

Conducting Creativity Brainstorming Sessions in Small and Medium-Sized Enterprises Using Computer-Mediated Communication Tools

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Abstract. A variety of Web-based low cost computer-mediated communication (CMC) tools are now available for use by small and medium-sized enterprises (SME). These tools invariably incorporate chat systems that facilitate simultaneous input in synchronous electronic meeting environments, allowing what is referred to as “electronic brainstorming.” Although prior research in information systems (IS) has established that electronic brainstorming can be superior to face-to-face brainstorming, there is a lack of detailed guidance regarding how CMC tools should be optimally configured to foster creativity in SMEs. This paper discusses factors to be considered in using CMC tools for creativity brainstorming and proposes recommendations for optimally configuring CMC tools to enhance creativity in SMEs. The recommendations are based on lessons learned from several recent experimental studies on the use of CMC tools for rich brainstorming tasks that require participants to invoke domain-specific knowledge. Based on a consideration of the advantages and disadvantages of the various configuration options, the recommendations provided can form the basis for selecting a CMC tool for creativity brainstorming or for creating an in-house CMC tool for the purpose.

Keywords: Computer-mediated communication (CMC), electronic brainstorming, creativity, small and medium-sized enterprises.

1 Introduction

Computer-mediated communication (CMC) technologies are increasingly being used to support communication between employees in small and medium-sized enterprises (SME), especially given their low cost and universal accessibility via the Internet. These technologies are unique in at least four ways. First, they allow participants to interact at varying levels of anonymity, thereby bypassing social cues that may negatively influence behaviour in face-to-face meetings. Second, they permit “any time, any place” meetings thus allowing employees of SMEs to work collaboratively regardless of time and geographical constraints. Third, they permit simultaneous input by multiple individuals—a key advantage over face-to-face meetings in a synchronous setting. Finally, an electronic log of the communication is automatically captured (a kind of “group memory”), which can be accessed subsequently by

employees and superiors for further processing. Not surprisingly, these technologies are increasingly being used in a wide array of business domains and are increasingly being viewed as indispensable for the conduct of collaborative work. Especially in light of the relatively low cost of Internet-based CMC tools for collaborative work, they can easily be deployed for both asynchronous work by “virtual teams” and also synchronous work by teams needing to work concurrently on business problems.

Organizations of all sizes, and especially SMEs, are constantly seeking ways to tap the creative potential of their employees. Mechanisms such as suggestion boxes and open-door policies encourage individual employees to offer their ideas for product and/or process improvement in the organization. Beyond such individual-based approaches, however, organizations realize that teams of employees can often come up with creative ideas that individuals acting alone cannot (Mohrman, Cohen, & Mohrman, 1995). As far back as the late 1930s, Osborn—who popularized the term “brainstorming”—proposed that groups could enhance their creative output by following a few rules. According to Osborn’s rules, criticism of ideas proposed by others should be avoided, wild ideas are encouraged, groups should seek to maximize the quantity of ideas generated, and members are encouraged to combine and improve on ideas proposed by others. As opposed to working alone, a key reason why individuals interacting in a team can generate more ideas is that when working in a team members can build on the ideas proposed by others (Mednick, 1962; Milgram & Rabkin, 1980). Essentially, a good idea expressed by one team member can foster additional good ideas by other team members who are inspired by the original good idea. There are also socially desirable reasons for meeting in teams, for example greater sense of commitment to the outcomes from jointly performed work. It is for these reasons that creativity sessions often involve teams of employees brainstorming together.

There are, however, some drawbacks to face-to-face creativity sessions that can inhibit overall productivity, most notably social loafing, production blocking, and evaluation apprehension (Mullen, Johnson, & Salas, 1991). Social loafing, also known as free riding or shirking, manifests itself when individual team members do not contribute their fair share to the team effort. Especially when team sizes are large, it is easy for any one team member in a face-to-face environment to stay silent and simply allow others to speak. Unless the session has a facilitator or leader who specifically calls on individual team members, there is nothing to prevent an individual member from contributing little to nothing at all to the session. The second drawback of face-to-face meetings is the production blocking phenomenon. The consequence of this phenomenon is that in a face-to-face meeting a team member cannot contribute ideas as and when they arise in the mind, because some other team member may be speaking and social norms require that the speaker not be interrupted. Furthermore, social norms also dictate that one must pay attention to the person speaking, and the mental effort consumed by listening to the speaker detracts from effort that could otherwise be aimed at generating creative ideas. The third inhibitor of productivity in face-to-face creativity sessions is the evaluation apprehension phenomenon. In a team comprised of both senior and junior employees in an organization, the junior members are particular prone to this phenomenon. Essentially, the evaluation apprehension phenomenon

means that junior members are unwilling to express their ideas freely, for fear that senior members may react negatively to the suggestions of junior members. A final drawback of face-to-face creativity sessions is that there is no real-time accessible "running log" of everything that is said during the session. Thus, it is difficult for individuals to recall ideas that have already been proposed, to avoid duplication and/or to build on previously mentioned ideas. Finally, it is important to note that face-to-face brainstorming requires all team members to be present at the same physical location at the same time.

The aforementioned three drawbacks, or process losses, of face-to-face creativity sessions can be overcome by employing CMC tools. In the information systems (IS) literature, there is considerable empirical evidence that brainstorming sessions held using CMC tools, referred to as "electronic brainstorming," is superior to face-to-face brainstorming (Gallupe et al. 1991; Nunamaker et al. 1991; Fjermestad & Hiltz 1998). The main reasons why teams using CMC tools generate more ideas than teams brainstorming face-to-face is because features of CMC tools allow computer-mediated teams to overcome the process losses inherent in face-to-face communication. Specifically, a CMC system used for creativity brainstorming offers four distinct advantages over face-to-face brainstorming: (1) parallel communication, also called simultaneous input, whereby each team member can simply type ideas into the system as they arise, (2) the possibility of anonymous or semi-anonymous input (to be explained later in the paper), whereby members can provide their input anonymously without fear of criticism, (3) a real-time accessible log of the creativity session, whereby ideas proposed by all members are accessible on a common screen that can be reviewed by all members at their convenience, and (4) members of the brainstorming team do not all have to be physically present at the same location; using Internet technologies members can log on from remote and still participate in the CMC-based brainstorming session. Parallel communication effectively overcomes the production blocking phenomenon and is one of the main reasons why CMC based brainstorming is more effective than face-to-face brainstorming (Nijstad, Stroebe, & Lodewijkx, 2003). The real-time log of the session in an electronic brainstorming session makes it easier to build on ideas proposed by others and also ensure that more ideas are read and processed by participants in the session. Using Internet protocols, members can participate from remote location, thus saving travel time and costs associated with assembling all participants at one physical location as must be done in face-to-face brainstorming.

Given these advantages of a CMC creativity brainstorming system, the question arises as to how the system can be configured to meet the needs of SMEs, considering the specific task types and individual characteristics that might affect the optimal use of such systems. Are there unique characteristics of certain brainstorming tasks that require the use of certain CMC features? What are the individual characteristics of employees, such as rank and position in the organization that might warrant the use of some CMC features but not others? Should the various CMC features be used in different ways at different phases in the brainstorming session? Answers to questions such as these would help SMEs harness the power of CMC tools for their creativity brainstorming sessions. This paper discusses the considerations involved and suggests configuration settings for CMC creativity brainstorming systems for SMEs so that they can obtain the maximum benefit from such systems.

2 Background on Brainstorming

The concept of brainstorming is not new. Osborn (1963), one of the original proponents of group brainstorming, proposed the following four rules for brainstorming:

1. Criticism is ruled out. Adverse judgment of ideas must be withheld;
2. “Free-wheeling” is welcomed. The wilder the idea, the better; it is easier to tame down than to think up;
3. Quantity is wanted. The greater the number of ideas, the more the likelihood of useful ideas; and
4. Combination and improvement are sought. In addition to contributing ideas of their own, participants should suggest how ideas of others can be turned into better ideas or how two or more ideas can be joined into still another idea.

The rationale for these rules is to reduce inhibitions and maximize the effectiveness of the brainstorming session, so that the largest number of good ideas can be generated. The first three rules seek to get participants to generate as many ideas as possible without regard to the ideas being proposed by others. The “free-wheeling” dictum seeks to get participants’ creative juices flowing—to get them to “think outside the box.” Sometimes, what may seem like a “wild” idea to the person proposing it may turn out to be the most original, innovative, and practical idea generated during the session. The last rule takes advantage of the fact that there are multiple participants in the team brainstorming session; it is logical to expect that ideas proposed by other team members might trigger ideas from another member that s/he would not have thought of alone.

Beyond the aforementioned four rules of brainstorming, however, there are other factors to consider in designing computer-mediated creativity brainstorming sessions. These include the use of alternative brainstorming techniques, facilitation techniques, and the role of the specific type of creativity task that the team addresses. These are now discussed.

2.1 Brainstorming Techniques

Following Osborn’s approach, the most natural technique for conducting creativity brainstorming is the interactive technique, wherein participants brainstorm at the same time but possibly from different locations. In the interactive technique, participants see ideas proposed by others in real-time, since each participant can simultaneously type his or her ideas and all ideas’ input appears in group memory. Interactive brainstorming thus facilitates Osborn’s fourth rule of brainstorming, since it allows participants to build on ideas offered by others in the session. Indeed, the term “brainstorming” implies that individuals interact and jointly produce ideas. Interestingly, however, there is considerable research that shows that the *nominal group technique* is superior to interactive brainstorming, when the brainstorming session is conducted face-to-face. In the nominal group technique, individuals “brainstorm” by themselves—that is, they record their own ideas without interaction

with anyone. Subsequently, members come together to share the ideas they had individually generated. All ideas individually produced are merged together. After eliminating duplicates, the merged set of ideas, constitutes the total number of unique ideas developed by the team, although they had “brainstormed” individually.

So which technique is “better” when using CMC to support creativity brainstorming—interactive or nominal brainstorming? There are both positive and negative aspects to each technique. Some researchers have argued that interactive brainstorming is necessary in order for group members to receive feedback and stimulation for generating ideas (Satzinger, Garfield, & Nagasundaram 1999). Satzinger et al. (1999) found that, through the group memory feature, interactive groups are exposed to the ideas of others while brainstorming and reading others’ ideas can provide stimulus for generating new ideas of their own. This finding tends to validate the importance of Osborn’s fourth rule of brainstorming, i.e., building off the ideas of others is a way to enhance creativity. However, one problem that can arise in interactive groups is cognitive inertia, which means that individuals tend to stay within the frame of previously submitted ideas. That is, individual members tend to “follow the lead” of others and offer only slight variations of previous ideas rather than entirely different, new, unique ideas. This phenomenon has been referred to as “groupthink”—a tendency for all group members to offer ideas that are essentially within the same realm, that is, ideas that do not differ substantially. The end result is a narrower range of ideas than if individuals were not subject to the cognitive inertia or groupthink phenomena. Another problem that can arise in interactive brainstorming is distraction conflict (Aiken & Sloan 1997; Pinsonneault & Barki 1999). In an interactive session, off-task comments made by others can be distracting, leading to a reduction in creative output. Although the group memory is a positive feature of electronic brainstorming, team members may become distracted by reading others’ ideas, which takes time away from offering new ideas of their own.

The nominal brainstorming technique does have advantages. Pitfalls such as cognitive inertia and groupthink are not as likely in the nominal technique, since each participant generates ideas individually, at least initially. Additionally, since there is no real-time available group memory of ideas proposed by others, the nominal technique results in less distraction conflict—individuals cannot be distracted by off task comments or by reading the ideas put forth by others. The main drawback of the nominal group brainstorming technique, however, is that brainstorming by oneself makes it impossible to build off the ideas proposed by others. In effect, the nominal group technique violates Osborn’s fourth rule of brainstorming. Therefore, the lack of interaction in nominal group brainstorming would seem to run counter to the concept of brainstorming as envisaged by Osborn (1963).

Whether interactive electronic or nominal electronic brainstorming is superior is an empirical question, which has been addressed to some extent in prior research. Interestingly, Gallupe et al. (1991) found no significant difference between interactive and nominal electronic brainstorming. Lynch, Murthy, & Engle (2009) also found no significant difference between the interactive and nominal group brainstorming

techniques, in the context of a fraud brainstorming task. On the other hand, Valacich et al. (1994) found that larger groups brainstorming in interactive mode using technology produced a significantly higher number of ideas compared to electronic nominal groups. Given that there is no clear evidence that either technique dominates, the logical conclusion is that both techniques could be used with no substantial loss of effectiveness. Indeed, what might make the most sense is to use the techniques in conjunction—a phase of nominal group brainstorming, followed by a phase of interactive brainstorming, with perhaps a repetition of the sequence. Such an approach captures the benefits of both techniques, while mitigating the disadvantages of each.

One more brainstorming technique is worth discussing. Referred to as the “round-robin technique,” it involves participants taking turns to propose ideas. In a face-to-face creativity brainstorming session, this technique makes sense, since it tends to equalize participation, i.e., the session cannot be dominated by one or a few members. Thus, in a face-to-face session, it makes sense to have participants take turns to speak. In an electronic creativity brainstorming session, however, given the parallel communication feature that allows simultaneous input by all participants, the question arises whether the round-robin technique applies, since there is less likelihood of the session being dominated by one or a few participants (i.e., every participant has an equal opportunity to input his or her ideas). I argue that the round-robin technique could still be productively employed even in an electronic creativity brainstorming session. Since the round-robin technique offers one participant’s idea at a time for the group to consider, it directs attention towards that idea in a way that interactive brainstorming cannot. The round-robin technique could be programmed into the CMC tool, so that it automatically switches from participant to participant, obtains his/her idea, and posts it to group memory.

2.2 Interaction Mode

As indicated earlier, the use of CMC permits the creativity brainstorming sessions to be conducted with participants identified in one of three modes: anonymous, semi-anonymous, or non-anonymous. Anonymous interaction and non-anonymous interaction should be self-explanatory. In anonymous interaction, there is no identification at all of the author of an idea. Participant “A” could type an idea and the same participant could type a second comment indicating that the previously typed idea is an “excellent idea.” The other participants would not know that it is in fact the very same participant who proposed the idea who is indicating that it is an excellent idea.

Non-anonymous brainstorming is the other extreme, where every idea is tagged with the full (real) name of the participant who input that idea. An intermediate identification mechanism is *semi-anonymous* brainstorming, in which each participant is assigned a unique code, which cannot be traced to the individual. Every idea input is tagged with this unique code. This approach would enhance transparency—an idea proposed by participant “X” cannot be touted as an excellent idea by participant “X” (or if that is the case, the other participants would see through it). If it is deemed essential for participants’ identity to be hidden, semi-anonymous interaction is

preferred to completely anonymous interaction, to prevent the sort of gaming alluded to here. That is, semi-anonymous interaction preserves anonymity while preventing “gaming” wherein a participant could anonymously comment on his/her own idea, as if the comment were coming from some other participant.

2.3 Facilitation

It is common for an expert facilitator to be used to run the brainstorming session. In an SME, the facilitator may be a senior member within the organization, rather than a hired consultant. The facilitator defines the problem, sets the agenda, and controls the flow of steps in the session. Prior to the session itself, the facilitator determines who will participate and might assign some background reading so that participants have a starting point and/or a common base of prior knowledge going into the session.

In preparation for the brainstorming session, the facilitator might also create a list of questions that could be used to stimulate discussion. For example, in a creativity session aimed at generating ideas for a new product, a few leading questions might be “What was the last successful new product introduced to the market? What were the unique attributes of that product? What made the product successful?” While not all of such advance questions may be actually posed during the session, the facilitator can judiciously propose a question if the session appears to be at an impasse. Another role the facilitator can play is to manage the session, so that it is not dominated by one or a few members. Some brainstorming techniques are aimed specifically at ensuring that all participants have their input attended to by other participants—these techniques will be discussed later in the paper.

So what exactly is “facilitation” in the context of a creativity brainstorming session? Bostrom et al. (1993, p. 147) defines facilitation as “...the set of functions or activities carried out before, during, and after a meeting to help the group achieve its own outcomes.” There are two main types of facilitation—process facilitation and content facilitation. Process facilitation involves setting the agenda for the creativity session, determining and controlling who participates and when, and moving participants through the steps in a multi-step task. Content facilitation, on the other hand, involves efforts to influence the substance, or output, of the creativity session. One example of content facilitation is the facilitator suggesting specific alternatives for participants to consider. Another example of content facilitation is to provide props or prompts to lead participants in a certain direction.

There is evidence in the IS literature that facilitation improves group performance in many settings (Anson et al., 1995; Niederman et al., 1996; Wheeler and Valacich, 1996; Dennis and Wixom, 2001). For example, Wheeler and Valacich (1996) found that facilitated groups more faithfully followed the outlined heuristics and decision-making sequence, which in turn led to better decision quality, in comparison to groups that were not so facilitated. Santanen et al. (2004) found that groups who used a model of idea facilitation in which group goals were specified every two or eight minutes performed better than groups who brainstormed without the aid of such idea facilitation.

Although prior research generally supports the notion that facilitation results in positive group outcomes, it is noteworthy that the most prior studies on the use of facilitation techniques in conjunction with CMC tools has used a human facilitator. Naturally, some expert facilitators might be better than others. Thus, it is difficult to determine the extent to which the positive outcomes of a facilitated CMC session is a function of the specific human facilitator who led the session. One alternative to using an expert human facilitator is to *automate* facilitation, to the extent possible. When using CMC tools, it is possible to automate both process and content facilitation at least to some degree. For example, process facilitation steps that involve moving participants through a set agenda, making participants take turns to contribute ideas, and enforcing time limits for different phases of the session can be programmed into the CMC tool. Thus, rather than having a human facilitator perform these steps, they can be automated so that the CMC system “drives” participants through the creativity brainstorming session. Content facilitation can also similarly be automated. Specifically, the CMC tool can be configured to automatically offer alternatives for participants to consider. The author has developed an electronic brainstorming system that automates content facilitation for a fraud brainstorming scenario, whereby prompts appear on the screen at periodic intervals offering suggestions for participants to consider as they brainstorm (Lynch, Murthy, & Engle, 2009).

2.4 Consideration of Creativity Task Type

As indicated earlier, there is substantial evidence in the IS literature that teams brainstorming electronically outperform teams brainstorming face-to-face. One consideration in evaluating that body of research, however, is that the majority of studies used students as participants in experiments and had them brainstorm on relatively simple tasks that did not require significant domain-specific knowledge. As examples of tasks used, participants in these studies are asked to come up with solutions to the parking problem on campus, ideas for how tourism in their city could be improved, and what uses they could come up with for an extra thumb on a hand. These tasks do not require much domain-specific knowledge for generating ideas. If one has ever driven on campus and struggled to find parking, one can come up with ideas to improve the parking problem. If one has ever travelled, one has ideas about how tourism can be improved. Coming up with creative solutions to business problems, however, is another matter. Unless one has the requisite education and some experience working as an auditor in a public accounting firm, it would be difficult to come up with specific and relevant ideas on how auditing procedures could be improved.

For creativity brainstorming sessions aimed at generating ideas to solve specific business problems, it is important to consider the extent to which participants’ background and experiences match the creativity task. For example, if the creativity task entails developing ideas for new products or services, it would be important for the brainstorming team to include one or more members from each of the following areas: sales, marketing, advertising, product design, manufacturing, and distribution. Within each of these areas, it is worth including both highly experienced and relatively inexperienced employees. While experienced employees

can bring their wealth of experience to bear, inexperienced employees are often the ones who can engage in “outside the box” thinking to come up with fresh ideas. The idea of including members from all functional areas is to bring different perspectives to the brainstorming session, which is particularly important for leveraging Osborn’s fourth rule of brainstorming—combining ideas proposed by others to form new innovative ideas.

Also depending on the specific business related reason for the creativity brainstorming session, it may be necessary to provide background reading to participants. This background reading should “set the stage” for the brainstorming session, ensuring that all participants come to the session with the same set of key assumptions. For example, for a creativity brainstorming session aimed at generating ideas for new products, participants could be given background material relating to the market, competitors’ products, and prior failed and successful product ideas. In the United States, auditing standards require auditors to conduct a fraud brainstorming session at the beginning of the audit of publicly held companies. As background reading for such a fraud brainstorming session, participating auditors should be assigned to read material about the client, the industry in which the client operates, and other environmental factors that might impact the nature and type of fraud risks that might be present. The main purpose of such background reading is to get all participants “on the same page” and minimize the extent of irrelevant or impractical ideas that are proposed. It would also be important to make such background material available during the creativity brainstorming session itself, either in paper form or accessible on the computer. Participants can be encouraged to refer to these materials, especially in later stages of brainstorming when participants might be running out of ideas.

3 Using CMC Tools for Creativity Brainstorming

3.1 Sample Creativity Brainstorming Task

To provide a concrete example of a creativity brainstorming session for an SME, imagine that the management of the SME would like to solicit ideas from employees on how the firm’s profits could be increased. They would first identify key employees from all departments who could contribute their expertise to such an endeavour. The task proposed to participating employees could be framed as follows:

Over the past several years, revenues and profitability have been declining for <<your SME>>. The firm’s Chief Executive Officer has appointed you to a task force with ten other SME employees to generate ideas about how <<your SME>> can increase its revenues and profitability. He has specifically requested ideas for increasing the firm’s share of the market by obtaining new clients, offering new products, and options for reducing expenses.

The author has built a Web-based brainstorming system that could be used for conducting creativity sessions, shown in Figure 1 below.

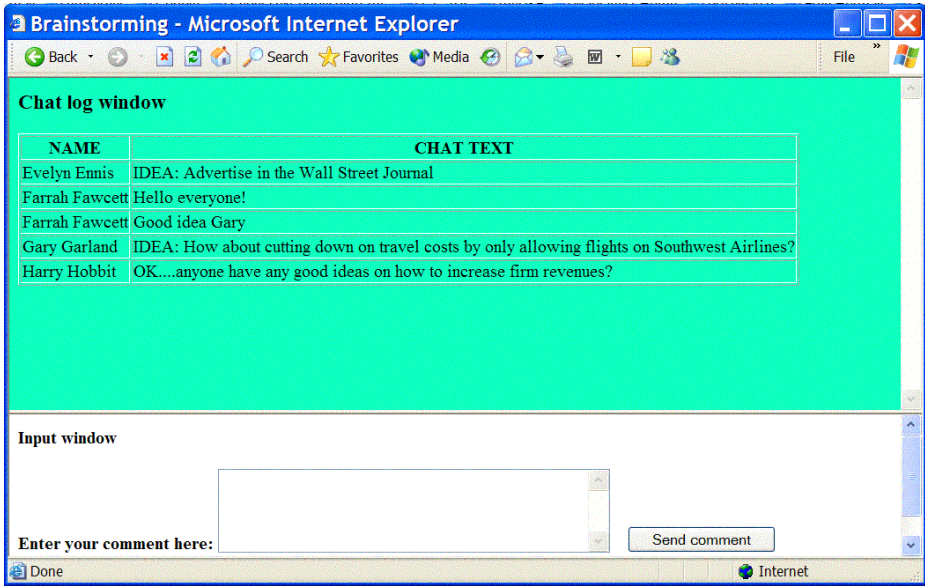


Fig. 1. Basic Web-based Brainstorming System

The system was built using Microsoft’s Active Server Pages (ASP) technology. Tables holding configuration settings (e.g., duration of the session, number of participants, etc.), the real-time log of the session, and participant information (e.g., log on time, log off time, number of comments, etc.) are all housed in an open-source relational database system (MySQL). Participants log on to a web site, input their personal information such as their name (or logon ID, if so configured), and are taken to a page of instructions. After all participants are logged on, participants are allowed to move to the main brainstorming screen, shown in Figure 1. To use system, participants type their ideas in the input window at the bottom of their screen. Upon clicking ‘Send comment’ (or hitting Enter) the idea is transferred to the larger window above the input window. All participants’ ideas appear sequentially in the large window, which in effect constitutes the “group memory” or real-time log of the creativity session. Ideas proposed by all participants appear in real-time in the group memory window. Prior comments made during the session are accessible by scrolling up through the group memory. In the rudimentary system that was developed, participants typed the word “IDEA” to distinguish between ideas being proposed about increasing revenues and profitability and comments that simply represented miscellaneous communication between team members.”

Subsequently, an enhanced version of the system was created specifically for conducting a fraud brainstorming session. The resulting system is shown in Figure 2. As can be seen in Figure 2, there are some task-specific features that were built into the system. For example, the window at the top contains instructions specific to the fraud brainstorming scenario. At the top right of that window, the brainstorming time

Brainstorming phase	Instructions	Time remaining: 38:51
<p>You are to assume that you are a partner in the accounting firm assigned to the audit of Helecom Communications. You and your entire audit team are in the planning stage of the audit. Based on the information that you have learned about this client's operations and its industry, you are to generate ideas about how and where Helecom Communications financial statements might be susceptible to material misstatement due to fraud and how the fraud may be concealed. Exclusively focus on fraudulent financial reporting (i.e., intentional material misstatements or omissions of amounts or disclosures in financial statements designed to deceive financial statement users). Your ideas should be in the form of a list of fraud risk factors for fraudulent financial reporting. Fraud risk factors are events or conditions that indicate incentives/pressures to perpetrate fraud, opportunities to carry out fraud, or attitudes/rationalizations to justify a fraud. Be as specific as possible. You have 40 minutes. Use the input box at the bottom of the screen to type and submit your ideas about fraud risk factors for fraudulent financial reporting. Your firm has decided to have each audit team member brainstorm individually, and then the results of all audit team members will be combined at the end of the brainstorming session.</p>		
Log of brainstorming ideas		
DATE/TIME	TEXT OF IDEA	
11/2/2005 4:17:27 PM	This is another idea about another fraud risk factor for Helecom Communications.	
11/2/2005 4:17:00 PM	This is an idea about a fraud risk factor.	
Input your idea here: <input data-bbox="374 451 893 495" type="text"/>		
<input type="button" value="Submit"/>		

Fig. 2. Task-Specific Web-based Brainstorming System

remaining is shown—the time automatically “counted down” and when time expired the participant automatically saw a prompt. Upon clicking ‘OK’ the participant was taken to the next screen, which showed all ideas that were generated, simply for review by participants (i.e., at that point no further ideas could be added).

3.2 Issues Unique to SMEs in Creativity Brainstorming

What are the issues unique to SMEs which need to be considered in the conduct and optimization of computer-mediated creativity brainstorming sessions? First, by definition, SMEs have fewer employees than large organizations. One consequence of the smaller size is that the likelihood of employees having well-developed relational bonds is higher in an SME as compared to a very large organization. Another consequence of the smaller size of an SME is that there are likely to be fewer layers of hierarchy between top management and lower level employees. The implications of a “flatter” SME organization is that the employees who come together for the purpose of creativity brainstorming are likely to know one another very well. Second, SMEs very likely face significant resource constraints in comparison with large organizations. An SME, therefore, most likely will not have the resources at its disposal to purchase a high-end multi-featured group support system or to hire an expert facilitator to conduct creativity brainstorming sessions. Third, due to the relatively small size of an SME, the degree of specialization of jobs is likely to be lower as compared to a large organization. In other words, employees of SMEs very likely undertake multiple roles within the organization, even if only temporarily (e.g., to cover for an absent co-worker whose job might be fairly different). Since employees in an SME might be expected to be familiar with multiple job responsibilities, this means that they may not be able to develop a sufficiently high level of expertise in any one job. Accordingly, the expectations for specialized contributions in a creativity brainstorming session comprised of employees at an SME would be different in contrast to a similar session at a large organization with employees who have years of experience at one narrowly defined job role.

These three unique characteristics of SMEs have implications for the CMC tool configuration recommendations that would result in the most effective creativity brainstorming session for such organizations. To reiterate, the three significantly unique characteristics of SMEs in the context of creativity brainstorming are (1) relatively small size resulting in a “flatter” organization wherein employees who come together for brainstorming will know each other well, (2) resource constraints that limit the budget for a computer-mediated creativity brainstorming system, and (3) a lower degree of narrow specialization and potential expertise that SME employees can bring to the creativity brainstorming session, compared to large organizations. After first outlining recommendations for configuring CMC tools for creativity brainstorming in general, specific propositions are offered regarding the most effective configuration of CMC creativity brainstorming systems given the unique features of SMEs.

3.3 CMC Tool Configuration Recommendations

Having discussed the various factors that relate to the design of a CMC creativity brainstorming session, specific recommendations for configuring a CMC tool for use in a creativity brainstorming session are now offered. It is beyond the scope of this paper to review specific CMC tools for creativity brainstorming. The InnovationTools web site offers reviews of software tools for supporting creativity brainstorming.¹ While a number of Web-based CMC tools are available in the market, the extent to which each configuration recommendation can be implemented in any particular tool will require additional research. If resources and in-house expertise is available in the SME, it would be possible to build a custom CMC tool for creativity brainstorming that incorporates all configuration options, which can be customized as desired.

Before turning to the configuration recommendations, some general guidelines for conducting creativity brainstorming sessions are worth considering. It may be beneficial to remind participants of Osborn’s rules of brainstorming at the beginning of the session. Specifically, participants should refrain from criticizing ideas proposed by others. The brainstorming session could then begin with a “warm up” task, where participants engage in brainstorming on an issue unrelated to the main purpose of the session. For example, if the brainstorming session is aimed at generating ideas for new products, the warm up session might involve asking participants to brainstorm about what they would do if they were unexpectedly given a day off at work. Such an exercise, which would very likely be viewed as a “fun” exercise, would probably put participants in a good, playful mood, ideal for fostering creativity for the “real” brainstorming task. Additionally, it may be worthwhile to refresh participants’ memories regarding the Osborn rules in the middle of the session. For example, following rule 4 in Osborn’s rules, after several ideas have been proposed and if participants appear to be stuck, the facilitator can encourage them to try to combine existing ideas to form a new idea.

In the previous section, four factors relevant for creativity brainstorming were outlined, namely brainstorming technique type, interaction mode, facilitation

¹ See <http://www.innovationtools.com/Tools/SoftwareHeadlines.asp> at the InnovationTools site.

technique, and task type. For the actual conduct of a computer-mediated creativity brainstorming session in an organization, several questions might be raised. Which particular brainstorming technique should be used? Should interaction be anonymous, non-anonymous, or semi-anonymous? Should process and/or content facilitation be used, and if so what specific types of process/content facilitation are to be deployed?

To complicate matters further, many of the options available are not “either or” options and can be used in conjunction with one another. Should the session begin with a phase of nominal group brainstorming followed by a phase of interactive brainstorming? Should the round-robin technique be introduced after a phase of interactive or nominal group brainstorming? Should the facilitator interject content facilitation if participants appear to be in a state of cognitive inertia? There is evidence in the literature that most innovative ideas come early in the session (Diehl and Stroebe 1991; Nijstad and Stroebe 2006). Thus, session management becomes more critical in the later stages of the brainstorming session, when participants are fatigued and should be spurred to produce additional ideas. Clearly, there are a host of options to consider, depending on the specific creativity task at hand for the SME.

Shown in Table 1 are the various factors discussed in the previous section, the options relating to the factor, and the recommendations relative to each factor option in designing the creativity brainstorming session.

Table 1. Recommendations for Creativity Brainstorming CMC Configuration

Factor	Option	Recommendation
<i>Brainstorming technique</i>	* Nominal	Use technique either at the beginning or the middle of the session, to allow participants to generate their own ideas without distraction conflict and to avoid “groupthink”
	* Interactive	Longest brainstorming time should be allocated to interactive brainstorming, to allow participants to see others’ ideas and build off one another’s ideas
	* Round-robin	Use to force each participant to offer an idea, in contexts where participants are likely to “loaf” (not offer their own ideas). Not appropriate when team size is large (e.g., greater than 10)
<i>Interaction mode</i>	* Anonymous	Configure session to be anonymous when creativity topic may be somewhat controversial and when it is not necessary to uniquely identify the author of each idea.
	* Semi-anonymous	Configure semi-anonymous identification when it is necessary to tag each idea’s author, without revealing the author’s full identity. Prevents “gaming” the session (author of an idea claiming in a subsequent posting that the idea is a good one).
	* Non-anonymous	Reveal full identity of each participant when there is little to no likelihood that participants will be inhibited from offering their ideas
<i>Facilitation</i>	* Content	Provide specific prompts, comprising subject-specific issues, to spur the generation of ideas relating to the prompt. Use later in the session, when participants may be running out of ideas.

Table 1. (continued)

	* Process	Have a set agenda and move participants through phases, with each phase being timed, when a large number of participants are involved, when multiple creativity tasks are to be undertaken, and when it is likely that participants may meander “off task.”
	* Human	If an expert is available and has a successful track record, employ a human facilitator. If the content or process facilitation to be performed by the human facilitator is relatively generic, then consider whether the costs of the human facilitator are justified.
	* Automated	If human facilitators are not available or have resulted in variable outcomes, and if the content or process facilitation to be provided is generic, program the facilitation (content or process) into the CMC tool system.
<i>Task type</i>	* General (cross-department)	If the creativity brainstorming task is of the type that spans multiple department, involve employees from all departments involved, including departments that may only tangentially be related to the creativity brainstorming task. Consider the use of anonymous interactive brainstorming for a “free-wheeling” type of discussion.
	* Specialized (domain-specific)	If the creativity brainstorming task is highly specialized, requiring extensive domain-specific knowledge, select knowledgeable experts in the domain. It may be necessary to provide participants with background reading so that they are all “on the same page” during the brainstorming session.

3.4 Propositions for Computer-Mediated Creative Brainstorming in SMEs

It is important to note that the recommendations indicated in Table 1 are generic, in that they apply to large organizations as well as SMEs. In light of their unique features in comparison to large organizations, the question remains as to the implications of the broad recommendations for creativity brainstorming specifically for SMEs. Given that relatively little research has focused specifically on creativity brainstorming in the context of SMEs, the recommendations that follow are framed as propositions, which future research can subject to empirical testing. The list of propositions offered below is intended to be illustrative rather than exhaustive. Reviewing Table 1 and considering the unique features of SMEs, it would undoubtedly be possible to generate additional propositions and/or refine the ones suggested below.

Proposition 1: *For SMEs, creativity sessions will be more effective in interactive brainstorming mode than in nominal brainstorming mode.*

The rationale for Proposition 1 stems from SMEs being “flatter” with a higher likelihood of participants knowing one another and relating to one another well. Accordingly, participants are more likely to build off the ideas proposed by others, taking advantage of the benefits of interactivity. As additional support for this

proposition, there is evidence in prior research that interacting groups feel better about electronic brainstorming than nominal groups (Gallupe et al. 1991). Given the higher degree of relational bonding among brainstorming participants in an SME, there should be a greater degree of cognitive stimulation resulting from viewing the ideas of other members (Connolly et al., 1993). As Paulus & Dzindolet (1993) suggest, interactive brainstorming should foster social influence processes that should promote a greater numbers of ideas. In contrast to interactive brainstorming, by definition nominal brainstorming does not provide cognitive stimulation from others' ideas nor are social influence processes possible (since each member "brainstorms" in isolation), both of which could inhibit creativity brainstorming productivity among employees in a closely knit SME.

Proposition 2: *When the brainstorming task is specialized (domain-specific) rather than general (cross-department), the round-robin brainstorming technique will be the most effective in an SME.*

Recall that the round-robin technique forces each participant to offer an idea. Due to the lower degree of narrow specialization among employees in an SME, it is likely that employees in other functional areas can offer constructive ideas because of the "cross pollination" of tasks across departments. Thus, in such situations, the round-robin technique elicits input from each employee who may have an interesting insight to offer, and there is a high likelihood that each idea thus proposed will be attended to by all other employees. In contrast to the round-robin technique, when either nominal or interactive brainstorming is employed individual ideas offered by an employee are not likely to be attended to by other employees to the same degree. When the brainstorming task is specialized it is important to obtain relatively equal levels of participation from all participants in the creativity brainstorming session, which the round-robin technique facilitates (Delbecq and Van de Ven 1971; Van de Ven and Delbecq 1974).

Proposition 3: *For SMEs, creativity sessions will be more effective in non-anonymous brainstorming mode than in the anonymous or semi-anonymous brainstorming modes.*

As Pinsonneault et al. (1999) indicate, non-anonymous brainstorming has two process gains in comparison to anonymous brainstorming: observational learning and social recognition. The idea of "observational learning" is that brainstorming participants can learn from and imitate the best performers in the session and "social recognition" means that individuals want their contributions to be recognized by others. Since it is quite likely that participants in a brainstorming session within an SME would have "bonded" well with one another, the interaction mode should be non-anonymous (i.e., identified) to foster both observational learning and social recognition anonymous. In contrast to non-anonymous brainstorming, both anonymous and semi-anonymous brainstorming modes will be viewed as "unnatural" and inhibiting. Not knowing the author of ideas being proposed is likely to be viewed negatively by participants, resulting in lower productivity, compared to when the session is non-anonymous. Given the likely high degree of relational bonding in an SME, it is also unlikely that

the creativity brainstorming topic would be controversial, which is when anonymous or semi-anonymous brainstorming is advantageous. Finally, there is unlikely to be significant evaluation apprehension in an SME, which is also the condition when anonymous or semi-anonymous brainstorming is likely to be most effective.

Proposition 4: *Creativity brainstorming sessions in SMEs will be more effective when process facilitation (agenda setting) is employed than when the session is not facilitated.*

As indicated in Table 1, one reason to employ process facilitation is when it is likely that participants may meander “off task,” i.e., engage in discussion that is unrelated to the issue at hand. Given that employees at SMEs would likely have bonded very well, it is natural to expect them to engage in some degree of “chit chat” in a computer-mediated session. Thus, the use of process facilitation techniques that involve setting an agenda and moving participants through the agenda should result in improved brainstorming effectiveness (Bostrom et al. 1993).

Proposition 5: *For specialized (domain-specific) creativity brainstorming tasks, effectiveness will be higher when content facilitation is provided for SME participants than when it is not provided.*

The logic underlying Proposition 5 stems from the lower likelihood of highly specialized domain knowledge in SME employees, given that they very likely perform a wider range of tasks than in large organizations wherein employees more likely perform narrow, highly specialized tasks. Content facilitation that seems to spur ideas by providing content related prompts should therefore be highly effective particularly for SMEs. Evidence consistent with this proposition is reported by Lynch, Murthy, & Engle (2009), who found that content facilitation by way of prompts about fraud risk categories resulted in greater brainstorming effectiveness.

Proposition 6: *For SME participants in a creativity brainstorming session, content facilitation will be more effective when interactive brainstorming is employed than when nominal brainstorming is employed.*

The rationale for Proposition 6 follows from the notion that employees in SMEs would likely have bonded together very well. Consequently, in response to content facilitation prompts, when the SME participants are engaged in interactive brainstorming, it is likely that the facilitation prompt would lead to discussion and the spurring of additional ideas as participants go back and forth in considering the prompt. Consistent with this idea, Miranda and Bostrom (1997) report that content facilitation can have a positive effect on group cohesiveness and participation, both of which are naturally facilitated if the brainstorming session is interactive. The lack of interactivity in the nominal technique would lead to decreased brainstorming effectiveness in such a scenario.

To reiterate, the propositions indicated above are not intended to be an exhaustive list. Additional propositions can almost certainly be generated by considering different combinations of brainstorming technique, interaction mode, facilitation technique, and task type, in light of the unique issues prevalent in SMEs. Using

controlled laboratory experiments as well as field experiments, the propositions suggested above can be subjected to empirical testing to confirm (or disconfirm) their validity.

4 Summary and Conclusion

Given the availability of low-cost Web-based CMC tools, this paper discusses how these tools can be used for conducting creativity brainstorming sessions in an SME. In addition to discussing the various factors of relevance in using a CMC tool for creativity brainstorming, the paper provided recommendations regarding how the tool could be configured to maximize brainstorming effectiveness. The recommendations are based on lessons learned from several recent experimental studies on the use of CMC tools in brainstorming tasks that go beyond the relatively simplistic tasks used in the early IS research on electronic brainstorming. Alternative brainstorming techniques such as interactive, nominal, and round-robin brainstorming were discussed. Options for the interaction mode were presented, namely anonymous, non-anonymous and semi-anonymous brainstorming. The use of process and content facilitation was also discussed. It is clear that CMC tools can be effectively used to enhance brainstorming creativity in SMEs.

There are many potential avenues for future research to explore the effectiveness and limitations of CMC tools for creativity brainstorming sessions. For instance, future research should be conducted to examine whether there is an interactive effect between the extent of subjects' experience using CMC tools for brainstorming and the degree of creativity of their ideas. Future research could also explore whether the use of CMC tools for creativity brainstorming significantly alters the interpersonal dynamics of the brainstorming team, because of the absence of face-to-face contact and the loss of the rich visual and verbal cues that are present in face-to-face creativity brainstorming sessions. Finally, user surveys combined with expert evaluation of the quality of ideas generated from creativity brainstorming sessions configured in different ways would yield answers regarding the most optimal configuration from both an effectiveness and user satisfaction perspective. To conclude, this paper raises issues regarding the various possible configurations of computer-mediated creativity brainstorming sessions and provides recommendations for setting the configurations based on task, participant, and technology features.

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