

Brainstorming

What does this technique do?

Brainstorming is one of several techniques to facilitate group creativity and is one of the oldest (Osborn, 1963) and best known. The idea is to let people come together and inspire each other in the creative, idea generation phase of the problem solving process. Brainstorming is used to generate new ideas by freeing the mind to accept any idea that is suggested, allowing freedom for creativity. The tool has been widely used in design.

There has, however, been a wide range of studies intended to evaluate the efficiency of the technique, and the majority of these studies shows that people working in isolation produce more and better ideas than when working as a group. (References to these studies may be found in Dennis & Valacich, 1994). So why is brainstorming still so popular?

One important reason is probably that the group process as such is rewarding and creates a feeling of ownership of the result. In the brainstorming process everybody in the group can take credit for good ideas. The result of a brainstorming session is hopefully a couple of good ideas, and a general feel for the solution area.

When to use it

Brainstorming is usually applied in the very early stages of design. Especially when there are people with different backgrounds that can give different input to the design process, brainstorming may be a good start.

SPECIAL CONSIDERATIONS:

Mental impairment ►

Elderly ►

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What resources are needed?

The human resources are the most important in this method. The more creative people with a variety of experiences in the field, the better the result. 5 – 12 people may participate, and a session need not take more than one hour.

Who can use it?

There should be a group leader, and the more experienced he/she is, the better the result. For suggestion on informants and special consideration for working in groups in general, see the section on group discussions.

One should be aware that the demands on being non-evaluative in a group context is very many new people. Most people are used to see a group meeting as a forum for discussions, which brainstorming is not about at all. Therefore participants attitude to the whole process is an important prerequisite for a fruitful brainstorming.

Special consideration

General

Since the setting of a brainstorming session is very similar to a round-table discussion, participants may tend to carry over their habits from such experiences. This may be a problem if participants look upon themselves as representatives for example, for an user group or a company. They may then wish to defend or advocate specific ideas on behalf of their organisation. The best way to avoid this is to inform thoroughly in advance of the purpose and procedures of a brainstorming session.

Mentally impaired

Some of the steps in a brainstorming session usually require that the participants write down their ideas, which may be hard for the mentally impaired. To overcome this problem one could let the participants work in pairs, so that only one of them need to write down the results. Many mentally impaired persons may have very stimulating suggestions during a brainstorming session.

Elderly

When one or more participants in the group is elderly, it is likely that group members may want to work at a different speed. The group leader must then see to that everybody get as much time as they need. This

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may not be optimal to the casual atmosphere that one tries to support in brainstorming. In some cases it may be a solution to use homogenous groups, in other cases one may just ask everybody to take into account that participants like to work at different rates.

Procedure

The most important aspect of a brainstorming session is that the participants feel relaxed and not being evaluated personally. The emphasis is on variety and quantity of ideas, not on quality. It is usual to have an evaluation phase after the brainstorming where the best ideas are cultivated further. Knowing this may support the participants in holding back their evaluative comments, and to feel free to suggest ideas that may seem irrelevant at first glance.

► See Sources of Further Information

The group leader should support a good, creative atmosphere, humour may be a good vehicle to achieve that.

The starting point of a brainstorm is important, so the group leader should have done some work in advance to ensure a good problem formulation that is in accordance with the goals of the whole project. The problem is usually stated as a question, for example, “How to improve x?”, “What makes a communication device user friendly?” etc.

After the problem has been presented, the next step is to let the participants sit quiet and think for a while, at least five minutes. During this period they should write down all ideas that come to mind. They are encouraged to use their imagination and to write down even “wild” or seemingly irrelevant thoughts as long as they are responses to the problem formulation. It could be advantageous to write them down on small, separate record cards. The formulations should be brief, and without any explanation or argumentation.

The next step is to let each one read out loud one entry on their list. This continue around the table, until all ideas have been presented.

The particular feature of the brainstorming technique is that each participants list continue to grow after the presentation has started. Each time a new idea is presented the other group members are encouraged to use it as a stimulus for new ideas. One should build on others ideas, try to take them further, try to think of similar or quite opposite ideas. Combining two or more previous ideas may led to a quite new one. Therefore there should be given some time after each idea is read out, to reflect and to write down new ideas.

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There are some general rules that should be followed during a brainstorming (Cross, 1989):

- ☑ No criticism is allowed during the session.
- ☑ A large quantity of ideas is wanted.
- ☑ Seemingly irrelevant ideas are quite welcome.
- ☑ Keep all ideas short and precise.
- ☑ Try to combine and improve on the ideas of others.

Results and data analysis

The raw data from a brainstorming is the total pool of ideas generated during the session.

To analyse the data further, it can be a good idea to go through all suggestions and try to see if there are some natural groupings. This may be done by the original group, the group leader or somebody else.

There are several ways to assign items like “ideas” to groups, they all rely on the assumption that it is possible to establish some degree of similarity between the different items.

Two simple grouping techniques

Subjective sorting

This is an “impressionistic” method, since there is no objective way to determine whether the sort is “correct” or not.

The first step is simply to read through all items and then to determine what the main categories are. Then each idea is then assign to the category it belongs to. In this process it is very helpful if all ideas are written down on record cards. There will of course be doubts about where some of the ideas belong, they may be put in a “miscellaneous” category. After the first sort, one may want to redefine the categories and do the whole thing over again, that would normally be the case if there are several ideas that is sorted in the “miscellaneous” pile, or if several items seems to belong to more than one category. If there are many items in one category compared to the others, one may decide to sort that category further into sub-categories.

Simple cluster analysis

The first step in a cluster analysis is to determine some indication of

similarity between the ideas. In this simple version it is sufficient to determine, for each idea, which one of the other it is most similar to. Be aware that many of the relationships are asymmetrical, i.e. if A has B as its most similar idea, B can very well have C as its most similar partner. This process are of course subjective in nature, and may be the result of one or several peoples judgement.

The next step is then to draw a map of all ideas, where an arrow indicates the relationships of maximum similarity. It is wise to start with the symmetrical relationships, and then to put each idea into the map one-by-one.

Taking the results further

The result of grouping the ideas could be input to a new brainstorming session, where one tries to find new ideas that would belong to some of the most promising categories.

If one have worked with the ideas in this way, one would certainly also have an opinion on what the best ideas are, and one may decide to take them further in the design process. It is of course possible to go directly to this stage, without a previous sorting of the ideas, especially if the number is not to big.

Sources of Further Information ◀ ◀ ◀ ◀ ◀ ◀ ◀ ◀ ◀

The method has been widely used in design, and has also been applied in the AT field. Mason (1981) reports the use of this technique for developing guidelines and research proposals for managing incontinence.

OSBORN, A.F. 1963, *Applied Imagination*, Scribners and Sons, New York.

JONES, J. C. 1980, *Design Methods: seeds of human futures*, Wiley

MASON, E. A. 1981, The management of incontinence. *Journal of Biomedical Engineering*, 3, pp321

CROSS, N. 1989, *Engineering design methods*. J. Wiley, 1989, 3pp37 - 38

Example:

A small group of young paraplegic wheelchair users were brought together to explore ideas for a new mobility aid. They were asked to think about what a new mobility aid should be like in order to improve their independence. Each person was asked to consider all ideas that came to mind and to speak them out loud one at a time according to the procedure described above. The ideas were then listed on the white board.

Ideas suggested were:

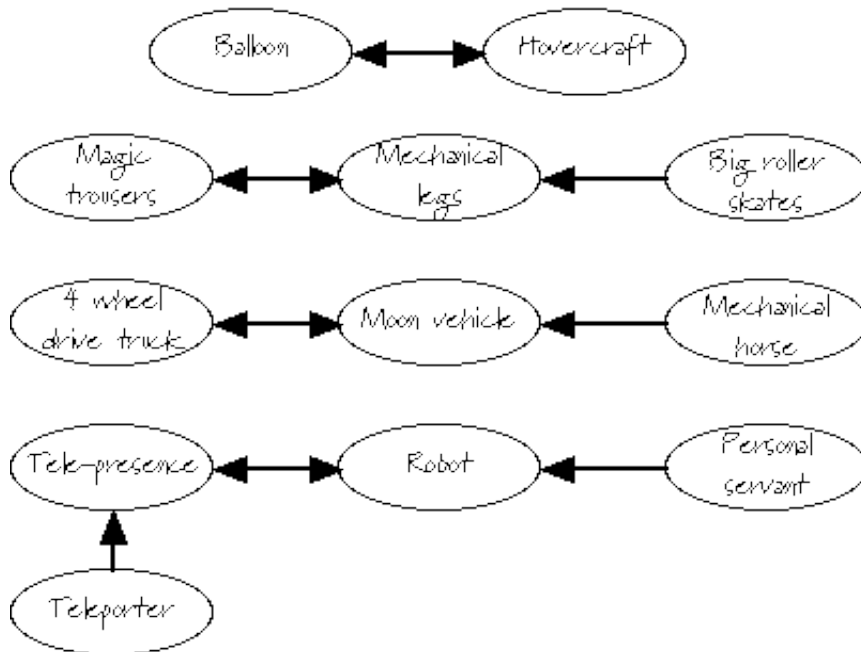
- Magic trousers- so I can walk
 - A 4 wheel drive truck- so I can go anywhere
- A Hover craft- so I can be lifted off the ground
 - A balloon - so I am light as air
- A teleporter - like in Startrek, so I can go anywhere immediately
 - Mechanical legs
- Robots - to bring things to me -so I don't have to move
 - A personal servant- to carry me about and do all the work
- A mechanical horse
 - Big roller-skates with body support
- A vehicle like the ones they used on the moon
 - Tele-presence, I control a mobile video-camera from my home

These ideas were then grouped according to the procedure of simple cluster analysis. To do this they had to be compared with each other according to similarity. For each idea the group decided which one it was most similar to.

Original idea	Most similar
Magic trousers	Mechanical legs
4 wheel drive truck	Moon-vehicle
Hover craft	Balloon
Balloon	Hover craft
Teleporter	Tele-presence
Mechanical legs	Magic trousers
Robot	Tele-presence
Personal servant	Robot
Mechanical horse	Moon-vehicle
Big roller-skates	Mechanical legs
Moon-vehicle	4 wheel drive truck
Tele-presence	Robot

Notice that the similarity judgements are a result of a discussion within the group, an other group might have given quite different judgements.

The grouping was displayed on the white board like this:



This also inspired the discussion on how the potential aid would be of use and led to further ideas as to possible support that could be provided.

- Magic trousers, Mechanical legs, Big roller-skates— replacing the functions of the legs. Which would make places more accessible e.g. climbing stairs and would also be less like a disability aid?
- 4 Wheel Drive truck, Moon-vehicle, Mechanical horse— Improving wheelchairs to go anywhere and be more powerful. If it looked like a truck it would be more attractive to use, and if it could climb stairs and navigate rough terrain it would be great.
- Hover craft, Balloon — Something to make the person effectively lighter. Maybe a built in hoist could help in moving the person in and out of the chair?
- Robots, Personal servants, Tele-presence —Performing my acts without me being there. How about a radio controlled robot?
- Teleporter- Although it belonged to the previous cluster it was perceived as a rather isolated idea. Its not practical but wouldn't it be wonderful?

Tools & Techniques Brainstorming



The most practical ideas generated from the session were to develop a four wheel drive wheelchair that could climb stairs and be used on rough terrain. Another practical idea to explore further was to provide some way of assisting the user in and out of the chair — i.e. a lift mechanism or hoist. The development of robots and environmental control systems was also encouraged by the group, but they also reported that sometimes human company was preferred by them.