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The Brainstorming Myth

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Research shows unequivocally that brainstorming groups produce fewer and poorer quality ideas than the same number of individuals working alone. Yet firms continue to use brainstorming as a technique for generating ideas. This continuing use of an ineffective technique is interesting psychologically. From a practical viewpoint, understanding why brainstorming is usually ineffective, and why people still do it, gives a basis for suggesting how managers can improve the way they use it.

This article starts by describing what brainstorming is, how it is supposed to be conducted and its claimed benefits. It then reviews the empirical research on brainstorming. Three processes in particular reduce its effectiveness: "social loafing" (the group context enables individuals to make less effort), "evaluation apprehension" (fear of suggesting ideas might make one look foolish) and "production blocking" (only one group member can suggest an idea at any moment). The article then discusses why, despite this evidence, firms carry on doing it. Finally, it explores the newer techniques of "electronic brainstorming" which may reduce the three process problems listed above.

The article is thus structured into six sections:

- What is brainstorming?
- Empirical research on brainstorming.
- Three processes which make brainstorming ineffective.
- Why firms carry on brainstorming.
- Electronic brainstorming.
- Managerial implications.

What is Brainstorming?

Alex Osborn, a Madison Avenue advertising executive, who is attributed with originating the business use of term "brainstorming", argued that it increased both the quality and quantity of ideas generated by the group (Osborn 1959). He developed the technique in the 1950s after concluding that typical group decision-making processes inhibit, rather than encourage, creativity. He observed that most groups discuss and evaluate an idea as soon as a group member generates it. In his view, people who had unusual ideas which were not yet well thought out were discouraged from sharing them by knowing that the ideas would be immediately evaluated. Creativity was thus inhibited. He stated bluntly that the average person can think up twice as many ideas when working with a group as when working alone.

Brainstorming was thought to be best suited to finding lists of alternative solutions to problems. It was assumed that the technical details of *how* to

achieve and *implement* these alternatives could be worked out at a later stage. Brainstorming was first developed for creating advertising campaigns. It is now put to such diverse uses as thinking of new products, making recommendations for new employee benefits, finding ways of raising money for a cause, and searching for new ways to lay out the work groups in a government agency.

A number of rules have been developed to ensure that a brainstorming session is properly conducted.

- *Group size should be about five to seven people.* If there are too few people, not enough suggestions are generated. If too many people participate, the session becomes uncontrolled and uncontrollable.
- *No criticism is allowed.* All suggestions should be welcome, and it is particularly important not to use derisive laughter or disapproving non-verbal behaviour.
- *Freewheeling is encouraged.* The more outlandish (even impractical, off-the-wall) the idea, the better. It is always easier to moderate an idea than to dream it up.
- *Quantity and variety are very important.* The more ideas put forth, the more likely is a breakthrough idea. The aim is to generate a long list of ideas.
- *Combinations and improvements are encouraged.* Building on the *ideas of others,* including combining them, is very productive. "Hitchhiking" and "piggy-backing" are essential parts of co-operation in brainstorming.
- *Notes must be taken during the sessions,* either manually or with an electronic recording device. One person serves as "recording secretary".
- *The alternatives generated during the first part of the session should later be edited* for duplication and categorizations. At some point the best ideas can be set aside for possible implementation.
- *The session should not be over-structured* by following any of the preceding seven rules too rigidly. Brainstorming is a spontaneous small-group process and is meant to be fun.

Claimed Advantages

Among the claimed advantages of brainstorming are the following (Napier and Gershenfeld 1985):

1. Reduces dependence on a single authority figure.
2. Encourages open sharing of ideas.
3. Stimulates participation among group members.
4. Provides individual safety in a competitive group.
5. Maximises output for a short period of time.
6. Ensures a non-evaluative climate.
7. Tends to be enjoyable and stimulating.

And again:

"Brainstorming is a popular method of encouraging creative thinking. Its main advantage is deferred judgement, by which all ideas – even unusual and impractical ones – are encouraged without criticism or evaluation. Ideas are recorded as fast as they can be suggested; then they are evaluated for usefulness at a later time. The purpose of deferred judgment is to encourage people to propose bold, unique ideas without worrying about what others think of them; this approach typically produces more ideas than the conventional approach of thinking and judging concurrently. Brainstorming sessions last from ten minutes to one hour and require no preparation other than general knowledge of the subject. Other advantages of brainstorming are enthusiasm, broader participation, greater task orientation, building upon ideas exchanged, and the feeling that the final product is a team solution." (Davis & Newstrom 1987, p221)

Empirical Research on Brainstorming

Taylor *et al* (1958) were the first to reject the claim that brainstorming was an efficient and effective way of generating ideas. They found that so-called "nominal" groups – made up of subjects who "brainstormed alone" and then had their non-redundant ideas combined – outperformed interacting groups of the same number ("real" groups). This finding has been consistently replicated. The most influential early research was carried out in the 1970s by Bouchard and his colleagues. Among other things, they manipulated the group size, subjects' sex and the brainstorming procedure itself in order to understand what in fact determined the problem-solving effectiveness of groups and individuals (Bouchard 1972). More recent research during the 1980s and 1990s has tried to answer the question of *why* individuals performed better than groups (Paulus and Dzindolet 1993).

"Brainstorming": the Word and Its History

The (chiefly north American) term "brainstorming" is derived from, and juxtaposed in the dictionary with, "brainstorm" which is defined as a "fit of insanity". The Longmans dictionary goes on to define brainstorming as "a problem solving technique that involves the spontaneous distribution of ideas from all members of a group". It is now very popular and often used as a verb, as in "to brainstorm a problem". In the etymological approach of the Oxford English Dictionary the definition is: "brain-storm, (a) 'a succession of sudden and severe phenomena, due to some cerebral disturbance' (Gould 1894); (b) *US colloquial* = brain-wave; (c) US, a concerted 'attack' on a problem, usually by amassing a number of spontaneous ideas which are then discussed…"

The evidence from science suggests that business people must be insane to use brainstorming groups. However, "brainstorming" now has a long and respectable history as a technique for generating innovation:

*"**brainstorming.** Or **buzz groups.** Bombardment of ideas between small groups of people uninhibitedly suggesting solutions, whether outlandish or well-informed, to various problems. Good therapy for participants and can produce the occasional breakthrough idea that might otherwise never be touched on. Brainstorming may be used to help solve a wide range of management problems or for longer term purposes such as technological forecasting. Other techniques used for the latter purpose include the **Delphi approach…**"* (Johannsen and Page 1995).

*"**brainstorming.** A technique aimed at stimulating the generation of as many solutions to a problem as possible; consists of a meeting, usually lasting no more than an hour, chaired by a strong moderator, who stimulates idea quantity and encourages building upon and modification of ideas expressed. …The technique has been very successfully used in such areas as advertising and product development"* (VNR Dictionary of Business and Finance 1980).

However, even in business dictionaries, opinion is equivocal. The *VNR Dictionary* comments:

"Properly used, brainstorming encourages expression of all ideas, no matter how seemingly offbeat, and completely bars criticism of any ideas expressed; but it is sometimes misused, as when the moderator is ineffectual, the technique is misunderstood, criticism is allowed to develop, or the meeting wanders away from the specific problem addressed."

"Nominal" and "Real" Brainstorming Groups

Much of the research on brainstorming compares the productivity of "nominal" groups – people working alone whose ideas are pooled – with the productivity of "real" groups – people brainstorming together in the same room.

One issue is group size. Although Osborn had suggested that the optimal size of brainstorming groups was between seven and ten, early experiments had never gone above four-person groups. Bouchard and Hare (1970) compared real groups of five, seven and nine to the equivalent nominal groups. They expected the effectiveness of nominal groups to be overtaken by that of the real groups as the groups got bigger. Instead they found that nominal groups were more effective up to nine persons.

Some have attempted to specify mathematical models of groups brainstorming. Brown and Paulus (1996) attempted a "simple dynamic model" based on three assumptions:

1. *"Output decay: Any given individual will eventually run out of ideas. This factor serves to decrease productivity over time.*
2. *Blocking: An individual's productivity will decrease as a function of total group output.*
3. *Matching: Individuals adjust their productivity rate to more closely match the average group rate. This factor decreases an individual's productivity if it is higher than the group average and increases an individual's productivity if it is lower than the group average."* (p95)

Brainstorming experiments usually involve unstructured, open-ended, "creative" tasks. The tasks traditionally used ranged from the "thumbs problem" (whereby the benefits and difficulties of growing an extra thumb on each hand were assessed) to the "blind world problem" (which involved thinking up the consequences if suddenly everyone went blind). The methodological diversity of these experiments makes it hard to compare one study with another.

All sorts of other possible explanations have been investigated. For example, does the personality of people in brainstorming groups have an effect (Furnham and Yazdanpanahi, 1995)? Camacho and Paulus (1995) found, perhaps predictably, that anxious people did less well in brainstorming groups. Harvey and Paulus (1995) found that brainstorming groups actually set fewer goals than people working alone. The topic continues to attract research partly because of the mystery noted in the beginning: despite the evidence, traditional brainstorming is still held up to be a better method than brainstorming by nominal groups.

Managers who argue that all this research is unrealistic (with poor real world validity) might look at a study of employees of a corporation who had undergone considerable training for effective teamwork. Even then the brainstorming groups generated only about half as many ideas as similar number of individuals working alone:

"In spite of common beliefs about the efficacy of group brainstorming, controlled research has demonstrated significant productivity losses in interactive groups. These types of findings lead some to suggest that there is little justification for group brainstorming in organizations. The results of this study provide additional support for such a perspective. However, we feel that the potential of group brainstorming as an adjunct to individual brainstorming has not received a completely fair assessment. It is necessary to examine various combinations of individual and group brainstorming under conditions that are likely to take advantage of potential stimulation from interaction with diverse group members. This may require the use of facilitators for both individual and group brainstormers." (Paulus *et al* 1995, p262-3)

Three Processes Which Make Brainstorming Ineffective

Reviewers of this research have pointed out that there are traditionally three separate processes that reduce the effectiveness of brainstorming (Diehl and Stroebe 1987, Gallupe *et al* 1994):

- *Social loafing:* the group context enables individuals to make less effort.
- *Evaluation apprehension:* fear of suggesting ideas which might make one look foolish.
- *Production blocking:* any one group member can suggest an idea at any moment.

Social loafing

Social loafing has been found for a wide variety of tasks. These include:

- Physical tasks – such as rope pulling and swimming.
- Cognitive tasks – such as navigating mazes and identifying radar signals on a computer screen.
- Creative tasks – such as thought listing and song writing.
- Evaluative tasks – such as rating the quality of poems, editorials, and clinical therapists.
- Work-related tasks – such as typing and evaluating job candidates.

In the 1880s, Ringlemann examined the effects of working collectively on a rope-pulling task and noted a decrease in performance with increasing group size (Kravitz and Martin 1986). These results were essentially ignored, regarded with scepticism, or interpreted as a mere artifact of lack of co-ordination among group members rather than as a reflection of motivation loss. It was not until 1974 that Ringlemann's findings were replicated, and an additional 15 years passed before the motivational component of this effect was understood as an important and reliable phenomenon in itself and given the label "social loafing".

Working in groups has traditionally been seen to have two opposing potential effects, social loafing and social facilitation. Social loafing occurs when interacting group members (with pooled outputs) exert less effort than similar participants working alone. However, depending on the task, individually-identifiable participants' performances can be greater than the output from subjects working alone and social facilitation is then said to be occurring. In order to explain why social facilitation happens, investigators have argued along the lines of a "presence theory"

and an "evaluation theory". According to presence theory, the mere presence of others increases motivation to perform. According to evaluation theory, the presence of others becomes associated with evaluation and/or competition, along with other things, which again increases the motivation to perform. Social loafing studies have tended to identify a "group versus individual effect" rather than an "evaluation effect": in traditional brainstorming sessions, some individuals can easily loaf, contributing very little.

Jackson and Harkins (1985) offered two explanations for social loafing: hiding in the crowd or the idea that people expect others to loaf and hence reduce their own efforts to establish an equitable division of labour. This expectation of how others behave is a crucial factor. It is what Robbins called the "fear of playing the sucker effect".

Williams *et al* (1981) demonstrated that the ability to identify each individual's output was an important factor in evaluation. However, Harkins and Jackson (1985) tested this notion using brainstorming techniques and found that, although identifiability was one factor in evaluation, this was only when the output evaluation took place as a result of competition with co-workers.

Karau and Williams (1993) reviewed studies and came up with a Collective Effort Model. This sees individual effort (or loafing) as a function of three things: (a) the perceived relationship between individual performance and group performance; (b) the perceived relationship between group performance and group outcomes; and (c) the perceived relationship between group outcome and individual outcomes. The model has interesting implications.

- *"Even if outcomes are highly valued, high levels of effort are unlikely when individual behaviors are not instrumental in obtaining those outcomes. For example, when individual differences in collectivism and need for belonging should have less impact.*
- *"Communication among group members should enhance collective effort when it enhances perceptions of task importance or social responsibility, but should hinder collective effort when it relays negative task attitudes or contributes to feelings of dispensability.*
- *"Group structural factors and member roles may profoundly influence collective effort in ongoing groups by affecting perceptions of the instrumentality of one's inputs and the value of various outcomes. For example, leaders and high-status group members may view their inputs as more instrumental to group outcomes, and norms encouraging social responsibility and hard work within groups should have a positive effect on collective effort, especially in cohesive or highly valued groups."* (p702)

Evaluation Apprehension

A second possible interpretation which has been offered to account for real group productivity is *evaluation apprehension,* literally fear of being judged or – more likely – not wanting to look stupid. Many group members refrain from expressing their views in various social settings, such as the classroom or the boardroom, because they are uncertain about how they will be received. Is this notion of "the unpleasant experience of negative evaluation from other group members" a plausible cause of productivity loss in brainstorming groups? The research findings are somewhat contradictory. Colaros and Anderson (1969) concluded that productivity was lowest in siuations which aimed to produce the highest amount of evaluation apprehension. But Maginn and Harris (1980) found that individual productivity in the presence of observers was not significantly different from that of individual subjects working without observers.

However, the methodology of the two experiments differed. The former experiment induced evaluation apprehension by deceiving the subjects on the number of experts who were present in the group. The latter experiment manipulated evaluation apprehension by telling subjects that three external judges were observing them. Furthermore, this latter experiment investigated only individuals working alone and aimed to use apprehension to lower productivity (to that of real groups). The former experiment dealt with real groups and aimed to show that productivity was higher when there were no experts involved. The conclusion to be drawn from these experiments is that evaluation methods are not the most powerful cause of the lower productivity of real brainstorming groups. Nevertheless, being in a real brainstorming group can, despite the rules, lead certain individuals not to give their best, most innovative ideas.

Production Blocking

Production blocking is the idea that, because only one individual can speak at a given time in a group, the other group members are prevented from airing their ideas when they occur to them. This waiting time can cause them to forget (due to the limitation of the short-term memory) or to consider the idea to be less original or relevant with respect to the presently-viewed idea. This contradicts the original claim that brainstorming allows individuals to express their ideas, which in turn would stimulate other members. Traditionally, brainstorming has adopted "equal person-hour" methodology. This in actual fact allows members of real groups of size n to have only one n^{th} of the amount of speaking time of the equivalent nominal group members. By varying nominal group members' time allowance, so that it was comparable to real group members' assumed time allowance, Diehl and Stroebe (1987) tested whether this procedural explanation of the blocking effect was valid. Two experiments which tried to test this by manipulating time allowance – or even speaking-time allowance – failed to yield a reduction in the productivity gap between real and nominal groups.

Research shows that a good, highly-trained group facilitator can help reduce the blocking problem. One recent study showed that a brainstorming group that had a highly trained facilitator outperformed not only groups with a less-trained (or untrained) facilitator but also nominal groups of individuals working alone (Oxley, Dzindolete and Paulus 1996).

Why Do Firms Carry on Brainstorming?

Most textbooks seem reluctant to discuss the damning research which explains how and why brainstorming does not deliver. There are several possible reasons why brainstorming has not fallen out of favour in the business community. Because brainstorming groups overestimate their own productivity? Or because of the use of group facilitators which has genuinely been found to help interactive group performance? In this section we look at how brainstorming can work – if at all – and in what circumstances. Let us start with Durham and Pierce (1989):

"How well does brainstorming work in practice? Compared to more traditional group processes, brainstorming works quite well. The number of quality ideas is better, and costs per idea generated tend to be more favorable. Through the brainstorming process group members tend to focus on the task at hand, and, as a result, interpersonal conflict and pressures toward conformity decline. In addition, ideas generated by group members are likely to be accepted by the group.

"Unfortunately the aspects of brainstorming that help make it successful also create some problems. Because ideas are not evaluated, at the end of a brainstorming session the only product is a list of ideas. There is no plan, there is no solution, and the initial problem still exists. This lack of closure can create dissatisfaction among participants, especially when someone else (a manager of another group) evaluates the ideas that the brainstorming group has generated.

"Many organizations use brainstorming because it appears to have many advantages in comparison to traditional group decision making and only a few drawbacks. There is some evidence, however, that individuals "brainstorming" alone would generate more and better quality ideas than they would in a brainstorming group. Even in a relaxed atmosphere, the presence of others may still inhibit the quantity and creativity of ideas generated by brainstorming group members.

"Individual brainstorming is helpful in some situations, group brainstorming in others. A group session encourages each member to devote the necessary time to idea generation, and, because group sessions are often more enjoyable than solitary work, they can create an esprit de corps and satisfy people's social needs. Group sessions remind each member that others have many good ideas, and they can improve group commitment to ideas and increase communication within the group. When these factors are important, managers may use brainstorming groups rather than individual brainstorming." (p263)

There are indeed good reasons why organisations use brainstorming even if they know that it is not the most effective way of developing new ideas. There are essentially three reasons why it is done:

- To increase decision acceptance.
- To pool resources.
- To benefit from specialisation of labour.

Decision acceptance. If people have taken part in a brainstorming session, they often feel they have made

a real contribution to the outcome. People involved in contributing to the solution, if not actually making the decisions, may be expected to understand those decisions better and to be more committed to carrying them out than if the decisions had been made by somebody else without their involvement. In other words the brainstorming group serves the same function as many committees but may be seen as more creative and more fun.

Resource pooling. Many believe that bringing people together can increase the amount of knowledge needed to make a good decision. Somehow the group is greater than the sum of its parts.

Specialisation of labour. If, while working in groups (brainstorming or not), it becomes possible for individuals to do only those tasks for which they are best suited, the potential quality of the group's efforts is improved.

Brainstorming is popular, fun and seen by many as the way to do things. Most organisations appear not to know about the academic research in this field. If they do, they seem happy to trade off the outcome for the benefits of the group process.

Electronic Brainstorming

New computer-aided techniques to "unblock brainstorms" have been developed over the last ten years (Gallupe *et al* 1994). This so-called "electronic brainstorming" aims to overcome the problems of social loafing, evaluation apprehension and production blocking. Electronic brainstorming involves group members sitting at computer terminals and typing in their ideas, but also having full access to the others' ideas as they are produced. It aims to integrate the two important and advantageous features of nominal and real group brainstorming, namely being able to generate ideas freely and also being able to share ideas respectfully. Ideas on the screen have not been found to be distracting, which was the case with traditional brain-storming (Gallupe *et al* 1994). Simultaneous contributions lessen the potential effect of blocking and the anonymous nature of the technique alleviates evaluation apprehension.

In Gallupe's original and pioneering study comparing electronic with non-electronic brainstorming, he found that electronic brainstorming four-person groups outperformed the four-person traditional (verbal) brainstorming groups and failed to find a difference between nominal and interacting groups using the electronic technique (Gallupe *et al* 1991, 1993). In electronic brainstorming groups, performance increased with group size, which contrasts with non-electronic brainstorming groups. Electronic brainstorming was not advantageous when only two people were involved (and thus anonymity and production blocking were minimal), but, as group size and therefore anonymity and production blocking increased, the potential of this new technique was exhibited. Per-person productivity tended to remain stable with an increase in group size (unlike non-electronic brainstorming, where a fall was noted). This was attributed to the fact that production blocking remained at a constant low level throughout different electronic brainstorming sessions. Lastly, satisfaction is greater with electronic brainstorming groups and this increases with group size, contrary to non-electronic brainstorming.

Dennis and Valacick (1993) found bigger (twelve versus six) electronic brainstorming groups did better than smaller ones. They attributed this to the synergy obtained and the avoidance of redundant ideas in these large groups. Paulus *et al* (1996) noted that if computer brainstormers verbalized (spoke out loud) the ideas they were typing in it decreased performance of all concerned, as may be predicted.

Thus the very features that mean brainstorming does not work can be largely overcome using computer networks. Social loafing is less likely to occur because individuals may be concerned that the ideas they key in are logged and counted. Evaluation apprehension does not occur because the source of the ideas is anonymous. Production blocking does not occur because participants can assess and attend to others' ideas when it suits them and not when others impose it.

Indeed there is an increasing interest in what have been called electronic meetings. Table 1 summarizes the benefits.

Implications for Managers

Research in this area is particularly fascinating because so many of the results are counterintuitive. What the findings seem to show is that brainstorming is most often used when it is least effective. It is odd that advertising agencies and design departments seem so

Table 1
Benefits of Electronic Meetings

Benefit	Feature
Shorter meetings	- clear structure - electronic sign-in - parallel processing of input - electronic display shares input immediately - electronic voting focuses the discussion
Timescales reduced	- larger meetings - electronic recording - records of past meetings available
More/better ideas	- anonymity - sharing of input - more open discussion - electronic voting - prioritized ideas - remote participants
Earlier meetings	- different time/different place - electronic meetings
Better documentation	- electronic recording
Greater commitment	- electronic display makes commitments very public - analysis of electronic voting - larger meetings - anonymity when appropriate - electronic recording
Immediate actions	- meeting record available instantly - discussions seen to be concluded - free anonymous votes
Cash saving	- different place meetings

Source: Weatherall and Nunamaker 1996, p24

reliant on brainstorming techniques, when all the research suggests it is not the best strategy. It is possible that brainstorming groups fulfil other needs in the organization, which may or may not compensate for the resultant loss of creativity. Further, fundamental processes at work in brainstorming groups appear to militate against good decisions being made or really creative answers being found.

If you have talented and motivated people, they should be encouraged to work alone when creativity or efficiency is the highest priority. Groups help acceptance of the decision. But when the climate is competitive and time is of the essence, use individuals working alone. However, there are things that can be done to ordinary brainstorming groups to make them more productive. For instance one could insist that group members initially brainstorm alone in writing and bring a certain number of ideas to the meeting. Groups could be encouraged to brainstorm different parts of "the problem" separately. They also produce more if they are set high targets/standards for both quality and quantity. Firms also need to keep track of the actual numbers of ideas that they generate. Giving the group several breaks (from each other) has also been shown to help the process. Certainly, as they are traditionally and casually run in most firms, they are among the least effective way of generating ideas.

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Note: For a full list of references, please go to the *Business Strategy Review* website at www.london.edu/bsr.

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