Momentum: Getting and Staying on Topic During a Brainstorm

Patti Bao[*], Elizabeth Gerber[*†], Darren Gergle[*], David Hoffman[*]
[*]Center for Technology and Social Behavior, [†]Segal Design Institute
Northwestern University
2240 Campus Drive, Evanston, IL 60208 USA
{pattibao, egerber, dgergle, david-hoffman}@northwestern.edu

ABSTRACT

Despite the prevalent use of group brainstorming for problem solving and decision-making within organizations, brainstorming sessions often lack focus and fail to produce quality ideas. We describe *Momentum*, a tool that elicits topic-oriented responses *prior* to a group brainstorm. In an exploratory study, we found qualitative differences in task focus, quality and rate of ideation, and efficiency of storytelling between users and non-users of the tool.

Author Keywords

Creativity support tools, brainstorming, group creativity

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Experimentation

INTRODUCTION

Brainstorming is a critical step in the design process. While designers have readily adopted the principles first identified by Osborn [11] – aim for quantity, withhold criticism, and build on the ideas of others – researchers have found mixed evidence for the efficacy of group brainstorming [5,12]. Practitioners, too, have said that lack of preparation means that "more often than not, these sessions turn out to be a waste of time [and] increasingly even the mention of brainstorming meets with eye rolls," a sentiment shared with the authors by the leader of a design consultancy firm. These observations have led researchers to investigate ways of reducing process loss [14] in creative groups. However, most efforts have focused on events *during* a brainstorm and less attention has been given to the period just *before* a brainstorm. We explore both timeframes and propose that addressing the latter can help facilitate the former.

In this paper, we introduce a creativity support tool to encourage small amounts of individual preparation prior to a group brainstorming session. The results of this preparation are then revealed and visualized to the entire group during the brainstorm. We report on an exploratory study using naturalistic groups and consider the potential influence of the tool on brainstorm outcomes as well as on team-oriented and social processes.

BACKGROUND

Within the HCI community, brainstorming methods have evolved in response to a growing knowledge of how group interactions may influence the brainstorming process. For example, individuals have been found to experience not only cognitive stimulation but also cognitive interference from other group members [10]. Early attempts to reduce interference often used electronic brainstorming systems [4,13]. More recent approaches include building collocated brainstorming systems to support group awareness [9] and adopting improvisational techniques to facilitate trust [8]. In this study, we propose that preparatory work can also facilitate cognitive stimulation gains in group brainstorms.

A handful of creativity support tools have been built to produce "stimuli" *during* a brainstorm. For instance, Wang and colleagues [16] displayed conversationally triggered images in a computer-mediated chatroom while Barki and Pinsonneault [2] provided "seed ideas" on a public screen. While this work is promising, it is difficult to automatically select novel but related images, and any seed ideas must be manually generated. Moreover, these tools focus on the brainstorm session itself without considering the influence of prior preparation on subsequent group interactions.

A small number of researchers have explored the role of creativity support tools in *preparing* for a brainstorm. However, such tools have focused largely on supporting the facilitator in agenda building and appear to be intended for highly structured meetings [1,3]. In a different vein of preparatory tools, *cultural probes* are "evocative tasks meant to elicit inspirational responses" [7]. Although cultural probes are typically used to gather information about users, we adopt a similar approach in order to generate personally relevant stimuli and encourage divergent thinking in a group brainstorm.

While researchers have made significant progress towards building tools that facilitate group interactions during brainstorming sessions, the role of preparatory work and individual perceptions of the experience have been largely overlooked. We propose a novel tool that invites minimal levels of pre-brainstorm participation, which result in personally relevant stimuli that can be used in a brainstorm.

DESCRIPTION OF TOOL

Momentum is a web-based system that generates a series of textual prompts based on a given brainstorm topic. Prompts can be modified before they are sent by e-mail to all group members at specified intervals in the days leading up to the brainstorming session. Group members are asked to quickly and individually respond to the prompts with text messages or photo attachments. These replies are stored in the system until the start of the brainstorming session, at which point all responses are unveiled as a large-scale visualization visible to the entire group.

Prompts Prior to a Brainstorm

Given a brainstorm topic in the form of "How to {verb} {adjective} {noun}", *Momentum* generates a series of prompts using the provided parts of speech. For example, given the topic "How to recruit adventurous tourists", the system would generate these prompts, among others: "What is something that reminds you of tourists?" "With whom do you have an adventurous relationship?" Prompts are designed to help group members prepare for a brainstorm in a non-intrusive and unconventional way. Partially based on cultural probes, prompts are intended to be open and somewhat unexpected in order to encourage thinking about the brainstorm topic in unusual ways.

Visualization During a Brainstorm

The Flash-based visualization displays each response from the group on a wood grain background. Photo responses are cropped to fit within a Polaroid-like frame, while text responses are shown in handwritten type. No names are included on the visualization to support anonymity. By default, responses are clustered by prompt such that each response is at least partially visible. Using a mouse, group members may move, reorder, or magnify the responses.

METHOD

Four groups of 3-4 participants completed a brainstorming task. Groups were randomly assigned to the Prompted (use of tool) or Unprompted (no use of tool) condition, where use of *Momentum* was a between-groups manipulation.

Participants

Participants were thirteen (seven female) students and staff members from a midsized university. All participants had prior experience in brainstorming (23% on a daily/weekly basis, 31% monthly, and 46% less than monthly). 80% of participants had formal training in brainstorming and 62% of participants (equally divided between the conditions) had previously led a brainstorm. All participants knew at least one other group member prior to the study and 77% knew everyone in their group.

Procedure

Participants were told that in one week they would be participating in a group brainstorm on "How to increase tourism in [the current city]" (adapted from Tourism Problem in [6]). Over the next six days, all members of Prompted groups received one email prompt a day with instructions to respond as soon as possible with either text (five words or less) or a single photo. Unprompted groups also received one email a day (at the same time as Prompted groups) but with a standard reminder that the brainstorm would be held in x days and y hours.

On the final day, groups were brought to the laboratory and told that they would have 30 minutes to brainstorm with a 5-minute warning near the end. They were instructed to aim for both quantity and quality of ideas and to write and number each idea on a large whiteboard. Prompted groups saw a visualization of their responses as a projection image adjacent to the whiteboard. They were also given a mouse and shown how to manipulate the visualization. Afterwards, participants completed a questionnaire on their experiences.

Figure 1. A Prompted group making use of the visualization.

Measures

Audio and video recordings were collected for each brainstorm. Recordings were transcribed and individual utterances coded for the following categories: *ideation, strategy, elaboration, (dis)agreement* and *response* (based on coding scheme by [17] as well as instances of *storytelling* and references to the *visualization*. Any actions were also coded, namely *drawing* or *writing* on the whiteboard and *clicking* or *pointing* at the visualization.

After each brainstorm, all ideas on the whiteboard were transcribed. Two independent coders with professional design experience scored the quality of each idea on 5-point Likert scales of originality (extent to which the idea was novel), feasibility (extent to which the idea was precise and could be implemented) and effectiveness (extent to which the idea helped to solve the problem), following precedent set by [2,5]. All repetitive ideas were removed. Raters were blind to condition and were considered to be in agreement when ratings differed by no more than 1 point. Agreement over 10% of the corpus was 73.8%.

RESULTS

Due to the small number of participants, it would be imprudent to draw conclusions from statistical analyses. Instead, we augment traditional evaluation metrics with a close examination of the qualitative data and reserve statistical inferences for a larger study. Our examination revealed three interesting patterns regarding the groups' strategy and task focus; quality and rate of ideation; and use of storytelling and visualization. Given that individual perceptions of a brainstorm often affect group interactions [9], we also report opinions shared by the participants regarding group processes and the design of *Momentum*.

Overall Experience and Perceptions of Tool

Participants described their experiences from receiving the emails beforehand to interacting during the brainstorm. While Prompted group members found the prompts "short and sweet", Unprompted group members found the reminders "repetitive and not informative". Prompted individuals who used *Momentum* said that the visualization "helped frame our discussion," "gave us ideas to run off of" and "helped me relate to team members". Others enjoyed its aesthetic and said they "loved filling up the board". Interestingly, both strategy and time appeared to be important parts of the experience. As one Unprompted individual said, "With a little more organization and time, [the brainstorm] would have really been something."

Strategy and Task Focus

During the first half (15 minutes) of the brainstorm, Prompted groups spent nearly a quarter of their time (22.7%) generating new ideas whereas Unprompted groups spent almost the equivalent generating new ideas (12.5%) and digressing (11.8%). Consider these excerpts from the first two minutes of the brainstorm:

> #### Prompted Group
> A: Of course the first idea is the Parthenon [pointing at vis]
> B: So let's just defer judgment
> A: And I mean, go crazy essentially
> C: Yeah
> B: Build off other people's ideas so Parthenon
> B: How about moving to pyramids here
>
> #### Unprompted Group
> A: I always had cinnamon raisin and I would have French vanilla cream cheese
> B: Okay
> A: And then they stopped making-
> B: Focus now
> A: That's true we need to start thinking about a brainstorm

While digressions did not go unnoticed (one participant said, "We wasted six to eight minutes I think"), this did not prevent them from reoccurring, as demonstrated below:

> #### Unprompted Group (after 10 minutes)
> A: We could have-
> B: I like this whiteboard
> C: What is that, acrylic?
> A: Number 38
> B: We need M&Ms

Moreover, in the post-brainstorm questionnaire, all but one of the participants listed several strategies they had used in previous brainstorms (e.g., "Data dump", "5 ideas in 60 seconds", "Go for quantity, then narrow down"). However, while most Prompted individuals described brainstorming strategies used in the current study, only a third of Unprompted individuals reported using strategies at all. Together, these data seem to suggest that Prompted groups both perceived and exhibited a strong task focus.

Quality and Rate of Ideation

In addition to standard metrics such as the quantity and quality of ideas, we looked at *when* ideas were produced during a brainstorm. Timing is critical because meeting time is limited and members may grow tired during lengthy sessions. Transcripts revealed that Unprompted groups generated more ideas overall but Prompted groups produced more "good" ideas (defined by [2] as ideas of above average quality) early on in the brainstorm. Additionally, while Prompted and Unprompted groups generated a similar number of good ideas after the full 30 minutes, at the halfway point Prompted groups had generated on average 6.5 good ideas while Unprompted groups had generated on average 1.5 good ideas. To give an example of idea quality, coders classified "Timeshares/ home rental network" as above average but considered "Allow trick or treating" to be below average.

Storytelling and Visualization

Although the role of storytelling during group brainstorms has received little attention from researchers (see [15] for an exception), we found that storytelling was frequently used to set up a new idea or proposed change in strategy. Stories that remained focused and relevant appeared to be a useful mechanism. We observed that Unprompted groups used extended storytelling to set premises that Prompted groups seemed to quickly establish using *Momentum*. For example, an Unprompted group member prefaced a story with, "This has nothing to do with [the current city] but perhaps we can get it from here." The group went on to share multiple stories before concluding that their "common idea of a good vacation" was to "include family". In contrast, a Prompted group member pointed out that "family and friends" appeared multiple times on the visualization, which immediately led another member to propose "getting into the family thing" with their ideas.

In addition to speeding up storytelling, the visualization served as an accessible reference point. For example, one response to the prompt "Share a piece of advice that's been important to you regarding traveling" was "no wallet in back pocket". Pointing to this response, another group member suggested, "I want to say increase police presence because that's a fear of being pick-pocketed". Likewise, one individual asked, "Why would a road tripper stop here? We have road tripping mentioned twice". This led another member to explain the significance of monuments on their road trips, followed by a related change in strategy.

DISCUSSION

Results suggest that participants who used *Momentum* found it useful for maintaining task focus and providing inspiration during group brainstorms. Although Prompted and Unprompted groups performed similarly according to traditional metrics such as the quantity and quality of ideas, we observed unique patterns in their use of time and ideation processes. Prompted groups were quick to generate quality ideas and largely avoided unrelated discussion. Even though storytelling was accompanied by ideation in both Prompted and Unprompted groups, the shift from story to idea appeared to be quicker for the former, especially with the aid of the visualization. Given the similar composition of the groups and high feelings of satisfaction, team spirit, and group identification reported by all participants, regardless of experimental condition, it is surprising to see such qualitative differences at all.

One potential concern is that the task focus evidenced by Prompted groups could result in a narrow design space. While we did not observe noticeable signs of design fixation, further investigation would certainly be useful.

One advantage of *Momentum* is its minimal requirement for pre-brainstorm use. Prompts appeared to be well-received and minimally intrusive, as 71% of Prompted group members reported spending one minute or less on their responses. In light of this positive response, we urge researchers and practitioners to consider additional means of incorporating the timeframe *before* a brainstorm when designing creativity support tools.

CONCLUSION AND FUTURE WORK

With this work we have started to think of brainstorming as situated within a larger context and not as an isolated phenomenon, a direction we believe can be pushed much further. Our future plans for *Momentum* include improving automatic generation of prompts as well as adding the ability to send SMS prompts in order to enable more ubiquitous responses. For future studies, we plan to deploy *Momentum* to a larger population as well as observe its use for non-prescribed, personally relevant brainstorm topics. We have also received considerable interest from managers who are frustrated with the lack of focus and time spent on brainstorming. We plan to provide the tool to 180 managers in a large consumer products firm and evaluate its use. It would also be interesting to see if *Momentum* could be used to prepare for design activities besides brainstorming.

Based on the current study, we are hopeful that tools such as *Momentum*, which require only minimal preparation, may help to facilitate positive individual experiences and productive group interactions, and have the potential to pay off during time and resource intensive meetings.

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