## Brainstorming, creativity (and keeping all involved)

This article is about brainstorming, and how it helps with the creative process. It is written based on my personal experience both as a participant in brainstorming events or as a facilitator of this type of sessions. Therefore, it does not necessarily conform to any specific textbook definition of how brainstorming should be done. Whilst there are important principles that should be followed it is equally important that the practise is flexible rather than rigid:

1) adapted so it it is “fresh” for the participants each time.
2) it is specific to the purpose the team has at the time.
3) it can be adjusted to how well the ideas of flowing during the session.

Brainstorming is an informal group activity intended to generate as many ideas as possible. It is best thought of a group activity, and requires a facilitator focused on ensuring the session achieves its intended purpose. I will come back to more details about the group aspects of the technique after describing the general overall approach.

Brainstorming can be used to generate ideas in many stages in the application of systems engineering. I have used it to

1. Identify stakeholders.
2. Assume requirements either for each stakeholder or generally. And then you see you. The requirement applies to. Be careful, this is not a substitute for talking to or communicating with stakeholders, but it's a support or parallel approach to get an idea to get started.
3. Generating a solution concept either directly to come up with ideas or my preference is via a functional means analysis or morphological analysis and then choosing. From those sets of means to come up with a set of concepts which is beyond the scope of this note.
4. Identifying potential risks involved in a project or solution and
5. Capture lessons learned, which is performed after a solution development or the completion of a significant technical task.

The overarching approach to brainstorming is to do it in controlled, focused phases.

The first step is to describe the problem, the question. Questions are only to come for clarification and there should not be an early start on answering the question vocally (obviously some people will inevitably be thinking of ideas immediately.

The second step is individual idea generation, done quietly or silently, with each person generating individual ideas on their own, undisturbed by the rest of the group. This is the beginning of a divergent phase of work.

The third phase is to start sharing the ideas. Typically, this is done one by one, each person reading out one of their ideas, without vocal comment by others. Affinisation or grouping of ideas into “themes” or groups can start at this stage or be waited for late later so. As an idea which read out several things should happen.

- It can be put into a group with similar as the ideas are read out, although this can be dangerous as it fixes one pattern of the ideas and doesn’t allow for the consideration of several different groups.
- Others can note that they've had the same idea and just add it quietly to the same item. But if their idea is related to the variation, they keep it till later but should note the “connection”.
- Other participants may be prompted by an idea and come up with another of their own, which they should quietly note down (so idea generation is allowed at any stage in the process).
- Participants may see problems and wish to critique the idea. I strongly believe that at this phase they should be quiet and just note their concerns. This step can be the beginning of some convergence but isn’t the end of divergence.

The next step, if you haven't done it above, is to group the ideas together. The advantage of doing this later is all the ideas are there and the group doesn’t jump to the first pattern that appears. There may be several different but valid sets of groupings. [Note, if you're doing this face-to-face meeting this is when the sticky notes stuck to the wall start falling off and become very annoying.]

The next step is more convergence, and this is where analysis and criticism (of the constructive type) can start, and questions asked for clarification of the point. Someone might explain why they think an idea won’t work, only for author to clarify that the idea has not been properly explained / understood and then clarify / correct the wrong interpretation. The discussion and (well-intentioned) critique of ideas can (and should) lead to the generation of more ideas or improvements on the ideas which are incorrect or flawed.

So, as figure 1 illustrates, the brainstorming approach does not start with us converging to a solution –it starts with divergent thinking – sharing ideas helps to generate more new and improved ones. The sequence is several instances of divergent thinking followed by some convergence (affinisation into groups, clarification discussion, error correction and (constructive) criticism). It is perfectly reasonable to repeat the exercise again perhaps taking one key concept or idea in turn and exploring it further.

Essentially continue until the generation of new ideas / insights runs out.

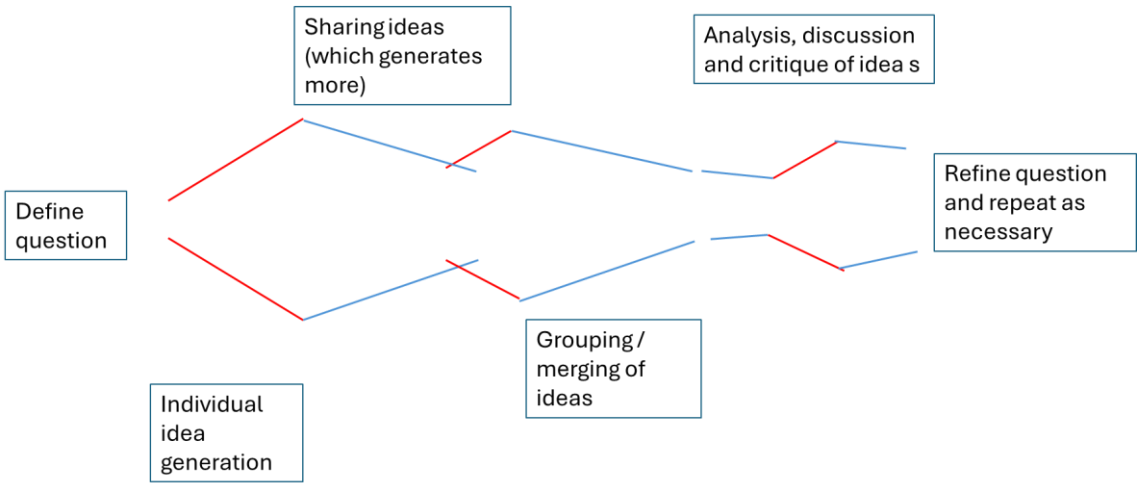


Figure 1 Divergence and convergent cycles in brainstorming (illustrative)

There can be problems getting started, and there is a poverty / lack of ideas, or everyone is fixed on one idea and nothing new is being produced.

One method which can break the lack of creativity is to choose some totally separate / random item from the natural world and, for example, ask

- in what way is this product we are developing like a lion
- in what way is this product we are developing not like a lion?

This can loosen up your minds but should not be taken too seriously or done for too long. Also be careful with this because some find it ridiculous and cannot take it seriously

Another variant which I have found protect particularly productive with cynical engineers is to do what I call “negative brainstorming”. In this variant, which is different to risk identification, you ask “how could we make this product / service / thing / project fail? What would be the bad features?”. If you are working on requirements, rather than ask what the stakeholders would like, instead ask what they wouldn't want, what they would annoy them. Or if you're thinking of negative stakeholders (maybe your competitors from another firm or the hackers you are trying to provide cybersecurity against). Ask what they don't want the solution to do. This it can be surprisingly liberating amongst cynical fixed mindset mindset engineers who are stuck with only one view of the solution.

It should be well known that the knowledge of a group is likely to be more than the knowledge of any one person. But you could make it more than just the sum of their individual ideas. In the phases when the ideas are revealed one person’s vague idea might jog the memory of another, or inspire a new divergent thought based on that idea – so a group working together can produce more than just the sum of their initial ideas.to take a trivial example, imaging the brainstorming exercise was to list capital cities. Suppose someone says Sydney, capital of Australia.  Now this is incorrect (and

will need to be corrected. But somebody saying I think Sydney is the capital of Australia will prompt somebody else who hadn't thought Australia to add the correct capital, Canberra, and add it to the list. Or even someone could say I was thinking of Australia but couldn't remember what it is. So, someone's wrong idea or prompt for something forgotten may provoke a correct idea, or a further insight from someone else

So, the point of the brainstorming exercise is to achieve as wide a group of ideas as possible. This requires both everyone being given space to generate ideas, and further ideas to be generated both as the ideas are shared, and from the affinisation, discussion and critique of the ideas.

It is important to have a diverse group of people in the session to ensure a wide coverage. Figure 2 below humorously suggests why very similar people might have a problem; you need input from different points of view. I once visited a company who told me in their initial idea generation where they didn't just have engineers / designers in the room, they had the cleaners, the secretaries, the admin clerks, the accountants etc.: all of whom made useful contributions. There is a saying that if everyone in the room has the same background / experience then they are all thinking the same way, and "if we are all thinking the same way then no one is thinking".


Figure 2 - Why diversity in brainstorming is important (found at diversity and inclusion - Marketoonist | Tom Fishburne (pinterest.com)

It is important to get the group dynamics right and get as many ideas as possible from all the participants and perspectives present. But especially in engineering projects there does have to be convergence to a preferred option (or maybe a view which of the ideas are the of preferred few), which are then analysed in much greater detail. So some ideas will have to be rejected.

The rejection (or criticism) must be of the idea, not the person who input it. Consider, for example, the suggestion of Sydney as a capital city for Australia discussed earlier – the error has to be corrected, but not in a way that shuts down the person who said it. It is best for people to note the error and correct it when appropriate and certainly don't say "You fool, everyone should know that it's not Sydney, but Canberra that is the capital of Australia".

In a brainstorming exercise, you need to create an environment where everyone can participate, and it's not dominated by a few. There are two types of dominant behaviour to particularly watch out for, which I have seen.

The first is the "**Idea Fountain**". I'm guilty of this when I am a participant in creative meetings. I can be a nightmare (more politely a colleague once described it as "thinking at the speed of Richard"). I have dozens of ideas, and they gush out uncontrollably. This is well-intentioned and rejection of my dafter ideas can show others the way to more sensible ones, the group ending up as more than the sum of its parts. But the problem is this level of enthusiasm can drown out and shut down others who wish to participate. My voice must be stilled so others can make contribution. Hence the importance of the first phase of generating ideas individually in silence so everyone can get some ideas. Although I have been told by a neighbour in one of these sessions that they were intimidated by my furious scribbling on sticky note after sticky note when they'd only managed to fill in two ideas.

The second problem is the "**Dominating Critic or Cynic**". Very often this will be a very experienced, influential, respected and knowledgeable person – and criticism and lack of respect from them can be keenly felt by the others – they don't want to appear foolish or wrong.

Now there is a place for criticism. And we will come to that later. But the (necessary) criticisms and critiques must not lead to the shutting down of ideas and contributions from some participants – you lose the power of the group.

Consider this (unfortunately) not imaginary scenario;

<Young, inexperienced and keen engineer> Expresses a vague idea.
<Wise old cynic> I tried that 15 years ago, it doesn't work.
<Young, inexperienced and keen engineer> But what about .....?
<Wise old cynic> Look, I've the experience, and I know that can't work.
Young engineer fools into silence with negative emotions.

So there must be a space and brainstorming allows this for the different diverse voices. There may be a crazy off-piste idea that might suggest different approaches to others. But that will never be achieved if the dominant people shut it down.

I agree with the idea that we must learn from mistakes, we must let bad ideas be critiqued and used as the springboard to develop into good ideas. But the first thing which brainstorming must achieve is to allow those bad ideas to see the light of day.

This article was prompted by my reading a discussion on brainstorming in the excellent book “Black Box Thinking” by Matthew Syed, which I highly recommend. There is a discussion of brainstorming, and he says that there is evidence that when ideas are criticised and critiqued (constructively, I must add) more and better ideas are produced. I agree vehemently that the best chance of success comes from learning from mistakes or errors or bad ideas, so we must be open to having ideas critiqued and failures investigated – but to blame but to learn. But in the specific case of brainstorming, I felt he ignored the potential problem of one individual dominating the discussion or the shy less confident people being frightened and put off by the vocal and dominant minority. Or attendees being frightened to making a suggestion for fear of looking foolish or wrong, even if the intent of the criticism is to improve the ideas and to generate better ones. Critics need to be aware of the impression they make - it is not the intent of an action that is important, but how it is perceived by the person being criticised.

When using the brainstorming technique there must be critique and review of the ideas generated and that must lead to the possibility of new ideas. But all involved must have the chance to insert their ideas, and if so, it's a question of when the critique is articulated, and that should not be in the divergent phrases.

I would add two further comments about Matthew Syed’s works.

1. The book Black Box Thinking also suggests another use of idea generation that I hadn't heard of before which he calls a “pre-mortem”. This is different to a risk assess assessment and I really like the sound of the idea. He suggests having decided what you're going to do as solution), you then ask, as if it were after the project and it had failed, what went wrong? Those ideas are essential for you for planning the work.
2. I am told (via interesting discussion on LinkedIn that in another book he discusses the makeup of teams and explores the issues I have discussed about the important of having diversity in the group (see Figure 2) and avoiding dominating voices in creative phases. It is called 'Rebel Ideas - The Power of Diverse Thinking', and it is certainly added to my list of books to buy / read.

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