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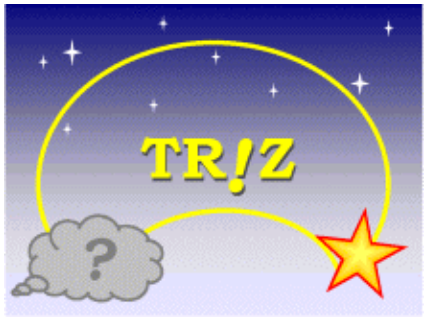

General Method of Creative Problem Solving: 'Six-Box Scheme'

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For (discoveries and) inventions, (it is often assumed that) idea generation and enlightenments are important.

Thus many surveys were carried out to record the experiences of enlightenments by scientists and engineers.

Findings in common:

(a) Continuing study and research having sound background knowledge,

(b) Having the problem in mind, thinking to solve it for a long time, generating ideas in various directions and examining them,

(c) At an occasion of some relaxed mental state, with a trigger of some minor event or in the dream, happened to encounter the 'enlightenment'.

(d) Applying the enlightened idea to the problem, one could solve the problem quickly.

Question: Using this finding as the guideline, what should we do now and in the future?

Obviously, we have to make efforts for a long time, BUT
It is uncertain when and whether an enlightenment really comes out.

Many different approaches have been advocated so far:

1. Anyway we have to work hard to learn, research, try, and do experiments.
2. Generate ideas freely and abundantly, and try them.
3. Try to enhance our own capability of imagination; use animation methods, etc.
4. Make your brain flexible, and train yourself to think from different aspects.
5. Think over using various examples as hints; search for hints and make a collection of them.
6. Survey relevant references and patents, and think over with them.
7. Describe and analyze your problem and your desire.
8. For making yourself relaxed, prepare for suitable time, space, environment, etc.
9. Communicate and discuss with people having different experiences, specialties, and opinions. ·····

These different approaches have been advocated and practiced, separately.
Each tries to find some 'short cuts'. Sometimes successful, sometimes not.
Effective in some aspects, but only partly for each.
Confusing with one another, without a clear overall view.

Recently, 'Methodology for Creative Problem Solving' has been developed

on the basis of TRIZ and its extensions.

G.S. Altshuller
(1926–1998)
(ex–USSR)

Reorganizing knowledge in science & technology and in patents, TRIZ has developed a number of methods for creative problem solving.

==> Without depending on enlightenment (or an occasional big jump), TRIZ intends to analyze and understand the problem, to build up a number of ideas (or smaller jumps), and to achieve creative solutions at a higher level.

Altshuller got the basic idea in 1946, and developed TRIZ in 40 years. TRIZ expanded into the western world since 1990s.

A big system of philosophy, knowledge bases, techniques, etc. has been developed.

Efforts for making TRIZ easier to understand and more effective to apply have been made for these years around the world.

==> General Methodology of Creative Problem Solving (CrePS) was introduced with a new paradigm of the Six-Box Scheme. (by T. Nakagawa)

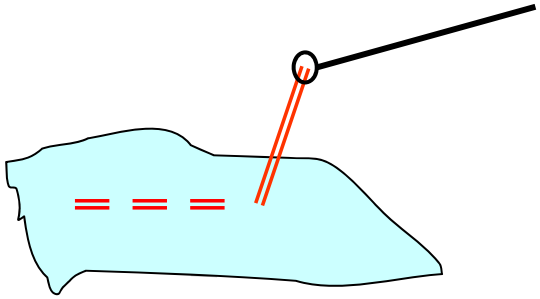
I will demonstrate this with an example

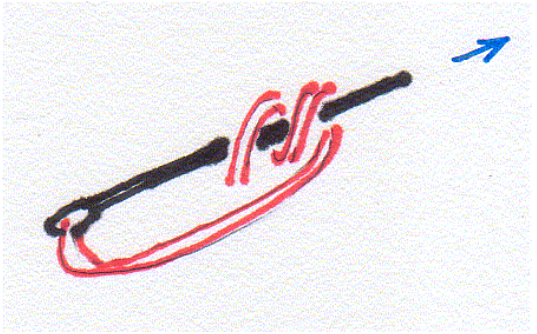
T. Shimoda and T. Nakagawa (2006)

A Simple Case Study in Everyday Life:
How to fix a string shorter than the needle at the end of sewing

Problem Situation:

At the end of a sewing process, when you want to make a knot of the string, you have found that the string left is too short to use the standard way of making a knot.





Question: What can you do?
Think of various ways of making a knot in this situation.

Question: Why are you in a trouble? What is the root cause?
What are the underlying assumptions, properties, constraints?

T. Shimoda and T. Nakagawa (2006)

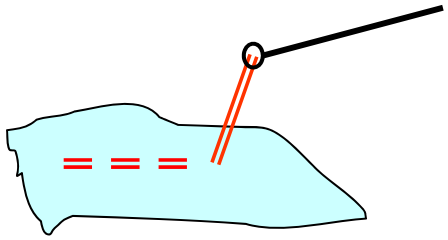
How to fix a string shorter than the needle at the end of sewing

Define the Problem:

(a) Undesirable effect: The string is shorter than the needle and prohibit applying the standard way of making a knot.

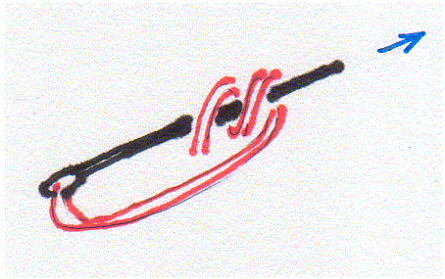
(b) Task statement: Devise methods for fixing the string left shorter than the needle.

(c) Sketch:



(d) Plausible root causes:

The standard way of making a knot is applicable only when the string left is longer than the needle.



(e) Minimum set of relevant objects ('things'):

Cloths, string (already sewn), string (left), the needle

Problem Analysis (1): Understanding the present system

(1) Functional analysis:

What is the function of the Needle in the standard method?

Question: What is the role of the Needle?
How the Needle is used to arrange the string in some special positions? What are the positions of the string?
---> Express them in words!

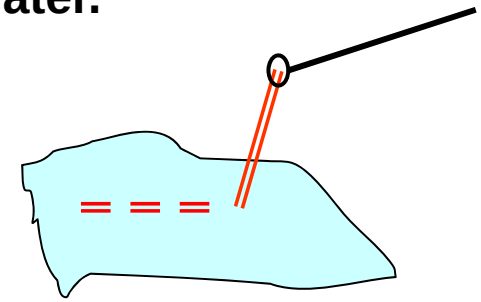
A base for making a loop of the string;
A guide for passing the end of the string through the loop

Problem Analysis (1): Understanding the present system

(2) Attribute (Property) analysis:

Properties assumed naturally (or taken for granted)

The string does not expand. = Its length (left length) does not change.
The needle is hard. = No change in shape and length of the needle.
The needle is thin. = The hole of the needle is small.
= Difficult to release the string from the needle and set it in the hole again later.



These properties taken for granted form the 'Constraints' of the problem.
When any of these constraints is lifted/relaesed, there appears a novel solution.

Question : Suppose any assumption of the above properties is lifted, think of (or imagine) ideas of making a knot with using such an advantage.

Problem Analysis (1): Understanding the present system

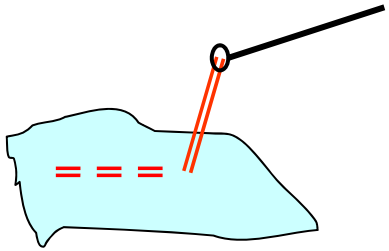
(3) Understanding the characteristics in time:

Think of the (full) processes of sewing:

Solutions at the final stage, and

Solutions at any earlier stage.

(4) Understanding the characteristics in space:



A knot makes the string 'thick' suddenly at the end.

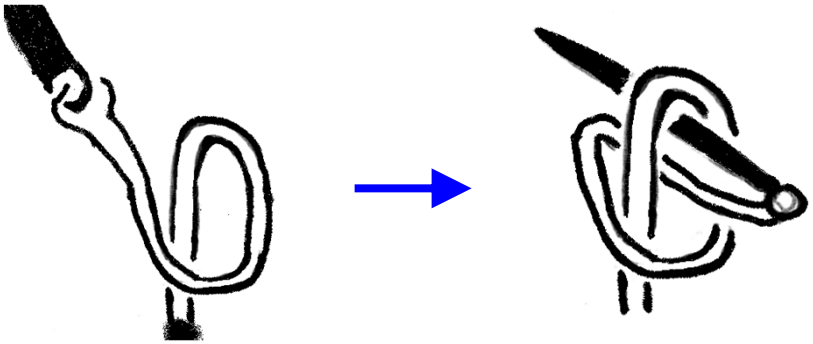
Watch out about the topology in making a knot and in the 'hole and string' .

'A needle with a slit at the hole'
(a commercial product)

The string can be passed and removed
without cutting the loop of the string

Problem Analysis (1): Understanding the present system

(5) Survey known solutions:



A well-known technique.

Difficult to make the loop of string in the space;
Need some practices

Problem Analysis (2) : Understanding the Ideal system

Ideal arrangement of the sting in space for making a knot

It should be nice if we could hold the string in this arrangement in the space.

Question : What the string in the above figure want to tell? Express it in words.

Think of desirable behavior and desirable properties.

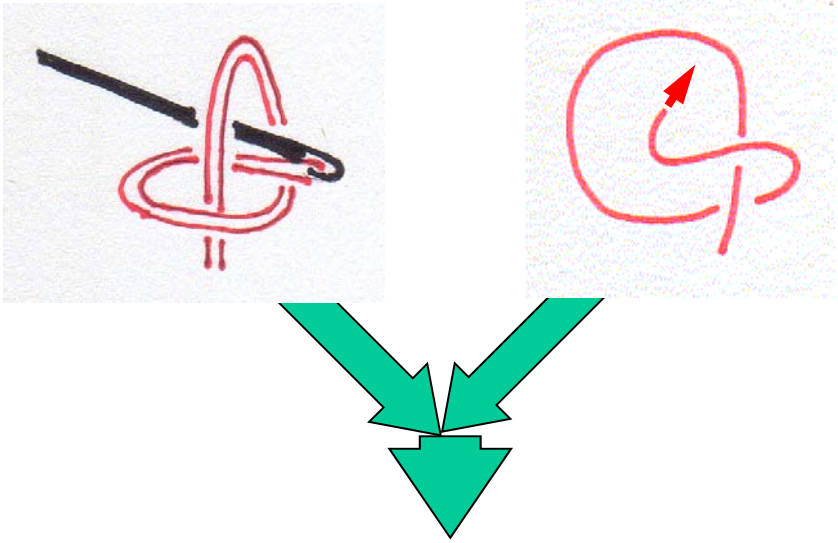
Up to here is the preparation stage (Analysis stage).

==> Then next, we start to generate ideas.

Solution Generation:

Generate Ideas and Construct Solutions

A known technique



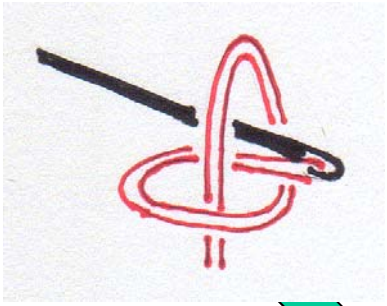
An image of Ideal situation

Question : The above two figures are similar in the string arrangement.

Can't you think of any solution idea ?

Solution Generation:
Generate Ideas and Construct Solutions

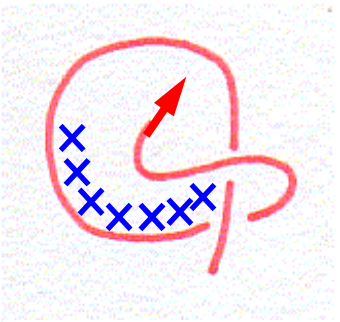
A known technique



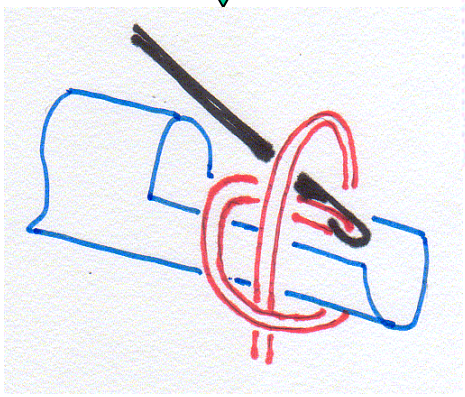
An image of Ideal situation

To support the string at the position of the Ideal arrangement.

Using the image of Ideal situation as a guide, try to improve the present system.



× marks:
Particles in the USIT method.



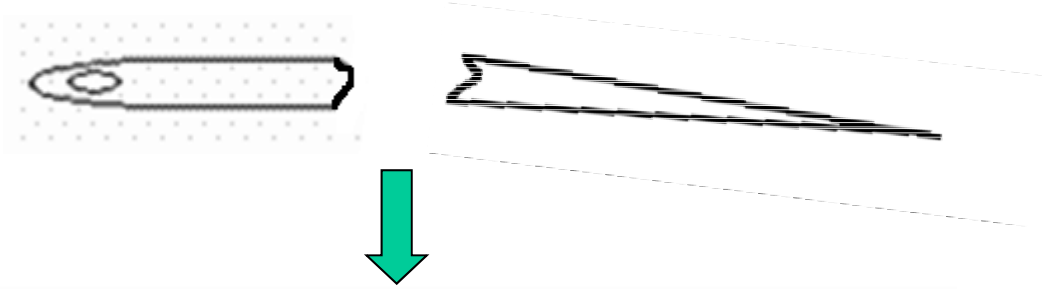
A novel tool made of a straw

Solution Generation:

Generate Ideas and Construct Solutions

A ridiculous idea:

Let's break the needle !



Let's install a screw in the needle.

We now realize that at this stage of sewing:

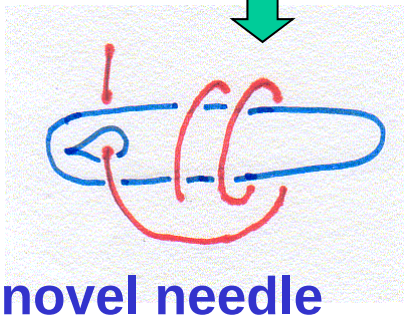
We do not need the needle point any longer and we just need the latter half of the needle.

Question: So, what kind of things do we need?
Draw a sketch of your ideas.
Try to improve them.

Solution Generation:

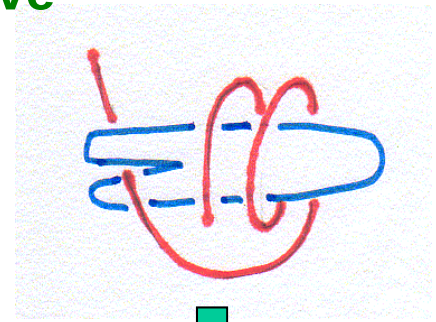
Generate Ideas and Construct Solutions

A ridiculous idea

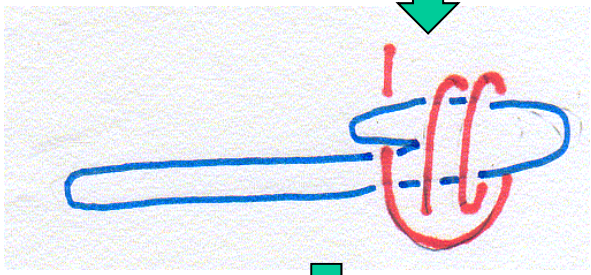


A novel needle specialized for making a knot

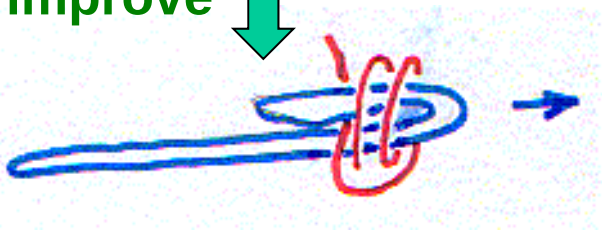
improve



improve



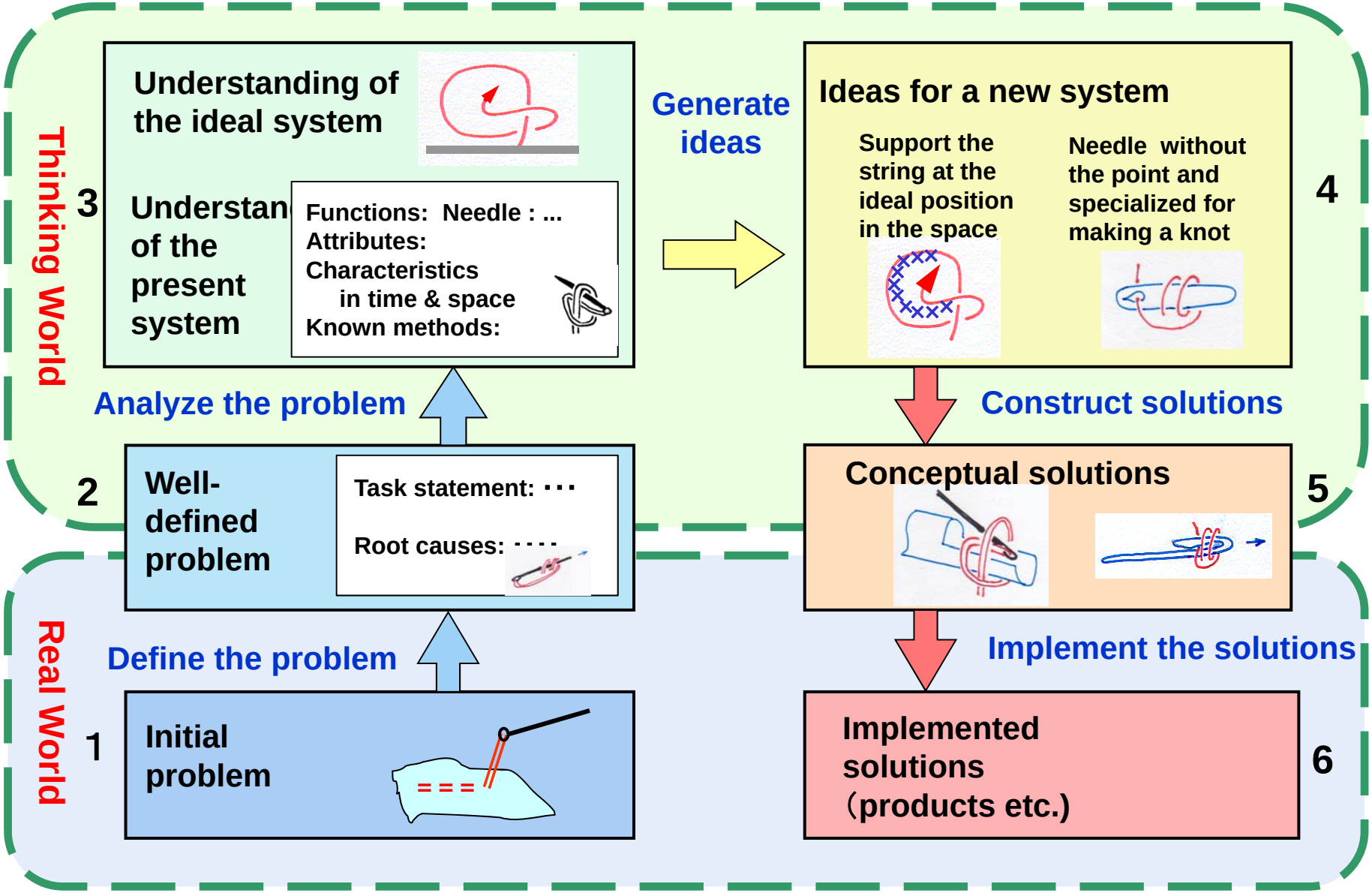
improve



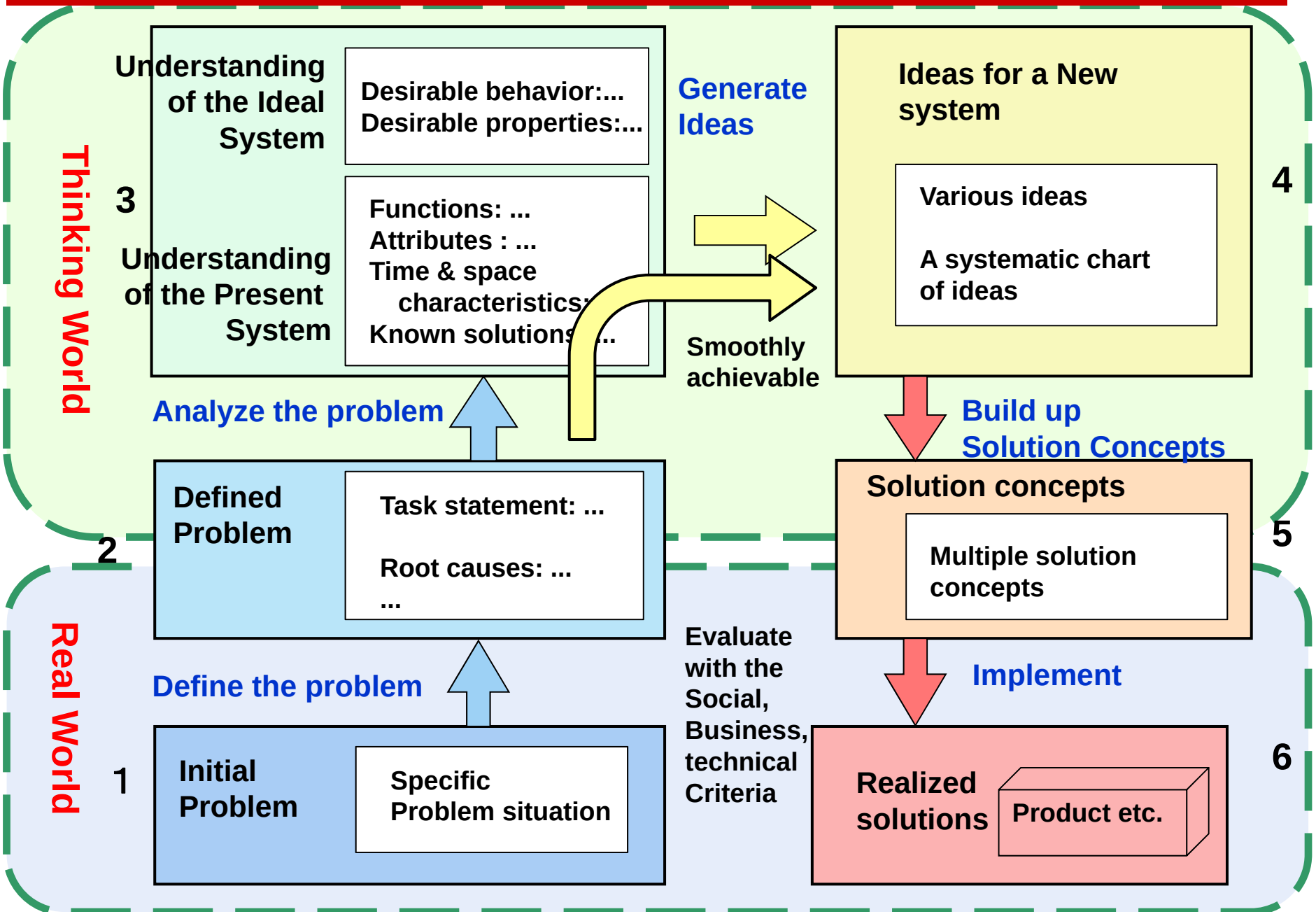
A hairpin like tool specialized for making a knot

Case study expressed in the Six-Box Scheme: How to fix the string shorter than the needle

T. Shimoda and T. Nakagawa (2006)



'Six-Box Scheme' = A New Paradigm of Creative Problem Solving



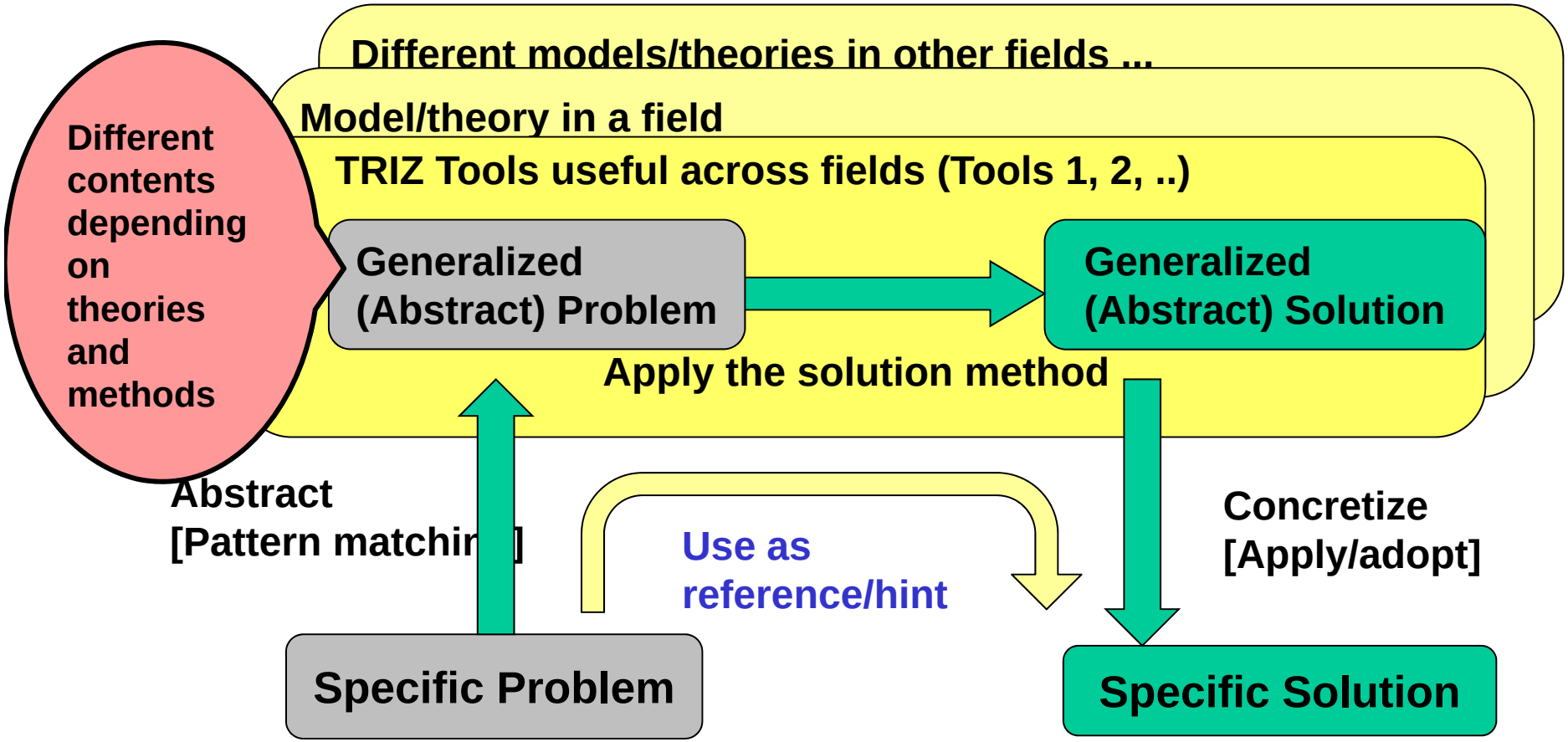
Basic Scheme of Problem Solving: Conventional: 'Four-Box Scheme'

Generally Understood in Science & Technology

Study multiple relevant fields for use.

Tools developed by TRIZ:

Multiple tools useful across various fields



In real problem situations, address with a specific problem to solve

Apply the solution to the real world and implement into product/process etc.

Concluding Remarks:

Today's talk is based on the research of:

TRIZ ==> USIT ==> CrePS (General Methodology of Creative Problem Solving)

These studies have revealed that

Creative problem solving can be achieved

(without depending on 'big jumps by virtue of enlightenments')

by many relatively smaller jumps

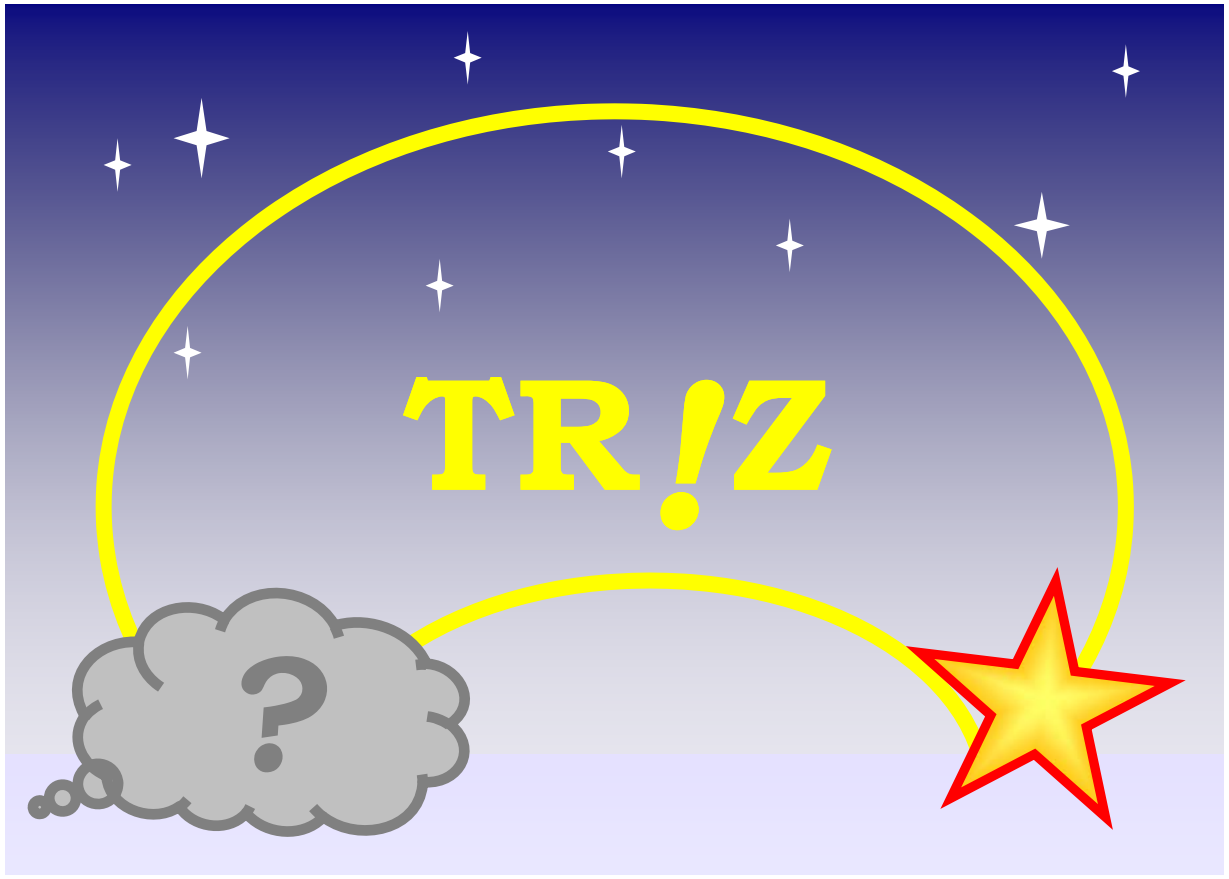
as the results of a systematic process of analysis and thinking

Addressing with various problems and solving them creatively

is a pleasant and useful work;

in studies, in everyday life, in the jobs, in society, etc.

I wish you to learn and master such a way of thinking creatively !



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