August, 2007

An Introduction to ARIZ

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Available at: https://works.bepress.com/umakant_mishra/91/
1. What is ARIZ?

ARIZ is the acronym for the Russian phrase “algorithm rezhenija izobretatelskih zadach.” Or "Algorithm of Inventive Problem Solving" in English, developed by Generich Altshuller, the originator or father of TRIZ. ARIZ is a structured process consisting a set of steps that incrementally evolves a complex problem to simplicity. ARIZ is considered as one of the powerful tools of TRIZ.

The main goal of ARIZ is to transform an initial problem step by step into a stage where it becomes easy to solve. It is a solution neutral process that takes out all preconceived solutions from the problem statement. It starts with an assumption that the nature of your problem is unknown. It provides a long list of procedures that converts complex problems to simple formats.
2. Why ARIZ

Problem formulation or analysis of the problem is the first and most important step of problem solving. When a problem is properly explained, it shows up its contradictions and stays very close to its solution. But in many cases, the inventive problems are too complex to be explained in simple terms. ARIZ is best used for solving complex problems.

ARIZ is a less frequently used tool in TRIZ. Any problem is attempted first with other tools like Principles, Contradiction, S-Fields and Standards. When the problem is too complicated to be handled through any of these tools, ARIZ is considered.

3. Versions of ARIZ

There are about ten different versions of ARIZ since it started in 1956. The last well known version of ARIZ is ARIZ-85-C developed in 1985. This version is well improved compared to its previous versions. This version of ARIZ includes S-Fields, operators, resources etc. for the analysis and solving of difficult technical problems.

4. Steps in ARIZ framework

The framework of ARIZ-85-B/C contains nine steps. The first three steps try to analyze and reformulate the original problem. The next three steps try to remove the contradiction. The last three steps try to analyze the solution. Basically all these are intended to solve complex problems by reformulating or reconstructing a given problem. These nine parts include about 50 step-by-step mental procedures for problem resolution. Below are the nine steps of the ARIZ framework.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>1.</td>
<td>Analysis of the Problem and the System Environment</td>
<td>Analyze and Reformulate the Original Problem</td>
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<tr>
<td>2.</td>
<td>Analysis of the Resources and creating the Problem Model using Technical contradiction</td>
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<td>3.</td>
<td>Pin point the problem by defining Ideal Final Result (IFR) and formulating the Physical Contradiction(s)</td>
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<td>4.</td>
<td>Solve the problem by utilizing the available Resources</td>
<td>Remove the contradiction to find solutions</td>
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<td>5.</td>
<td>Utilization of the Information or Knowledge base, such as, Patents. Utilization of effects, inventive standards and inventive principles etc.</td>
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<td>6.</td>
<td>If the problem is not solved then Change or Reformulate the Problem to a mini-problem or maxi-problem</td>
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<tr>
<td>7</td>
<td>Review all the solutions and select the best solution. The solution should be beneficial not only to the system but also to the super system and sub-systems.</td>
<td>Analyze and review the solutions to arrive at the best solution.</td>
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<tr>
<td>8</td>
<td>Apply the selected solution and develop maximum usage of the solution</td>
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<tr>
<td>9</td>
<td>Review all the steps in the process and go back to the first step (reformulating the problem) and iterate this whole process till you arrive at a satisfactory solution.</td>
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### 5. Tools and techniques used in ARIZ

ARIZ uses all the tools and techniques that is used in TRIZ. As both are from the same brain, they are not very different. However, ARIZ is more process oriented than TRIZ and provides a flowchart of the processes to follow in order to solve difficult problems. The tools and techniques used in ARIZ are as follows.

- **Ideality** – this gives an understanding of the Ideal Solution that is desired for the problem (problem analysis). Besides ideality also guides the main patterns of system evolution (problem solution).
- **Contradictions** - this states why an IFR or desired result is not possible to achieve. In other words, what are the contradictions to achieve the goal? First a technical contradiction is formulated and then a physical contradiction. Afterwards, the contradictions are removed to solve the problem.
- **Inventive Principles** – to solve contradictions
- **Resources** - in order to explore all the resources available inside the system and possibility of solving the contradictions by using the available resources.
- **Using the knowledge base** - one purpose is to learn how others have solved similar problems in other domains so that similar methods can be used to solve the given problem. Scientific effects and Inventive principles are also used for the same purpose.
- **S-field modeling** and **Standard Solutions** to find solutions to the problem
- **Patterns of evolution** - to predict the next generations of the current product.

### 6. Summary

ARIZ is a process of solving complex problems which can be perceived from different angles. From one point of view, ARIZ is a complete method of problem solving which involves almost everything that is used in TRIZ. ARIZ includes Ideality, Contradictions, S-Fields, Standard Solutions and Inventive Principles. It involves more than 50 individual steps to analyze a problem, finding and solving the contradiction within the problem and finding and selecting the best solution.

From another point of view, ARIZ is a part of TRIZ. It is not as popularly used as other methods in TRIZ. The steps in ARIZ are difficult to follow and requires more intellectual effort. This method is used only to solve complex problem which are not solved by applying other methods of TRIZ. It is a tool for thinking in alternative directions to solve complex and non-standard problems.

From another point of view, ARIZ is a method of problem solving by redefining and restructuring the problem. Although problems can be solved by using other methods, it is better to evaluate the method of solution using ARIZ. ARIZ moves you back and forth on the functional domains of the super-system, the system and subsystem in order to ensure that the derived solution does not create any problem for the super-system or sub-systems.

### Reference:

1. Valery Kraev, “Kraev's Kotner”, TRIZ-journal
6. Yuri Salamatov, “TRIZ: The right solution at the right time”, Translated by Maria Stragaia and Sergei Yakovlev, 1999