Creative Problem Solving

ASK THE RIGHT QUESTIONS! Learn to phrase questions that offer a wide range of creative thinking and not limit your team to accepted ideas.

REDUCE FUNCTIONAL FIXEDNESS. Functional fixedness is when a person sees only one use for an object, the one it was intended for. For example: A pen is used to write with and some will only see it used this way. FLL'ers are encouraged to see it as many items; a backscratcher, an ice pick, a hole puncher etc.

BRAINSTORMING. The focus of Brainstorming is to generate as many potential solutions as possible before trying to select the best ones:

- Clearly state the problem to be solved. For complex problems, it is best to try to break them down into smaller, independent problems and solve them separately.
- Generate as many potential solutions as possible WITHOUT judging whether they are good, bad or meet all known constraints. It is VERY important that ideas NOT be judged during this idea generation phase as that will tend to stifle additional ideas.
- Test generated ideas to determine if they are possible. Prune (or modify) ideas that do not meet known constraints. Critical constraints include the resources of available time, finances and skills.
- Evaluate the ideas to determine which are the most promising.
- Conduct experiments or "feasibility studies" to validate assumptions of analysis.
- Focus energy on "best few" approaches, refining to "best one" with time.

Rules of Brainstorming.

There are rules for brainstorming that your team should follow. Remind your team:

- **NO CRITICISM IS ALLOWED**. Reinforce everything positively and do not allow team members to criticize. Do not evaluate ideas while brainstorming. A poor idea may trigger a good idea for someone else.
- **QUANTITY IS DESIRED**. The larger the number of ideas, the greater the chance for reaching the best solution!
- **HITCHHIKING IS ENCOURAGED**! Team members should be encouraged to combine ideas. They might get an idea from a team mate and change it slightly. This is called `hitchhiking'. One idea builds on another. This leads to the improvement of ideas.

- **FREE WHEELING IS WELCOMED**. The wilder the ideas, the better. Offbeat, silly ideas may trigger practical breakthroughs that might not otherwise occur!

- **JUDGMENT AND EVALUATION**. At this point in the problem solving process, ideas are evaluated. It is important this step is not done too early.

- **EXECUTION**. This is the step to carry out ideas. Often through trial and error teams find themselves back at brainstorming during this phase. It can be frustrating to the team, but is an essential part in the learning process.

- **REFINEMENT**. Practice....practice....practice! And then practice some more!

Formalized Decision Making Methodologies

Formalizing the Decision Making process is not something that comes naturally. It is not trivial to do well and "wrong" answers can result if care isn't taken. The chief benefit these methodologies offer are that they allow much of the emotion associated with decisions to be suspended and logical discussion to predominate. This allows people who originally disagree on a decision to discuss the alternatives without it becoming "personal". Moreover, these methods encourage looking for additional alternatives.

Often, the "best" solution when considering two alternatives is to uncover the aspects of those alternatives that make them desirable and then discover and adopt a third, as-yet unconsidered alternative. Most importantly, emotional arguments can go on forever -- and make those involved LESS willing to work together. Logical discussion focused on the merits of the ideas generally bring the parties closer together by understanding each others values and allow decisions to be made quicker and more amicably. You might want to do some research to find some more details on these methods. What is listed below are simply our recollections from what we saw years ago.

Matrix Decision Making

The focus of Matrix Decision Making is to systematically evaluate a limited number of alternatives to determine which one(s) hold the most promise.

Clearly state the problem.

Generate a list of all the desired outcomes that can be affected by the decision. Put these along one axis of a matrix (i.e. write them in the first column down the left side of a piece of paper).

Generate a list of feasible solutions. Typically, Brain Storming approaches are used to generate a list of "best few" alternatives before applying Matrix Methods to evaluate them. Put these along the other axis of a matrix (i.e. write them across the top of the same piece of paper).

Score each solution by how well it accomplishes the desired outcomes (i.e. give it a rank of 1 - 10). Typically, it is a good idea to include an outcome that measures how easily a solution can be solved using the available resources.

Spend some time evaluating which of the outcomes are the most important. While it is often difficult to explicitly weight the outcomes, it is usually possible to rank them from "most important" to "incidental" – or break them into broad "bands".

Focus on those solutions that score highest on the most important outcomes.

In practice, the PROCESS of laying out the outcomes and alternatives will make it clear which alternatives hold the most promise - without having to get into detailed weighting and scoring. It is important that "outcomes" like "This solution is one others will not have thought of" are included and given a reasonable weight. However, it is CRITICAL that the solution be feasible. A BRILLIANT idea that can't be completed is not as good as a CLEVER idea that CAN! It is often necessary to do some experimenting to determine whether a potential solution is feasible. Don't let the kids throw out the "excellent, but might not work" ideas without testing them first -- these are often the ones that work out best.

Another important aspect is that there is a limited amount of time. At some point, the decision has to be made that analysis is over and it's time to start producing something! Finally, it is often possible to borrow aspects of the brilliant ideas and fold them into the feasible approaches to give them a bit more pizazz. As always, the best solution is often the one that hasn't been considered. In general, it takes a less time to brain-storm subtle alternatives to an aspect of a problem that isn't working out than it does to build and test every possible solution.

For some problems, it's impossible to know whether it will work until it's built. In these cases, building something "quick and dirty" (without worrying about meeting all the details and constraints) is a good way to test out an idea. If it can't be made to work when relaxing some of the more difficult constraints, then it certainly can't be made to work with the constraints in place.