

*The Second TRIZ Symposium in Japan  
Held by the Collaborative Board of  
TRIZ Promoters and Users in Japan  
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## A New Paradigm of Creative Problem Solving (3) Usage and Significance of the Six-Box Scheme in USIT

**Toru Nakagawa**  
(Osaka Gakuin Univ., Japan)

<http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/>

*The Second TRIZ Symposium in Japan  
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## Outline of Talk

We reconsider the fundamental scheme for Creative Problem Solving.

The Four-Box Scheme has been recommended widely:

Abstract the problem, Solve it in a model space, and

Concretize it into a solution.

However, no further general description is given, and hence this often leads to (enforced) analogical thinking with hints from KBs.

We have constructed the Six-Box Scheme

by clarifying necessary information in every stage of problem solving.

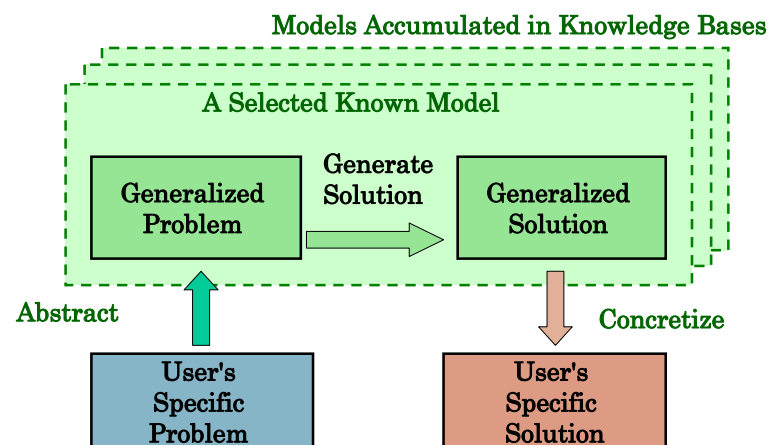
It gives A New Paradigm for Creative Problem Solving.

The scheme can be performed smoothly with USIT.

Two case studies of creatively solving everyday-life problem:

- (a) How to fix a string shorter than the needle at the end of sewing
- (b) A system for preventing from our leaving things behind.

## Traditional Paradigm of Problem Solving Basic Scheme in TRIZ == in Science and Technology



Many models ==> How can we select one? How to abstract?

## TRIZ in the traditional way: [Mann's textbook as well]

Principal Models for Solution Generation request their own analysis methods (for abstraction):

- |                                 |   |                      |
|---------------------------------|---|----------------------|
| Contradiction Matrix            | ➡ | Inventive Principles |
| Su-Field analysis               | ➡ | Inventive Standards  |
| ARIZ (for Phys. Contradictions) | ➡ | Separation Principle |
| ---                             | ➡ | Trends of Evolution  |

Separate analysis methods provide insufficient and narrow understanding of the problem.

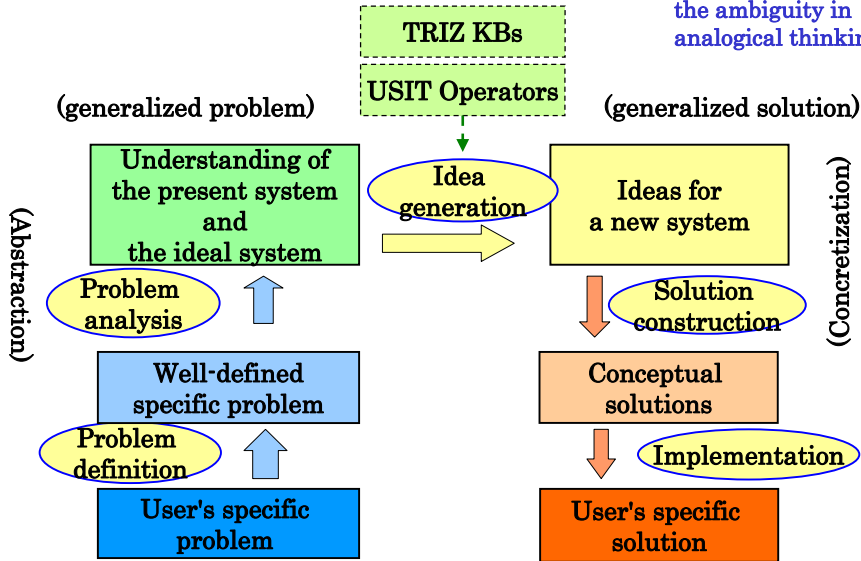
➡ The solution process is confusing and not effective enough.  
Difficulty in learning the overall process of TRIZ.

The lack of a clear overall structure in TRIZ is the root cause of the "TRIZ slow-penetration problem".

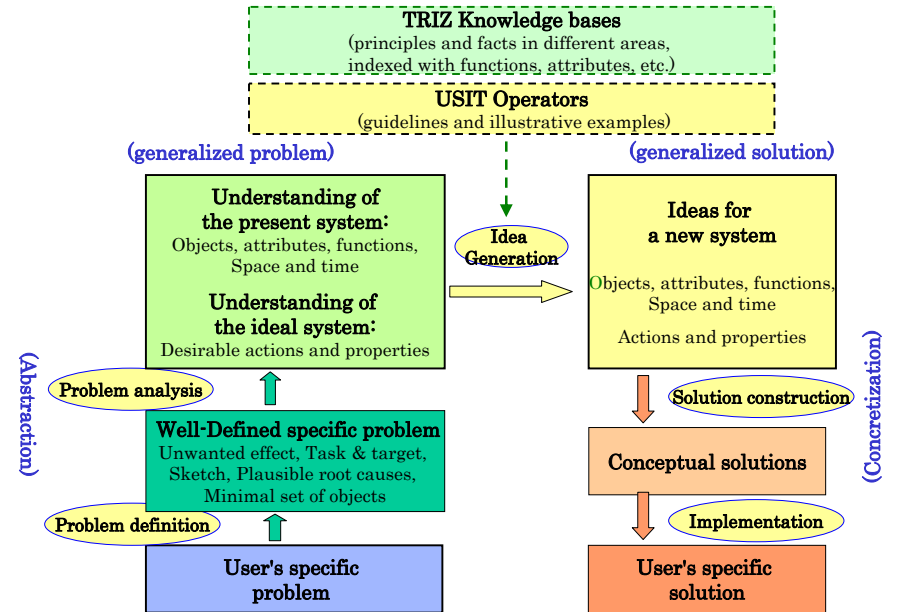
# A New Paradigm for Creative Problem Solving

## Six-Box Scheme in USIT

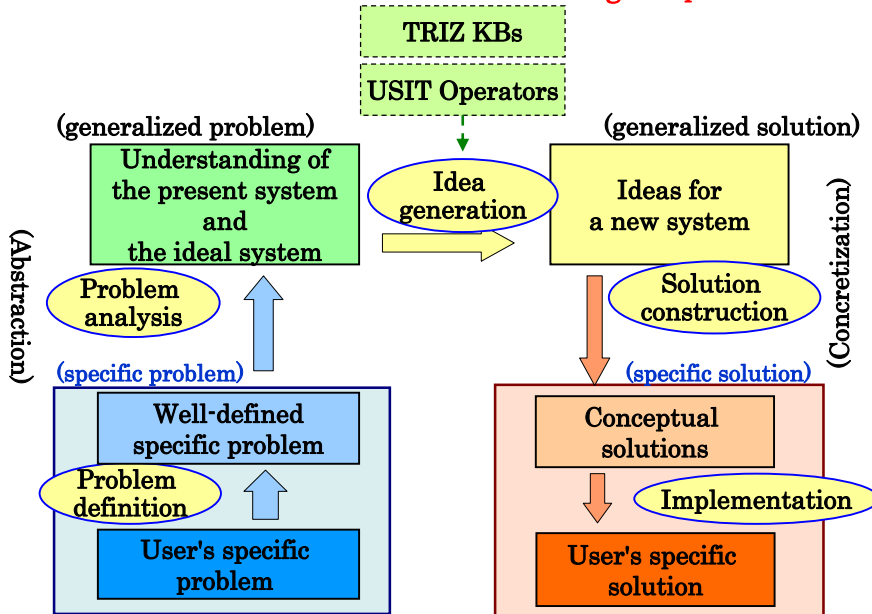
We have overcome the ambiguity in analogical thinking.



# Overall Structure of Problem Solving in USIT

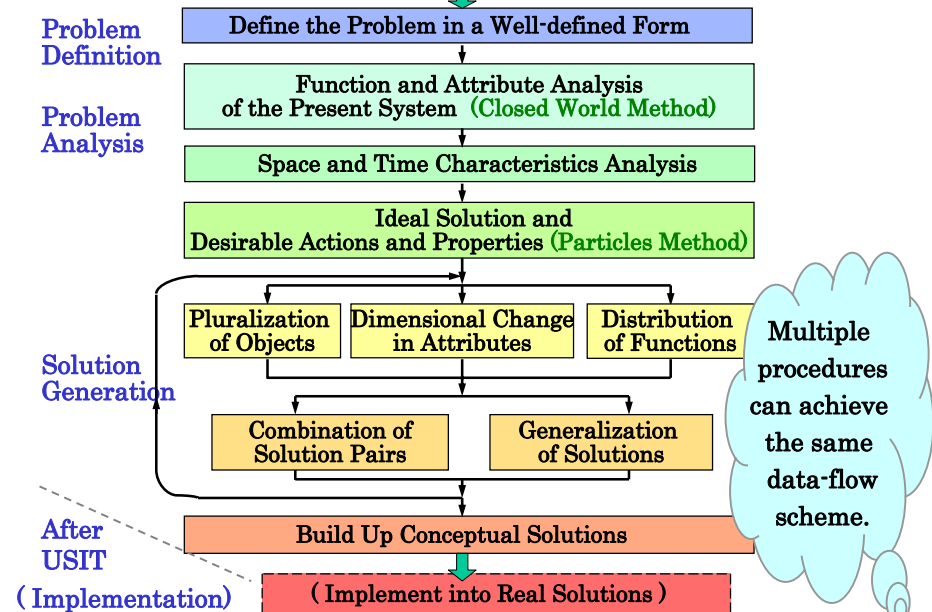


# 6-Box Scheme of Creative Problem Solving : Implication(1)



# USIT Procedure [Flowchart]

[T. Nakagawa, Mar. 2005]

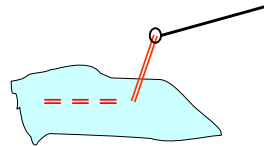


## Everyday-life Case Study: How to fix a string shorter than the needle at the end of sewing

### 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:

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

## Problem Analysis (1): Understanding the present system

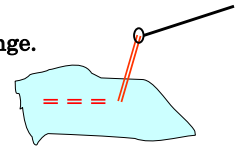
### (1) Functional analysis: What is the function of the Needle?

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



### (2) Attribute analysis: Properties taken granted form the Constraints:

- The string does not expand = Its length does not change.
- The needle is hard = No change in shape and length.
- The needle is thin = The hole is small
- = Difficult to pass the string through the hole.



When any of these constraints is lifted, there appears a novel solution.

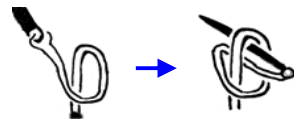
### (3) Analysis of time characteristics: Processes of sewing:

Solutions at the final stage and solutions at any earlier stage.

### (4) Analysis of space characteristics: A knot makes the string thick at the end.

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

## Several known solutions:



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



The hole of the needle has a slit, thus the string can be passed and removed without cutting the loop of the string. (a commercial product)

## Problem Analysis (2): Understanding the Ideal system

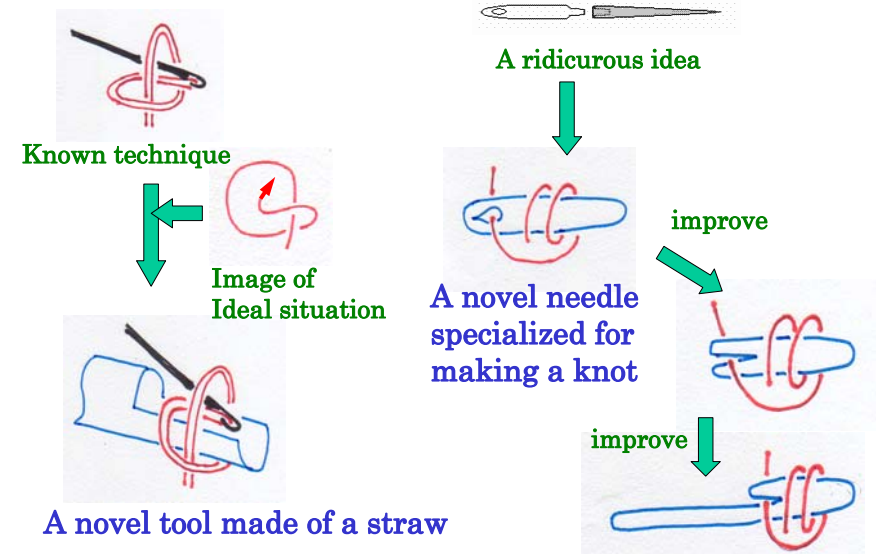
Ideal arrangement of a sting in space for making a knot



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

## Solution Generation:

### Generate Ideas and Construct Solutions



## A System for Preventing from Our Leaving Things Behind

Define the Problem (after some discussions) :

(a) Unwanted effect:

We happen to leave our things behind and get them lost.

(b) Task statement:

Devise a system for avoiding and preventing from our leaving things behind.

(c) Sketch:

'Scenario' (processes along the time)

get on a train --> put a bag on a shelf -->

.. --> stand up the seat

--> get off the train leaving the bag behind

(d) Plausible root causes:

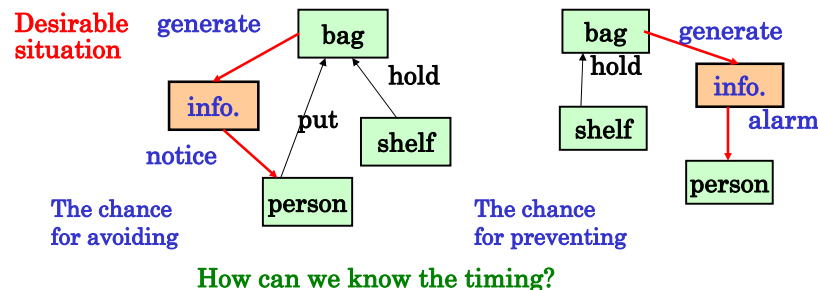
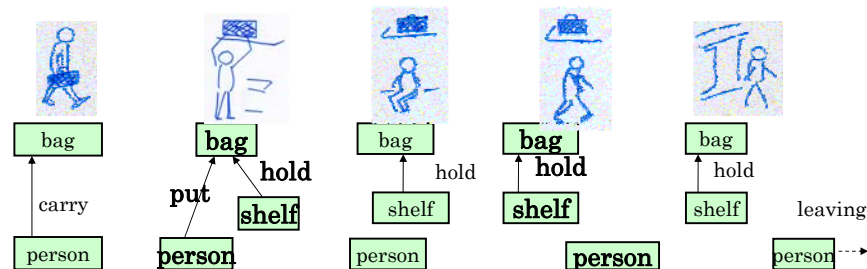
Not able to recall it at the timing necessary to do

(e) Minimum set of relevant objects:

The person, the thing, and the place

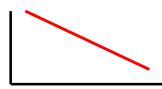


## Analysis of the Present System: Functional Analysis (along the Time)



## Analysis of the Present System: Attribute Analysis

likelihood of leaving a thing behind



**The thing:** Troublesome to carry, Becoming unnecessary.

Large, Remarkable, Bright color, Carrying around always,

**Person:** Busy, In a hurry, Tired, Sleepy, Careless, Thinking something else, Reading a book

Expensive, Important Careful always, Awake

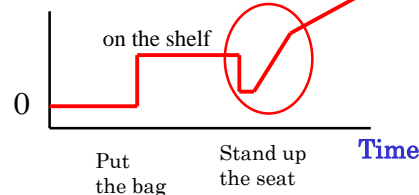
**The place: Environment:**

## Analysis of Space Characteristics



less likely  
more likely

Distance between the bag and the person



## Analysis of the Ideal Situation (Particles Method)

Present situation

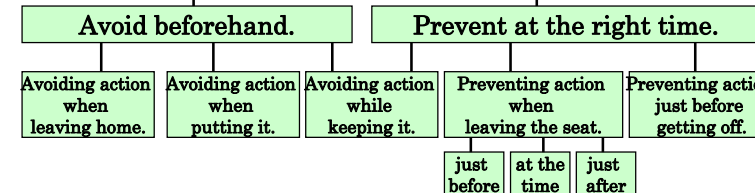


Ideal situation









× ×  
"Particles"

(Particles) Avoid and prevent from our leaving things behind.




Consciousness of the person, Action onto the person, Desirable action of the things

## Solution Generation: (1) Generate Solution Ideas

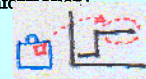



	<b>Functions to be performed by the objects close to the person</b>	<b>Functions of the baggages</b>
<b>Form (Size, shape)</b>	 <p>Objects attached in the brain, on the head, on the glasses, on the wrist, in the pocket, etc.</p>	 <p>Small tags and sheets attachable to the bag, umbrella, etc.</p>
<b>Sensing function (and Input)</b>	<p>To measure the time. <b>To measure the distance</b> between the person and the tags on the baggage (with supersonic wave or radio wave).</p>	<p>To locate the position of the baggage relative to the person. To locate the absolute position of the baggage (e.g., with GPS). To recognize that the baggage is now carried. To recognize the person's motion with an accelerometer.</p>
<b>Processing function</b>	<p>To calculate the distance between the person and the baggage. Memory of time, distance, etc.</p>	<p><b>To distinguish the signal of one's baggage from that of others'.</b> To match the timing of the objects' sensors with the system. Capability of communication.</p>
<b>Decision function</b>	<p><b>To judge that the baggage is put at a place (by using the distance information)</b></p> 	<p><b>To judge that the person is standing up for leaving.</b></p> 
<b>Output function</b>	<p><b>To alarm with a sound getting louder.</b> To notice with a light,</p> 	<p><b>To judge that the person is now carrying the baggage.</b></p>  <p>To alarm with a sound, or with the light emission from the tags on the baggage.</p>

## Solution Generation : (2) Building Conceptual Solution

**Output of the System**

<p>Ring the mobile phone and display a message.</p>	<p>Alarm with a sound, with a light, with an electric pulse, with a vibration,</p>	 <p>Objects attached in the brain, on the head, on the ear, on the glasses, on the wrist, in the pocket, etc.</p>	<p>Show an image of the bag in the person's view. When carrying the bag, reset it.</p>
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<p><b>Measuring</b></p> <p>Measure the time.</p> <p>Measure the distance between the person and the bag (with a tag) (with supersonic wave or radio wave).</p> <p>Send and receive signals (supersonic or radio wave)</p>	<p><b>Judging and Processing</b></p> <p>Judge that the bag is put at a place (with the distance information)</p>  <p>Recognize the person's motion (with an accelerometer)</p> <p>Distinguish the signal of one's own bag from that of others'.</p>	<p>Judge that the person standing up for leaving.</p>  <p>Judge that the person is now carrying the bag.</p> 	<p><b>Additional Functions</b></p> <p>Set the ID's of my own bags</p> 
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<p><b>Output of the Bag Tag</b></p> <p>Receive and send signals</p> <p>Information of ID</p>	<p>Display information (on the bag)</p> <p>Illuminate for alarming</p>	<p>A reset switch at the handle of the bag.</p>
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## Six-Box Scheme of Creative Problem Solving (in USIT)

