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A New Paradigm of Creative Problem Solving: Six-Box Scheme in USIT

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Outline of Talk

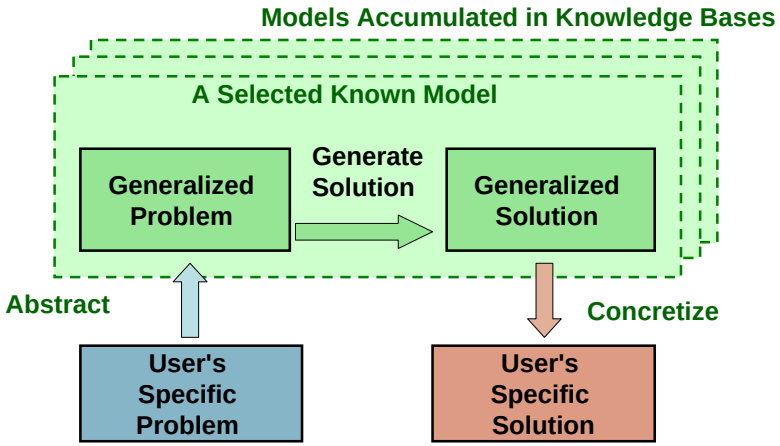
We have reconsidered the Basic scheme for Creative Problem Solving.

The **Four-Box Scheme** has been recommended so far:
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.

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.

The **New Paradigm with USIT** is compared with
the old one with traditional TRIZ.

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".

The keys to solve this difficulty in TRIZ were

- Simplifying & unifying the procedure (into USIT) in the flowchart.

- Describing the whole procedure in the data-flow diagram.

Flowcharts (or process-flow diagrams) show
the processes in the boxes and their processing order with arrows.
The information required/produced is often not described.

Data-flow diagrams show
the information required (inputs) and produced (intermediates/outputs).
The processes of converting the information are shown by arrows.

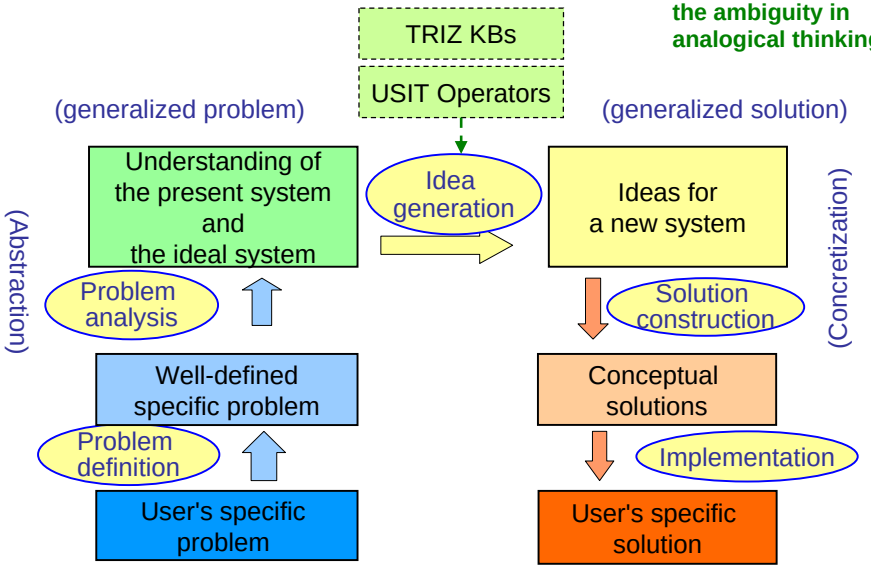
It is well known in information science that
the data-flow representations are often more basic and stable
than the process-flow representations.

The data-flow diagram of USIT resulted in a Six-Box Scheme
and is found to be 'A New Paradigm of Creative Problem Solving'

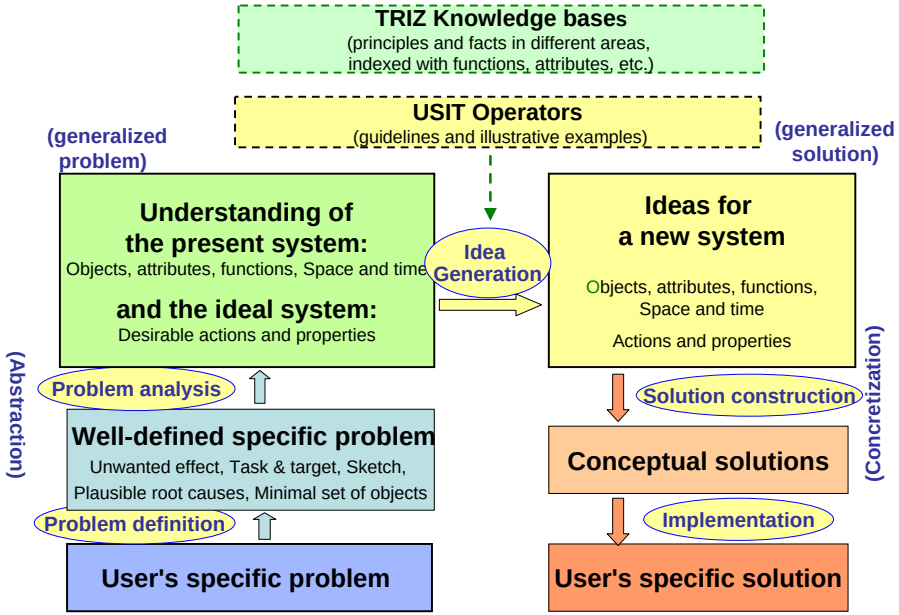
A New Paradigm for Creative Problem Solving

Six-Box Scheme in USIT

We have overcome the ambiguity in analogical thinking.

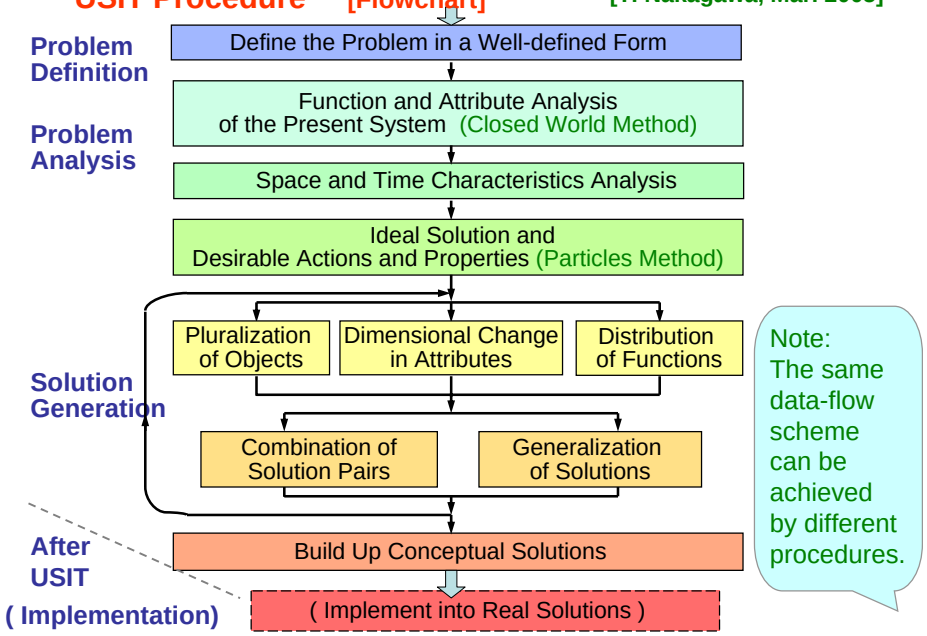


Six-Box Scheme of Creative Problem Solving with USIT



USIT Procedure [Flowchart]

[T. Nakagawa, Mar. 2005]

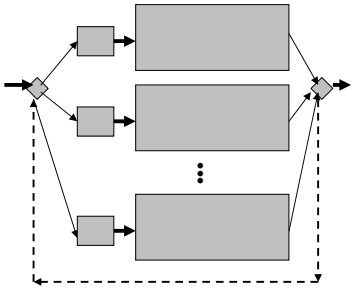


Comparisons (1) Procedure

TRIZ Traditional:

several sets of (analysis-solution) methods
with huge knowledge bases

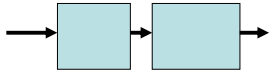
Apply one set, and, if failed, try another.
==> partial understanding of the problem



New paradigm with USIT:

A standard set of analysis and solution methods

Apply always the standard set



==> Full understanding of the problem

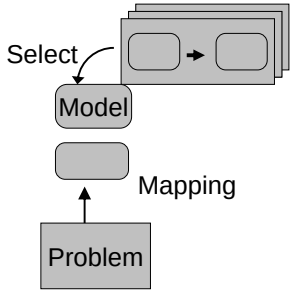
Comparisons (1A) Analysis/Modeling

This slide was added afterward on Oct. 28, 2006

TRIZ Traditional:

A known Model is selected
from Knowledge Base
intuitively or with trial-and-error

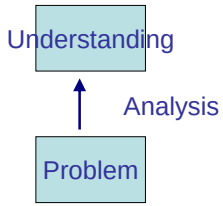
Real Problem is mapped onto the Model
on the basis of intuitive similarlity



New paradigm with USIT:

A real Problem is well defined, and then
analyzed in the standard terms
by using standard way of analysis

The way of Abstraction is standardized and
used consistently for any problem.

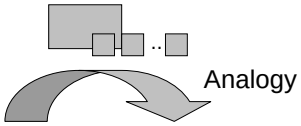


Comparisons (2) Idea generation

TRIZ Traditional:

Presenting a few (Inventive) Principles
together with application examples

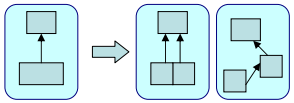
==> (Enforce) analogical thinking



New Paradigm with USIT:

(In theory)

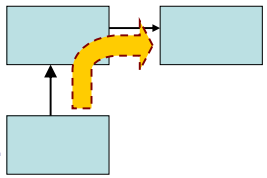
Apply USIT Operators
one after another
in the abstract level



(In practice)

Already generated in the brain during the analysis stage

List them up and build into a tree structure.
(Can be done smoothly)

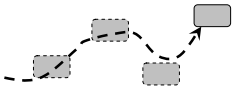


Comparisons (3) Solution space

TRIZ Traditional:

Seeks for one best inventive solution

without seeing the whole solution space

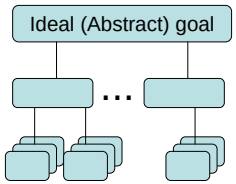


New Paradigm with USIT:

Build up a map of solution space.

In the analysis stage (Particles Method)
A tree diagram of desirable actions

In the idea generation and solution building stages
(Solution Generalization Method (a USIT Operator))
A hierarchical system of possible solutions

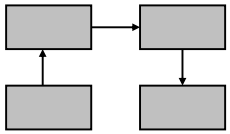


==> **Multiple solutions, practical and inventive**

Comparisons (4) Relation to the Real World

TRIZ Traditional:

Not clearly stated

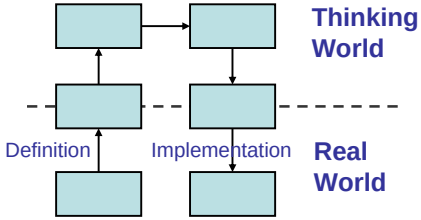


New Paradigm with USIT:

Problem Definition in the Real World

Analysis and Conceptual Solutions
in the Thinking World

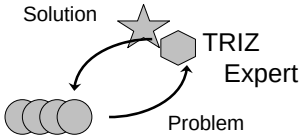
Implementing a specific solution
in the Real World



Comparisons (5) Ideal expert

TRIZ Traditional:

an almighty inventor
an almighty contract researcher
in any technology field

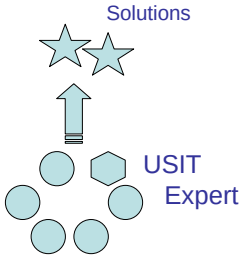


New Paradigm with USIT:

a guiding assistant of engineers
to help engineers think and solve

work together with engineers in any field

can achieve much more
than he/she can do alone
and than the engineers can do without USIT.



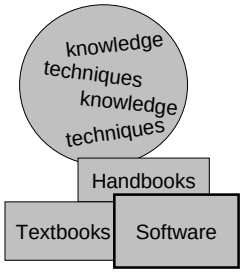
==> practical and suitable for wider penetration

Comparisons (6) Basis of Capability

TRIZ Traditional:

Huge accumulation of techniques and knowledge

Handbooks and software tools are indispensable.

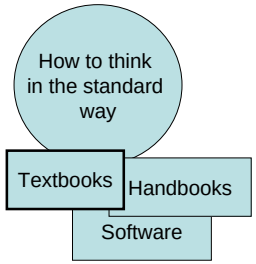


New Paradigm with USIT:

Understanding how to think
in the standard methods
of problem solving

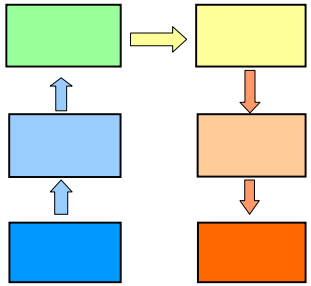
Need to be trained in group practices.

Handbooks and software tools
are only a part of supporting tools.



Conclusion

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



The Scheme clarifies
what types of information are required
for every stage of problem solving.

This solves a fundamental problem
in TRIZ (i.e. the lack of clear overall structure).

USIT is a practical procedure
for performing the Six-Box Scheme.