

jointly for our common future

WP6

INNOVATION TOOLBOX



VADEMECUM INTERVENTION TOOLS

Methodologies and Tools for Technology Transfer: a new approach for businesses

Index

Introduction.....	4
Inventive problem solving: the context	4
Methods for systematic problem solving	4
TRIZ.....	4
Morphological Analysis.....	6
TILMAG	6
Methods of creative problem solving	7
Brainstorming.....	7
Lateral Thinking.....	7
Scamper.....	9
Conclusions	10

METHOLOGIES AND TOOLS FOR TECHNOLOGY TRANSFER: A NEW APPROACH FOR BUSINESSES

Introduction

The main target of the TECHFOOD project is support the innovation process in the agro-food enterprises, to reach the goal there will be predisposed operating procedures structured on project management and **creativity development techniques**.

Enterprises Intervention Tools are set up considering the innovation management, creativity development (TRIZ) and EU project implementation techniques outlined in EC paper "Innovation Management and Knowledge-driven Economy".

Inventive problem solving: the context

All over the world different theories of inventive problem solving (methodologies, models and tools to analyze, address and successfully resolve problematic situations in different contexts and situations) have been developed and tried.

In this case, the context here is the "enterprise system" in which the "problematic situation" may relate to the organization, marketing, administration, and especially the development of new solutions, whether products or processes.

Innovation: a systematic or creative process?

Is it possible to plan, organize, manage the innovation process, a purely creative, inventive action characterized by unpredictability, by uniqueness, by finding proposals and solutions outside the schemes?

The answer to the question posed in these terms is positive. There are methods and computer tools to support innovation systematically.

Methods for systematic problem solving

TRIZ

TRIZ is the acronym of the Russian Teoriya Resheniya Izobreatatelskikh Zadatch, translated into English as Theory of Inventive Problem Solving. It is both a heuristic method and a set of tools developed in Russia since 1946 by Genrich Altshuller Saulovich (1926-1998), aiming to capture the creative process in a technical and technological area, encode it and make it repeatable and applicable: a true theory of the invention.

The architectural complex of TRIZ is based on the following observations:

Technical systems evolve according to objective laws and tend to maximize their level of idealism.

Any specific technical problems can be traced through a process of abstraction, a general model, and the logical processes of resolution can be grouped into a finite number of "problem-solving principles."

Given the finite number of models and principles of problem solving, conceptually similar solutions can be applied to technical problems apparently different.

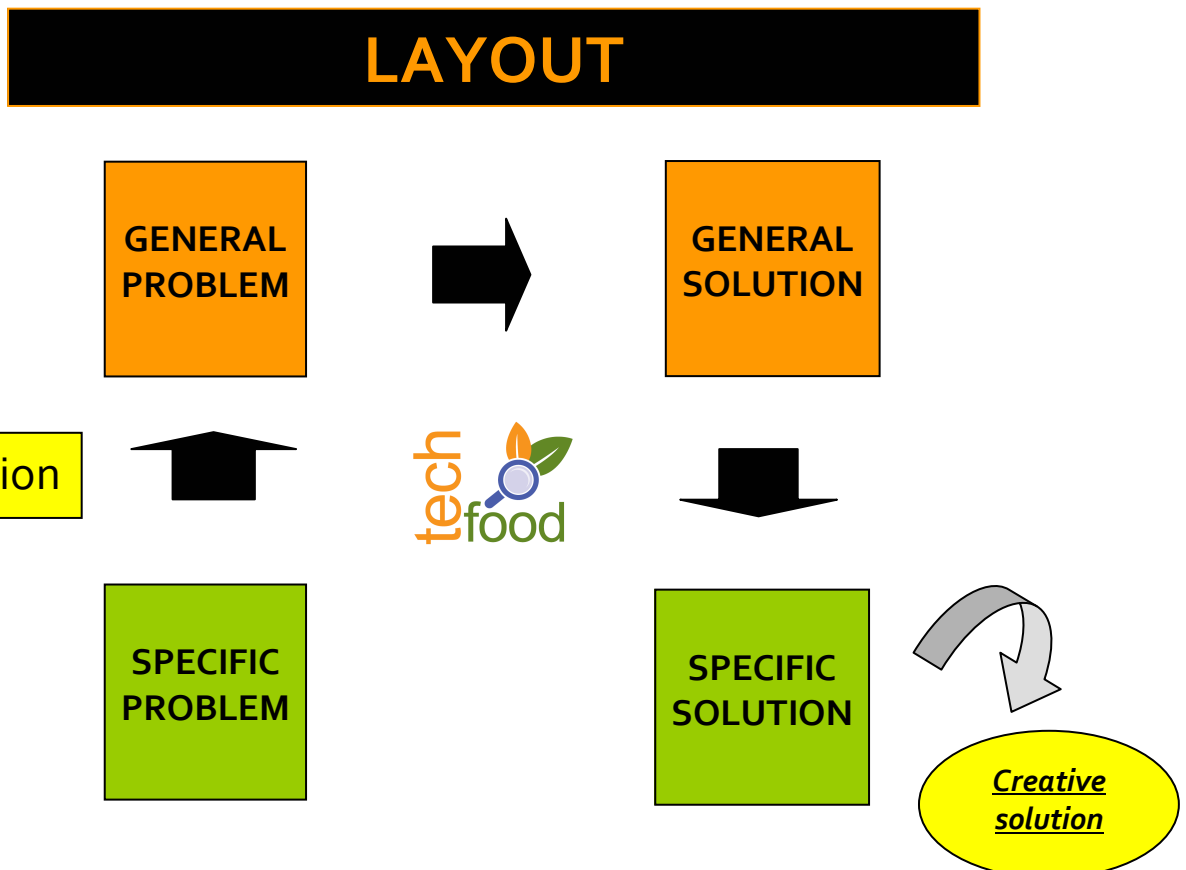
Each technical system has the characteristics that describe the status and determine the contradictions binding. The study of these features helps to avoid the trade-offs arising from the contradictions, overcoming them, and getting high level solutions.

Every technical system exists to make a main function. Over time, the required functionality to the system tends to remain as solutions tend to change.

On this conceptual framework Altshuller and colleagues have built over the years a set of tools for:

- ✓ analyse a technical system to extract a model,
- ✓ apply to the model the principles of problem solving that are more effective,
- ✓ searching, between the models of solution known, the most suitable for the problem analyzed.

The philosophy that underlies TRIZ is not groped to solve a specific problem simply looking for a specific solution but rather to follow a path of abstraction of the problem. Once the problem is generalized is possible to exploit the structured knowledge available to the methodology to systematically identify the generic solution, and only now to translate into a specific solution that abstract solution.



Morphological Analysis

Morphological analysis was designed by the American astrophysics Fritz Zwicky. In principle it is to break down the problem to be solved in its well-defined components. Combining them, these issues generate many new potential solutions of the problem; the likelihood increases, approaching the most possible to the optimal solution.

TILMAG

Idealer Transformation und mit Lösungselemente Assoziationen Gemeinsamkeiten

Created by Helmut Schlicksupp, it roughly translates from German as "the transformation of the elements of the ideal solution with a common matrix, the associations." The process begins with the definition of the problem. Once the problem is defined, the second step is to identify and define the elements of the ideal solution (ISE), which are then used to construct an array. By connecting 2 or more items of ideal solutions - called associations - we return to the problem of providing possible solutions.

The TILMAG method involves the following steps:

Step 1: Define the problem clearly

Step 2: Identify / define the ideal solution (ISE)

Step 3: Construct a matrix of association, write the ISE on each axe

The matrix size depends on the number of ISE. The ISE in the array are listed sequentially on both axes.

It's necessary to proceed inserting a cross in all the cells where each ISE crosses himself.

Option A

	ISE 1	ISE 2	ISE 3	ISE 4	ISE 5
ISE 1	X				
ISE 2	X	X			
ISE 3	X	X	X		
ISE 4	X	X	X	X	
ISE 5	X	X	X	X	X

Option B

	ISE 1	ISE 2	ISE 3	ISE 4	ISE 5
ISE 5					
ISE 4					X
ISE 3				X	X
ISE 2			X	X	X
ISE 1		X	X	X	X

Step 4: Do a brainstorming within the team of problem solvers by combining pairs of ISE which do not have a cross in the cell.

For each cell not barred, the team should identify 2 or 3 associations between the combinations of two pairs of ISE.

If a row or column is empty, it usually means that the ISE is not applicable to the problem. The process continues until all the cells are not barred were taken into account by the team.

Step 5: The team returns to tackle the original problem.

Using each association and the principles that underlie this concession, the team returns to confront the problem to be solved in origin.

The basic principles of each association are finally defined.

Step 6: The team brings together the best ideas bringing together the ideas from the original Brainstorm (Step 1) and the associations TILMAG and the principles (Steps 4 and 5).

Methods of creative problem solving

The creative problem solving is particularly useful where the ability to identify and to define the problems can be improved through the use of techniques and tools that aim to promote freedom of expression and give rise to unusual ideas and original and innovative visions. The techniques used are the following.

Brainstorming

Brainstorming is a group creativity technique to bring out ideas aimed at solving a problem. It consists on, a problem supposed, letting everyone proposing solutions of any type freely (even odd or without sense) without censoring any idea. The criticism and a possible selection only intervene at a later time, when the brainstorming session is over.

The main result of a brainstorming session, which apparently seems a silly and childish method, is usually very productive: it can consist of a new, comprehensive solution to the problem, a list of ideas for an approach to a solution or a list of ideas that will transform in the writing of a work program to find out a solution later. The method of brainstorming began to spread in 1957, thanks to the book "Applied Imagination" by Alex Faickney Osborn, an advertising executive. The Blue-Sky thinking is similar to brainstorming.

Lateral Thinking

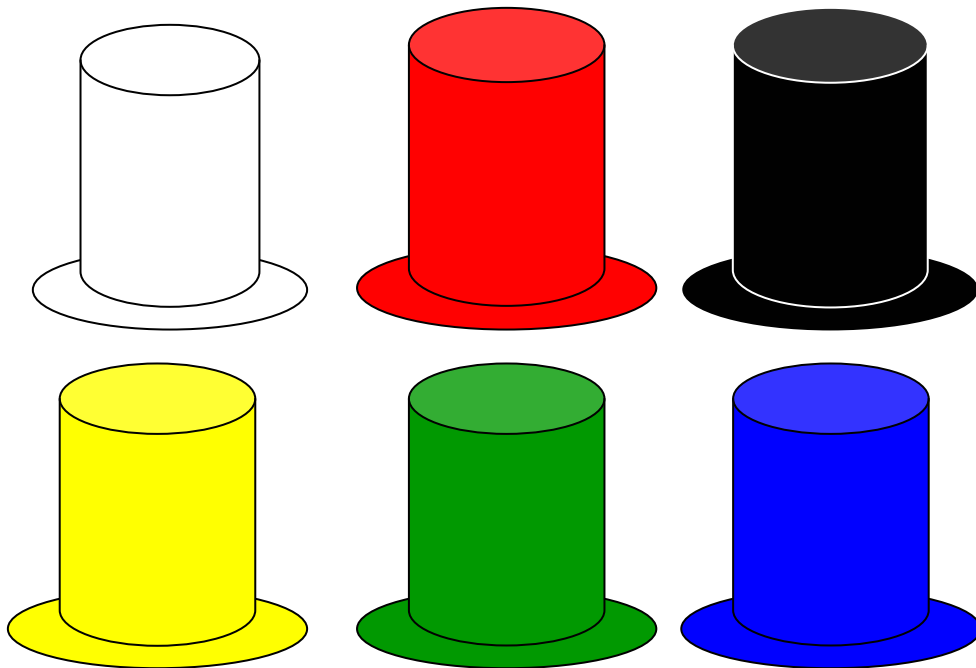
The term lateral thinking was coined by Edward De Bono Maltese psychologist: it describes a mode of logic problem-solving, which provides an indirect approach (the observation of the problem from different angles) as opposed to the traditional mode that focus on a direct solution to problem.

While a direct solution involves the use of sequential logic, solving the problem starting from the considerations that seem more obvious, the lateral thinking leave it (hence the term lateral) and look for alternative points of view before searching for the solution.

The principle behind this mode is similar to what is proposed with **divergent thinking**: for each problem you can always find different solutions, some of which emerge only regardless of what

initially appears the only possible path by looking elements, ideas and insights that are outside the domain of ideas and knowledge and far from the rigid chain of logic.

It is therefore important to have ways and means to facilitate these processes of thinking, to generate hypotheses to match and combine with the knowledge already possessed, to achieve this objective. This is the case of creative maps that allow both to stop the ideas and record them, ready to be reworked later. Among these also fit Tony Buzan mind maps or "solution maps", which can be used to facilitate the holding of sessions based on creative techniques such as the **Six Thinking Hats**.



The technique relies on the use of six colored hats and aims to provide an analysis aimed at identifying a comprehensive picture of the situation. Each member of the team of problem solvers can decide to wear, even if only metaphorically, a hat. This is in itself an invitation to leave the "rails" of the passive thinking, the reaction one, and to predispose to a form of active thought.

Each color corresponds to a particular type of mode of thought.

The **white** hat for the collection of objective data: facts and figures, as "acting" part of a computer;

Red for the emotional point of view: an opportunity to highlight, sometimes even to himself, the less rational implications of a situation, not only emotions, but also intuition and hunches, which can then be expressed, to be further examined in the light of ... another hat;

Black does not need much explanation, the voice of the famous "Devil's Advocate," is examining all the negative aspects;

The **yellow** hat is optimistic, the other side of the coin, the one that always takes "the glass half full";

Green is the color of creativity: is the voice of ideas, is the space left to think more boldly;

The **blue** is for the voice that has the task of organizing, to translate ideas into practice: the scoreboard of the entire process.

The six hats promote the activation of different areas of the mind, creating a comprehensive map to guide effectively from the intention to the implementation. Inside the meeting may be called, in different moments, to adopt different hats or during a discussion we can draw the interlocutor that he still has to wear the red hat, rather than black; this is a more sure and delicate and diplomatic formula to invite him to look at things from another point of view. The Six Thinking Hats are used to direct our thoughts towards goals certainly more interesting than those that could have achieved if we had remained in the hands of habitual patterns.

Scamper

SCAMPER is a method based on lateral thinking and is built around a checklist that helps the problem solver to think in particular to what changes you can make to an existing product or service to create a new one. You can use these changes either as direct suggestions or as starting points for lateral thinking. Developed by Bob Eberle, the check list of SCAMER is, as follows:

S – Substitute - Components, materials, people.

C - Combine - Mix, combine or integrate products and services with other products and services.

A - Adapt - Alter, change function, the use by another element.

M - Modify - Increase or decrease of scale, change shape, change features

P – Put to other purposes.

E - Eliminate - Remove elements, simplify, reduce to core functionality.

R - Reverse - Turn inside out or upside down, including the reverse use.

Conclusions

Among the methods to generate and accelerate innovation processes TRIZ is enjoying a very high success. The reasons lie mainly in a few factors:

- ✓ The method is objective and not subjective: the approach is neither sociological nor psychological!
- ✓ It is based on logic and data, not on intuition.
- ✓ The method has potential applications in very important areas such as mechanics, where systems are the basis of technical and creative processes of innovation.
- ✓ It allows to overcome in a very agile and effective way the psychological inertia because through the comparison between the state of the art in various sectors, research areas and disciplines it allows to broaden the cognitive scope of those who must implement innovative processes.

This success suggests its application also in our application context.

The TRIZ has been used mainly in companies large and highly structured with substantial financial resources and time to devote to research and development of new products and services.

It is therefore necessary to undertake a review to fit its socio-economic context in which each partner will have to experiment to achieve an effective service.

The process of adoption of TRIZ methodology must be integrated in a way that allows flexibility in its application and a strong adaptability to the methodologies to make innovations that are already been adopted by small and medium enterprises.

