Our Contributions to Matrix 2003

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As you probably know the main limitations of the original Contradiction Matrix (CM) and 40 principles are:

- Problems have to be pre-formulated in terms of technical contradictions involving parameters from the list limited to 39 parameters.
- Most of recommendations are quite general and require substantial creative work to implement.
- Empty boxes; limited number of problems that can be handled (in our estimate, no more than 20-25% of all problem situations without using additional tools).
- Outdated and limited amount of examples.
- With few exceptions, principles in the boxes did not offer the resolution of the given contradiction but rather suggested ways that could avoid them, for example offering a different way to improve a parameter that would not impact the other parameter participating in the initial technical contradiction[1].
- In many situations users do not have contradictions, but rather are seeking the best ways to improve a certain parameter or to get rid of an undesired feature.

Because of the limitations mentioned above and the necessity to deal with too many tools, by the end of 1980s we started developing a universal system of Operators that would integrate all knowledge base tools (40 Principles, Separation Principles, 76 Standard Solutions, selected patterns/Lines of Evolution, etc.) in one. By the early 1990s the System of Operators was ready and capable to replace all other knowledge base tools. For that reason, when we started introducing TRIZ to the American audience we wanted to move the CM and Principles back to the position Altshuller himself put it in the mid 1970s – historical context.

However, rather unexpected, CM became very popular in the U.S. and Europe because of its simplicity and because of in many situations it was introduced as a status of the art tool (sometimes because of pure lack of knowledge, sometimes intentionally). The positive result of this popularity was conditioning the market. Unfortunately, in many

[1] Working with the Contradiction Matrix, it was found that selecting Principles based on a pair of contradictory characteristics limits the tool's capabilities. In fact, with Technical Contradiction (TC) modeling, two characteristics (parameters) are "connected" via a specific means of eliminating a drawback. For example, one way to improve productivity might cause an increase in weight, while another way might result in decreased reliability – that is, lead to a different TC. Given this, we can assume that besides the traditional methods of eliminating a TC there might be others as well. For example, if our TC contains the pair "productivity – reliability," the following might also be considered:

- Another way to improve productivity that does not impact reliability
- A way to avoid or compensate for the decrease in reliability that does not impact productivity.

situations, it caused damage. The damage was associated with the situation when after a very successful seminar (it is not that difficult to prepare a set of special educational case studies for the particular training that are the most suitable for CM utilization) the encouraged students would return to their working place just to realize that they were not able even to enter the CM with their problems. Many of those unhappy users have decided that TRIZ did not have any practical value similar to many other techniques introduced during the last decades.

At first we were trying to handle the situation explaining the weaknesses of CM and the whole classical TRIZ and offering much more effective tools. Then we decided to stop fighting and capitalize on this demand, developing the new CM (we called it Super-table) that will be (at least partially) free from the drawbacks of the original one and have additional benefits, such as:

- Increased coverage (more typical problems to address, including various harmful effects).
- Possibility to apply without formulating contradictions.

These benefits have been achieved because of the following new useful features:

- 11 More parameters (see the list)
- 50 more principles (see the list)
- Additional recommendations
- Allows resolve physical contradictions as well

To simplify the situation, we have built the new table (50x50) around the old one without actually touching it, just adding new parameters and principles to the existing ones (see the model below).

	0	1	2	···	39	40	···	50
1								
2								
···								
39								
40								
···								
50								

Note. The column 0 is for the situations, when the user is just looking for some ways to improve a parameter and thus is not aware of other parameters that might degrade as a result.

Another important finding was identifying and separating Universal Principles. From the very beginning, our research have shown that inventive principles have different nature and could be divided in groups in several ways, one of which is by its applicability. For example there are principles that are practically universal – could be applied to any type of problem including non-technical (like Inversion, Segmentation, etc.) while others (like thermal expansion) have rather limited applicability being more specialized. Identifying universal principles allowed us to make sure we always try them.

Our research also have identified Principles that are working with specific single parameters rather than a pair of parameters and found out that in the majority of cases Principles work with single parameters. This finding resulted in creation of lists of Principles suggested for improvement of specific parameters.

Eventually, our work was combined with a very important work made by Dr. Darrell Mann's team.

In the nutshell, our contribution could be mentioned as increased applicability and problem coverage via:

- Extending the number of parameters and the number of Principles to handle them
- Identifying universal Principles that could be applied to any situation (beyond the extended number of parameters)
- Possibility to address a problem without technical contradiction articulated (a list of relevant Principles for each parameter have been identified).