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Adopt-a-Tool: Morphological Box

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Sun Tzu once said, “In battle there are the normal and extraordinary forces, but their combinations are limitless; none can comprehend them all” (Michalko, 1991, pg. 117). In life, both personally and professionally, we are often confronted with a plethora of possible parameters and options from which we must derive one perfect solution. In order to create an organized manner to generate, assess and evaluate a multitude of possible solutions to a problem Dr. Fritz Zwicky constructed the morphological box, sometimes also referred to as the idea box. This thinking tool helps map out all the combinations of potential solutions that address the essential parts of a problem (Ritter and Brassard, 1998, pg. 71).

While the morphological box was not officially created until the mid-twentieth century, the term and practice of morphology has been utilized for centuries. Morphology has been a part of many fields of science to designate research on structural interrelation – in particular in the fields of anatomy, geology, botany and biology (Zwicky, 1966, pg. 34). Johann Wolfgang von Goethe used the term “morphology” in reference to his study of plants and animals in the late 1700s. His techniques with morphology allowed him to map the essential structure and formation of things in order to describe their essential features (King and Schlicksupp, 1998, pg. 119). This use of morphology reduced the multitude of structural forms of plants and animals to a common denominator (Zwicky, 1966, pg. 34). Many, many years later Zwicky described morphology as a way to establish a “complete field of coverage.” Meaning that the quest for a true solution can only be successful if all possible avenues have been explored (Zwicky, 1966, pg. 34).

When applied to problem solving, morphology allows individuals and teams to review the fundamental structure of a problem in a way that identifies the entire spectrum of possible solutions. The morphological box method provides a system to look at each characteristic or parameter of a solution, and the realistic options for each criterion presented (King and Schlicksupp, 1998, pg. 119).

So where exactly is the creativity in all of this? That can be answered when considering one of the most basic definitions of creativity; that it is the bringing together of two, or more, seemingly unrelated items in a novel and useful way (King and Schlicksupp, 1998, pg. 119). The morphological box is a tool that organizes what can often be a chaotic and freewheeling approach to brainstorming, into an easily read and utilized table or map of options and possible outcomes.

According to Zwicky the benefits of using morphology are plenty, and as it relates to the process of creative problem solving are as follows:

1. Morphology is “totality research;” in an unbiased manner it attempts to derive all solutions to a given problem.
2. The morphological approach gives the greatest guarantee that no circumstance or solution that could be of value or importance to accomplish the task has been overlooked.
3. Morphological thinking helps to clarify all conflicts that might arise among a team and is a great means of communication that all members can use to avoid misunderstandings.

4. Morphology is a satisfying tool because its approach to all-embracing perspectives strives for the ultimate perfect solution. This total solution to a problem breeds contentment among a group.
5. The morphological approach enables a group to systemize their inventiveness, allowing discoveries to be made in a methodical manner that can sometimes feel automatic.
6. Morphology is a great source of inspiration for continued successes, as the use of this tool continually allows for one's intuition to be stimulated.

For these, and many more reasons, the morphological box is a wonderful thinking tool for groups and teams alike to use throughout the creative problem solving process (Zwicky, 1966, pgs. 105-106).

The first step in utilizing the morphological box is to assemble a team. Unlike other creativity tools that simply require group members that are committed to finding a plausible, yet creative, solution, the morphological box recommends the team include at least one or two “experts” with a good knowledge base of the subject matter. This composition is suggested because the morphological box requires analytical and clear thinking, as well as the ability to define things precisely. For the same reasons it is recommended that the team be kept relatively small (King and Schlicksupp, 1998, pg. 121).

The next step is to identify and define what characteristics would be essential to an effective solution. These essential characteristics are known as the “parameters” and will be common in all possible solutions generated (King and Schlicksupp, 1998, pg. 121). Good parameters must be independent of the other parameters, describe a complete

solution when combined with other parameters, be valid for all potential solutions, and represent a characteristic of an effective solution (Ritter and Brassard, 1998, pgs. 71-72).

It is also important to note that there is no set number of needed parameters, but a good rule of thumb is that it should be six or fewer when you are new to the tool, but in general, with more experience, five to ten will work well (Ritter and Brassard, 1998, pg. 72). Once this list is complete begin to assemble your “box” or table, by placing these parameters vertically down the left hand column (King and Schlicksupp, 1998, pg. 124).

For the sake of demonstration I have chosen to use an easy to understand problem of buying a home, “How can I determine which home is best suited for my family?” The chosen parameters have been laid into the table below.

Parameters	Option 1	Option 2	Option 3	Option 4	Option 5
Location					
Cost					
Type of Dwelling					
School Ratings					
Number of Bedrooms					
Commute Time					

After the parameters are listed, “options” for each need to be established. Options are alternatives within each parameter. There must be at least two options per parameter, but there can be more, and each parameter within the table can have a different amount of options. It is important to generate options that draw on both your current knowledge, as well as your imagination, keeping in mind that more options are not necessarily better

(Ritter and Brassard, 1998, pg. 74). The table below has now been filled in with each parameter's options in the columns to the right.

Parameters	Option 1	Option 2	Option 3	Option 4	Option 5
Location	City	Suburbs	Rural		
Cost	< \$100k	\$100k – \$150k	\$150k – \$200k	> \$200k	
Type of Dwelling	Apartment	Condo	Townhouse	Single-Family Home	Duplex
School Ratings	Good	Mediocre	Bad		
Number of Bedrooms	Two	Three	Four	Five	
Commute Time	< 20 minutes	20 – 40 minutes	40 – 60 minutes	> 60 minutes	

Once the morphological box is complete with parameters and options, alternative solutions can be built. This is accomplished by linking together options from each parameter; within each parameter at least one option must be selected. Usually a single option is chosen within each parameter, and selecting more than one option within a parameter is only advised when it will lead to more interesting combinations. Do not choose more than one option just to avoid making a decision (Ritter and Brassard, 1998, pg. 76). The table below demonstrates how to string options from different parameters together to create a solution. The below combination shows the solution as a dwelling, in the city, in the \$100,000 –\$150,000 price range, that is an apartment, in a neighborhood with mediocre school ratings, that has 4 bedrooms and has a commute to work of less than 20 minutes.

Parameters	Option 1	Option 2	Option 3	Option 4	Option 5
Location	City	Suburbs	Rural		
Cost	< \$100k	\$100k – \$150k	\$150k – \$200k	> \$200k	
Type of Dwelling	Apartment	Condo	Townhouse	Single-Family Home	Duplex
School Ratings	Good	Mediocre	Bad		
Number of Bedrooms	Two	Three	Four	Five	
Commute Time	< 20 minutes	20 – 40 minutes	40 – 60 minutes	> 60 minutes	

At this point the team continues to develop alternative solutions by repeating this “mark and connect process.” Each line represents one solution to the problem (King and Schlicksupp, 1998, pg. 126). It is helpful to distinguish between each line or solution by using differently marked points such as circles, triangles, squares, stars, etc. The morphological box below has been updated to show this technique.

Parameters	Option 1	Option 2	Option 3	Option 4	Option 5
Location	City ■	Suburbs ★	Rural ●		
Cost	< \$100k ●	\$100k – \$150k ■	\$150k – \$200k ★	> \$200k	
Type of Dwelling	Apartment ■	Condo	Townhouse	Single-Family Home ★	Duplex
School Ratings	Good ★	Mediocre ■	Bad ●		
Number of Bedrooms	Two	Three ★	Four ■	Five ●	
Commute Time	< 20 minutes ■	20 – 40 minutes ★	40 – 60 minutes	> 60 minutes ●	

Keep connecting options from each parameter until all possible solutions have been identified. Examine the combinations in the box to see how they affect the challenge. Some teams find it helpful to first randomly examine the entire box, and only then start to

gradually restrict themselves to portions of the box that are seemingly more fruitful (Michalko, 1991, pg. 118).

The final step is to analyze each of the solutions that were developed and select the best one to solve the challenge. The morphological box does not “point to the right solution,” nor does it provide suggestions as to which solution might be the right one. At this final step it is the team’s job to evaluate each solution against the criteria that relate back to the original problem’s goals and circumstances (King and Schlicksupp, 1998, pg. 128).

There are three main suggested methods a group can utilize in this final step of evaluation. The first is intuitive evaluation, in which, as the name suggests, the team members use their intuition or gut instincts to record interesting partial or complete solutions. The second evaluative method is optimization. In this approach the team’s perceived “best option” for each parameter is combined to create an overall solution. The downfall here is that this may not be a workable solution, and thus a “less than ideal” option for one or more parameters may need to be substituted. Lastly, the sequential evaluation method has the group list the parameters in a top-down order of importance, placing the most important parameter first, and the least important last. This allows the group to review each parameter’s options one at a time, from a perspective of highest importance, working their way down until an optimal solution is found (King and Schlicksupp, 1998, pg. 129).

From my perspective the morphological box is a fairly all-inclusive thinking tool. It begins with a group using diagnostic thinking skills to clearly understand the problem at hand, defining and clarifying key parameters necessary in obtaining a successful

solution. Strategic thinking is then utilized as parameters and options are fully created to ensure that critical gaps and pathways to a desired outcome have been considered. Once the full morphological box has been constructed and reviewed the group enters a phase of ideational thinking. In this step all possible solutions are created, producing mental images and thoughts that respond to, and answer, the original challenge. Lastly, before the team can move forward into implementation they must use evaluative thinking to assess the reasonableness and quality of the solutions they have generated to determine the workability, usefulness and practicality of each. Thus, in my opinion, the morphological box is a wonderful tool to guide a team nearly all the way, though not fully, through a creative problem solving process.

As previously discussed, when reviewing challenges, the solutions can seem limitless, and they often are. This occurs often in both a personal and professional setting. However, Zwicky's morphological box is a tool that can be used to work a group or team through a creative problem solving process, from challenge to workable solution. By mapping out all the combinations of potential solutions that address the essential parts of a problem, a team can obtain a plausible, and hopefully novel, solution to their challenge. Furthermore, this is accomplished in a manner that is unbiased and satisfying, which leads to contentment among all group members.

References

King, B. & Schlicksupp, H. (1998). *The idea edge: Transforming creative thought into organizational excellence*. Methuen, MA: GOAL/QPC.

Michalko, M. (1991). *Thinkertoys: A handbook of business creativity for the 90s*. Berkely, CA: 10 Speed Press.

Ritter, D. & Brassard M. (1998). *The creativity tools memory jogger*. Salem, NH: GOAL/QPC.

Zwicky, F. (1969). *Discover, invention, research through the morphological approach*. Toronto, Ontario: The Macmillan Company