Three raters were used to evaluate the opportunities using a Likert-like scale to assess the success probability and uniqueness of the opportunity and new ideas generated in the exercise. An inter-rater reliability test was conducted to determine the validity of the test.

Discussion and Conclusion

The purpose of this research is to test the concept that brainstorming and brainwriting is improved by using bisociative thinking processes. The anticipated results from this quasi-experimental research design is expected to indicate that the groups using a bisociation process as facilitated with a Cross Impact Matrix to facilitate opportunity discovery will result in higher value as determined by success probability and idea uniqueness scores.

Using the Strategic Visioning System model of creativity, managers can systematize and replicate brainstorming efforts to produce radical innovations of new value-added products or services that can be commercialized and new markets that can be developed. Incremental innovations of new processes, supply sources, and exchange mechanism can be exploited. Organizations can reinvent their business models, develop new strategies, engage new strategic alliances, develop cost-effective outsourcing alternatives, reengineer efficient business processes, and solve business problems.

The importance of developing a replicable system for idea creation can be invaluable to public and private sector organizations of any size or industry. Whether this discovery process leads to incremental or breakthrough innovation, managers can improve organization efficiency or anticipate the next “big thing” to increase the value to their stakeholders.

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