

### Alternative Generation and Evaluation

*(An optional method for generating and ranking alternatives.)*

Although Salt & Rothery discuss creative generation of alternatives under the heading “Conceptualization” (4.3.1) and evaluation of alternatives (at least some discussion of criteria) in section 2.3, this discussion offers an alternate way of generating ideas and one possible way of ranking them. It draws on the same knowledge and concepts, but applies them using a slightly different approach.

#### **Idea generation** (“Green Light Session” or “Brainstorming Session”)

This works best with a group of 8 - 10 people; some related technical knowledge may be an asset, but a basic general knowledge is often enough. A mix of backgrounds is often helpful.

#### **Step one:**

Using a facilitator / recorder, jot down as many ideas as possible that might possibly solve the problem. Any technology, any concept; even if it sounds far-fetched or impossible. Do not analyze or criticize (that comes later)!

*Example: Refrigeration Block - “How could we cool the pop”*

<i>compressor refrigeration fan block ice Peltier device heat rods pre-freeze self-cooling cans</i>	<i>reptiles ex-girlfriend endothermic chemical reaction outer space inner space (underground) drug that simulates cold for user</i>
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#### **Step two:**

Combine similar suggestions and clarify idea if necessary to produce a distilled list of concepts or options.

*Example*

<i>normal refrigeration unit thermoelectric cooling (Peltier device) environmental cooling pre-cooling</i>	<i>biological cooling chemical cooling pharmaceutical cooling heat transfer rods</i>
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Note: this may still require some discussion or preliminary analysis to clarify or refine the concept enough so that a preliminary assessment can be made in the next step. *Positive* suggestions and modifications are welcome at this stage in order to make as many useable alternatives as possible.

### **Evaluation and Ranking**

**Step three:**

Analyze the alternatives further to see which will actually do the job. This may be quite extensive, or could involve assumptions where real data or time is not available (i.e. an “educated guess” - amount of research that can be done depends on time and resources available). Reject the ones that have no, or little, hope of producing a useable solution. Retain the “survivors”

Example

<i>1. normal refrigeration unit</i> <i>2. thermoelectric cooling (Peltier device)</i>	<i>3. heat transfer rods</i> <i>4. environmental cooling</i>
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**Step four:**

Develop a set of criteria related to the technology and situation that can be used to compare the different surviving alternatives. This may also require more than one iteration.

Example

*primary cost*  
     *design*  
     *manufacturing*  
*secondary costs*  
     *maintenance*  
     *marketing*  
     *warranty*  
*availability of components*  
*performance / efficiency*  
*regulations / codes compliance*  
*social acceptability / environment*

**Step five:**

Rank the alternatives using the selected criteria. It may be appropriate to “weight” the criteria so that different criteria have more or less influence on the final “score”. One way to do this is to rank the alternatives comparatively in each criteria (e.g. best to worst, with an associated number score), and multiply by the weighting factor. In the end, the scores will help you decide which alternative(s) to carry forward or complete. If one is way ahead of the others, you may decide to gamble on developing just that one. If several are close, you may decide to analyze all of those further before making a final decision.

<i>Criterion</i>	<i>weight</i>	<i>Alt. #1</i>	<i>Alt. #2</i>	<i>Alt. #3</i>	<i>Alt. #4</i>
<i>primary cost</i>					
<i>design</i>					
<i>manufacturing</i>					
<i>secondary costs</i>					
<i>maintenance</i>					
<i>marketing</i>					
<i>warranty</i>					
<i>availability of components</i>					
<i>performance / efficiency</i>					
<i>regulations / codes compliance</i>					
<i>social acceptability / environment</i>					
<b><i>Score</i></b>					

**Step six:**

Mentally “step back”, and review the results and ask yourself whether you’re “comfortable” with the selection(s) that have floated to the top. This “gut fee” test will be more useful and accurate as you gain experience. Caution: don’t let your paradigms blind you to a new innovative alternative!