Classical TRIZ and OTSM applied scientific theories

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Content

- Motivation
- Structure of an applied scientific theory
- Why OTSM has a Fractal Model of a problem solving process
- OTSM Network of problems

Motivation

What was happening 27 years ago and why we need it now

Years 1979-80: is it a theory?

- My first acquaintance with TRIZ: good technique, but why the word THEORY in its name?
- What is a theory? What is a scientific theory? What is an applied scientific theory? Encyclopedias, dictionaries, discussion in journals, conferences with colleagues and opponents.
- Conclusion:
  There is not clear and commonly recognized definition of what is an applied scientific theory.
- To study and understand TRIZ deeper I need my own definitions based on the research was done in literature
- Plus direct communication with the Author and his manuscripts.

Why definition could be useful

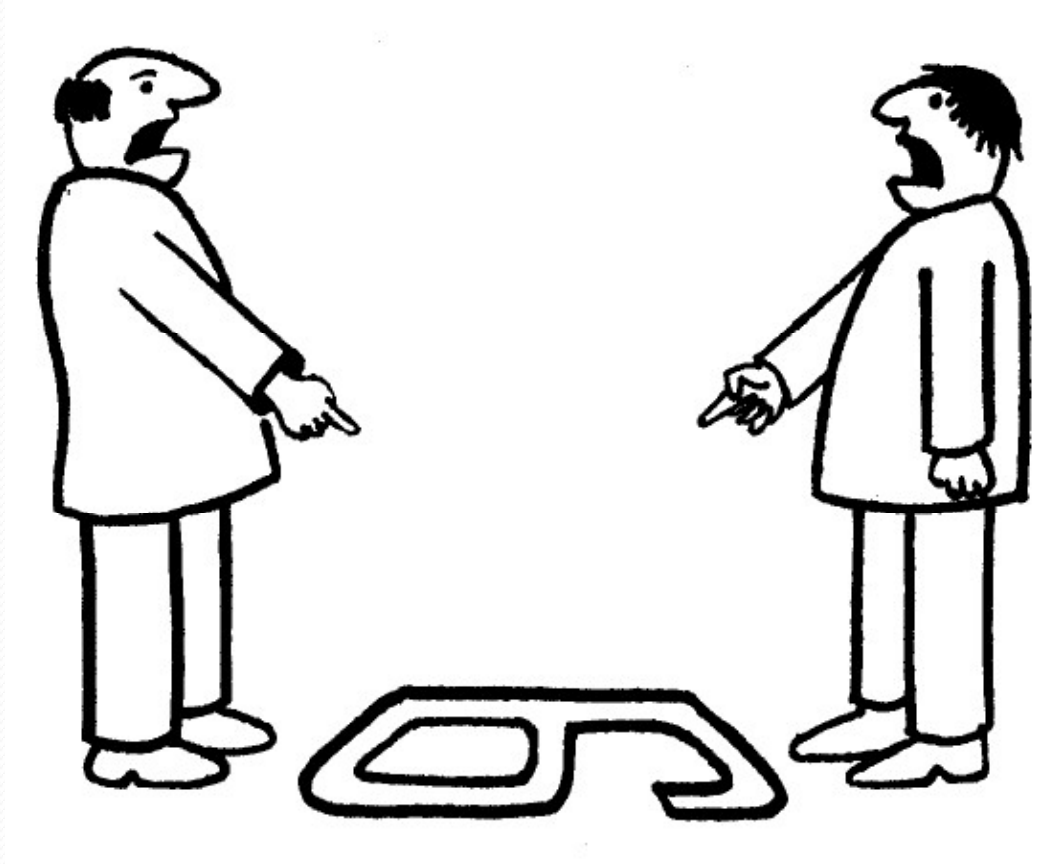
- Contradiction: Definition usually helpful to understand deeply the subject to be studied and communication about it. But each word create mental inertia and misinterpretation that prevent good communication and isolate subject form other world.
- Definition should be clear and should be fuzzy in order to study and communicate efficiently.
- One of TRIZ typical Solution - Dynamisation:
  Use Classical TRIZ **SYSTEM OPERATOR (SO)**:
  - **ZOOM IN:** to make specific clear but general fuzzy.
  - **ZOOM OUT:** to make general clear but specificity fuzzy.

System Operator (SO) - Multi Screen schema of powerful thinking

- SO is a dynamic instrument to study certain subject in, - at least, - three dimensions:
  - Various **Hierarchy** Schemas (Sub-Dimensions) to study relationships between elements of the world.
  - Various **Time** Sub-Dimensions to study elements and their relationships as in the process of their changes in various processes (historical time, product life time, product working cycle etc.) with various speed, acceleration etc.
  - Various **Anti-systems** – Environment, Components, People etc. Anti-system is a source of conflicts and challenge, provoke evolution of any Elements of the world.

OTSM Axiom of models

Root-Cause of many
Disagreements



Everybody describe their perception about something from their own standing point.

Why today we have to study TRIZ and OTSM as a theories useful for practice but not just as set of various techniques?

- Stage of TRIZ evolution according G. Altshuller:
  - Technique for inventing new things and

  NON TYPICAL problem solving (40-50s)
  - Set of the techniques and **heuristics** (50-60s)
  - Algorithm of using the set of the techniques (60-70s)
  - **The Theory** for creating new techniques and algorithms (70-80s).
  - **The General Theory to manage complex interdisciplinary** problem solving process to achieve the Worthy Goal: Problem management of the whole interdisciplinary process instead of troubleshooting solving one by one some of most painful problems (started in 1974-1976 - … first draft 1997….).
    - Examples, complex interdisciplinary :
      - (1) Strategy for life (Strategy for individual);
      - (2) Sustainable Region Development (strategy for region);
      - (3) Company of Sustainable Innovation (Strategy for Business);
      - (4) Sustainable Research Center (Strategy for research organization); etc.

Structure of an applied scientific theory

Model of an applied scientific theory

How the model was used study Classical TRIZ and create OTSM (Russian Acronym proposed by G. Altshuller for further development of Classical TRIZ

Model of the structure of an applied scientific theory for study existing and create new ones.

- **A Key Problem** to be solved by the theory.
- **Key Assumptions** were done to solve the problem or to answer the Question – axioms, postulates, paradigms.
- **Key Models** that is used by the theory in order to create instruments for practical needs.
- **System of Instruments** that could be applied for practical needs and obtain satisfactory results.

Comments: Please keep in mind SO of Classical TRIZ and S-curve, as well as the Laws of system evolution. Theory evolve the same way. "Today" is just a single moment between "Past" and "Future".

Why a Non-Typical (Creative) Problem appear?

…The problems that exist in the world today

cannot be solved

by the level of thinking

that created them…

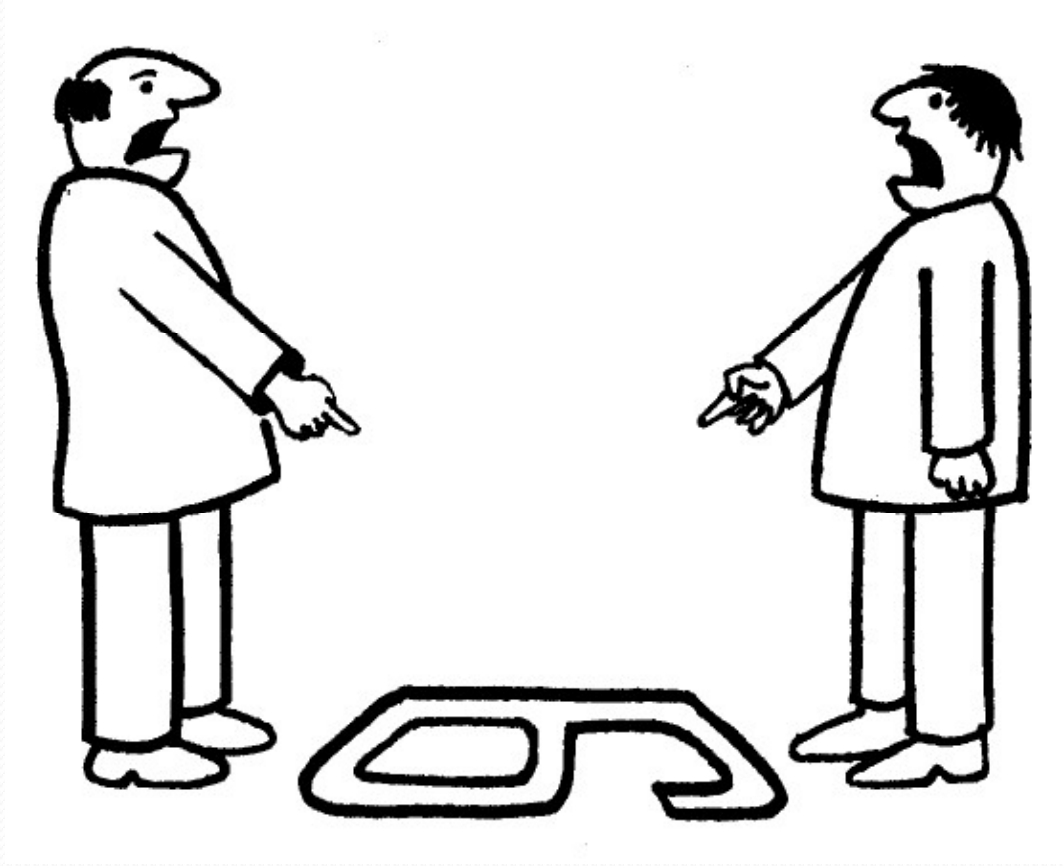
attributed to Albert Einstein

WANTED!

1. New thinking technology
for non typical problem solving process.
2. Dynamic self evolving mind is required
to survive in the world of accelerated rapid changes..

OTSM Axiom of models

Root-Cause of many
Disagreements



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Key Problems

Classical TRIZ

- How could be decreased an amount of useless trials and errors during solving non typical problem
  but
  not degrade quality of an obtained conceptual solution?

OTSM

- How should be organized domain free, universal instrument for problems solving that could be efficiently applied for various non typical problem situations to obtain useful for practice satisfactory solution that is useful for practice .
- The contradiction underlining the problem: Instrument should be general to be universal and should be specific to be useful for practice.

Key Assumptions

Classical TRIZ

- **Objective Laws** of engineering system evolution do exist and could be used for problem solving.
- **Contradiction** show the root of problem. It should be disclosed and resolved.
- **Specific Situation** provide us with recourses that should be used to solve a problem.

OTSM

- **Axiom of Models** are used during thinking process. Problem arise when typical, traditional models could not be used and should be changed.
- Group 1: Axioms on thinking process.
- Group 2: Axioms on World Vision

The assumptions come from research and study historical facts, as well as from study of using Instruments of Classical TRIZ and OTSM.

Key Models

Classical TRIZ

- **System Operator** instrument to describe components of a problem situation.
- **Classical TRIZ Model of Problem Solving Process** dedicated to develop and organize other problem solving instruments into whole system efficient for solving problem and develop thinking skills further.
  - "Tongs" Model
  - "Hill" model
  - "Parallel" model

OTSM

- **ENV Fractal model** is a tool to describe components of a problem situation and *harmonize* relationships between various instruments for problem solving: ENV – Element, Name of property, Value of the property.
- **OTSM Fractal Model of Problem Solving Process** dedicated to manage a problem solving process and harmonize application of various (not only TRIZ based) instruments .

The Key Instruments

Classical TRIZ

- **For Typical Problems:**
  - Standards
  - Pointers of Effects
  - Mechanisms of Convergence
  - And may other techniques. Some of them described briefly in the book TRIZ: History of the instruments by Natalia and Alexander Narbut. (see www.jlproj.org)
- **For Non Typical Problems:**
  - ARIZ

OTSM

- **For small Problem situations (dozen of sub-problems):**
  - New Problem Technology
  - Typical Solution Technology
  - Contradiction Technology
  - Problem flow Technology
- **For complex problems (hundreds sub-problems)**
  - Problem Flow Networks Approach
    - Network of problems
    - Network of Contradictions (!!!!)
    - Network of Parameters (specific)
    - Network of parameters (general)

OTSM-TRIZ toolbox is an “Intellectual Lego”.
It gives user new level of creativity and degree of freedom

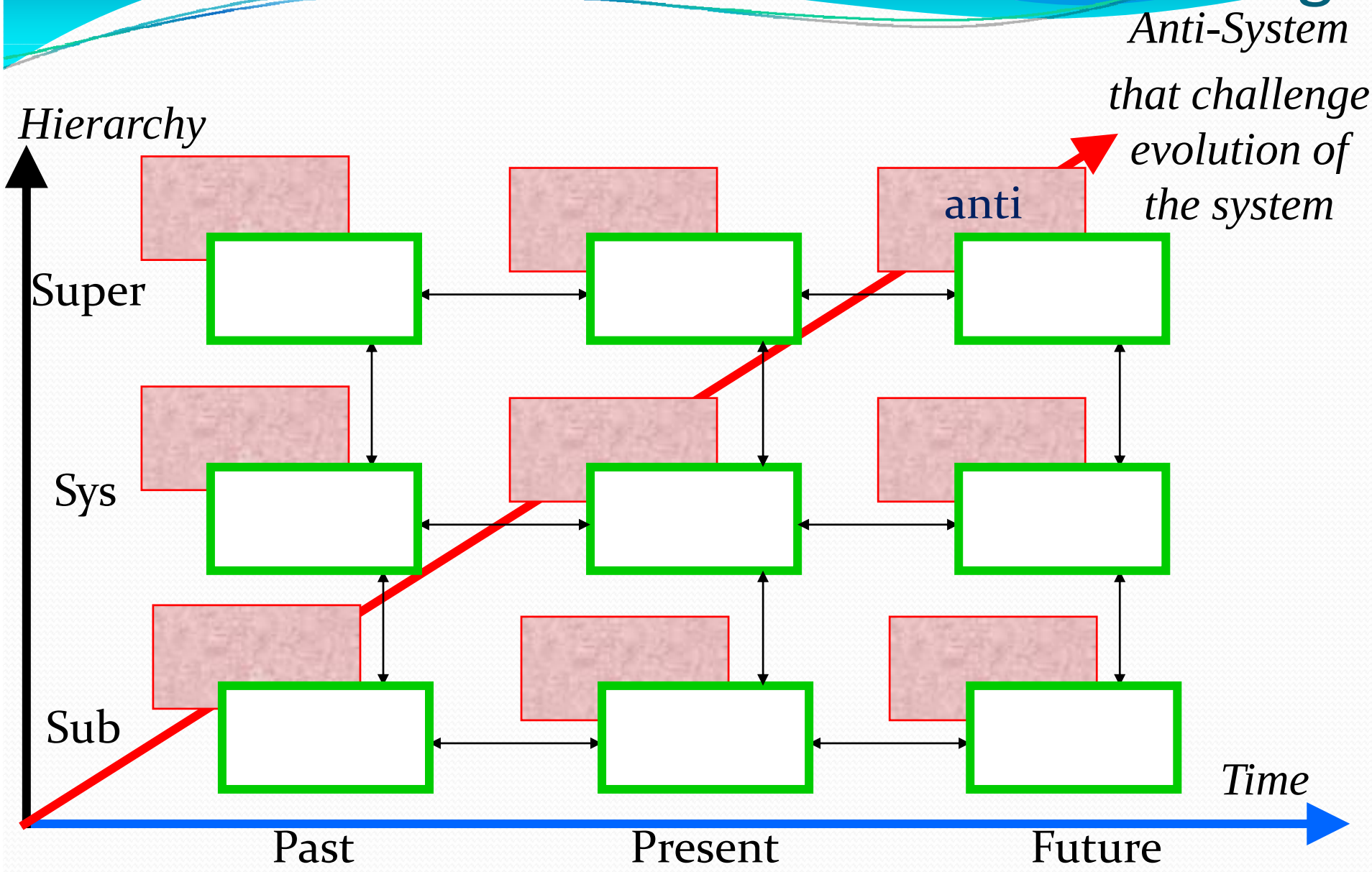
Why OTSM has a Fractal Model of a problem solving process?

1. ARIZ – the key instrument of Classical TRIZ.
2. Evolution of Classical TRIZ model of problem solving process.
3. OTSM Fractal model of problem solving process.
4. OTSM based Problem Flow Networks approach – the key instrument of OTSM.

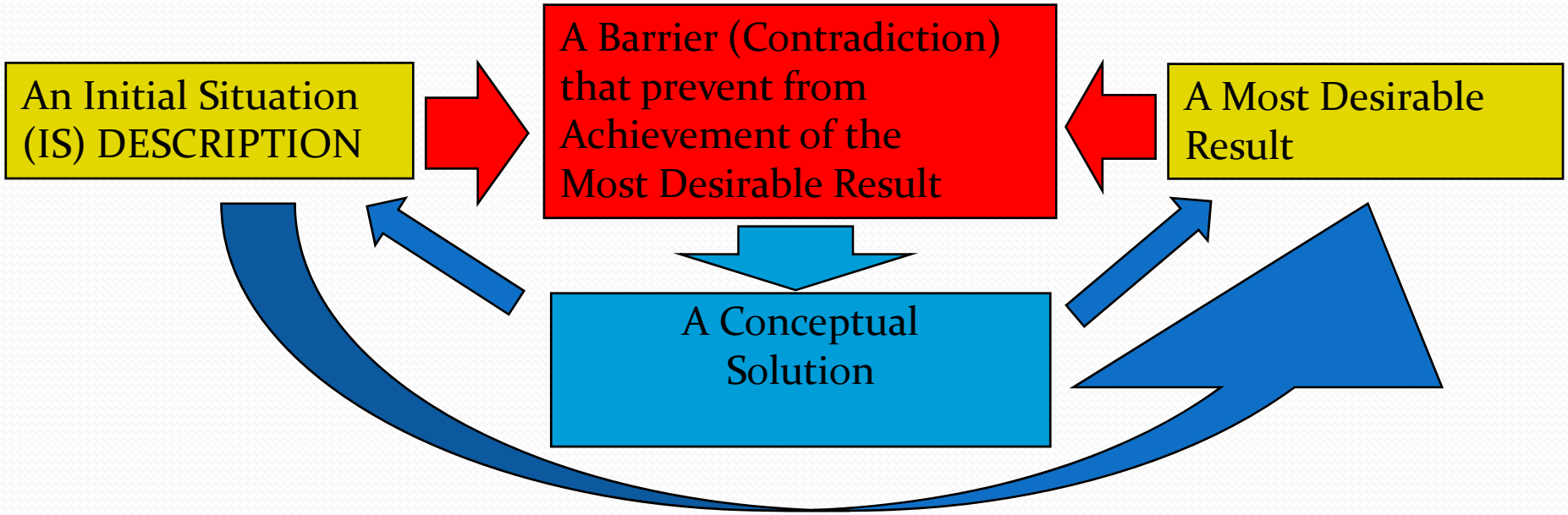
ARIZ is a multi-screen schema of powerful thinking presented as a line….

G. Altshuller

Classical TRIZ Schema of Powerful Thinking

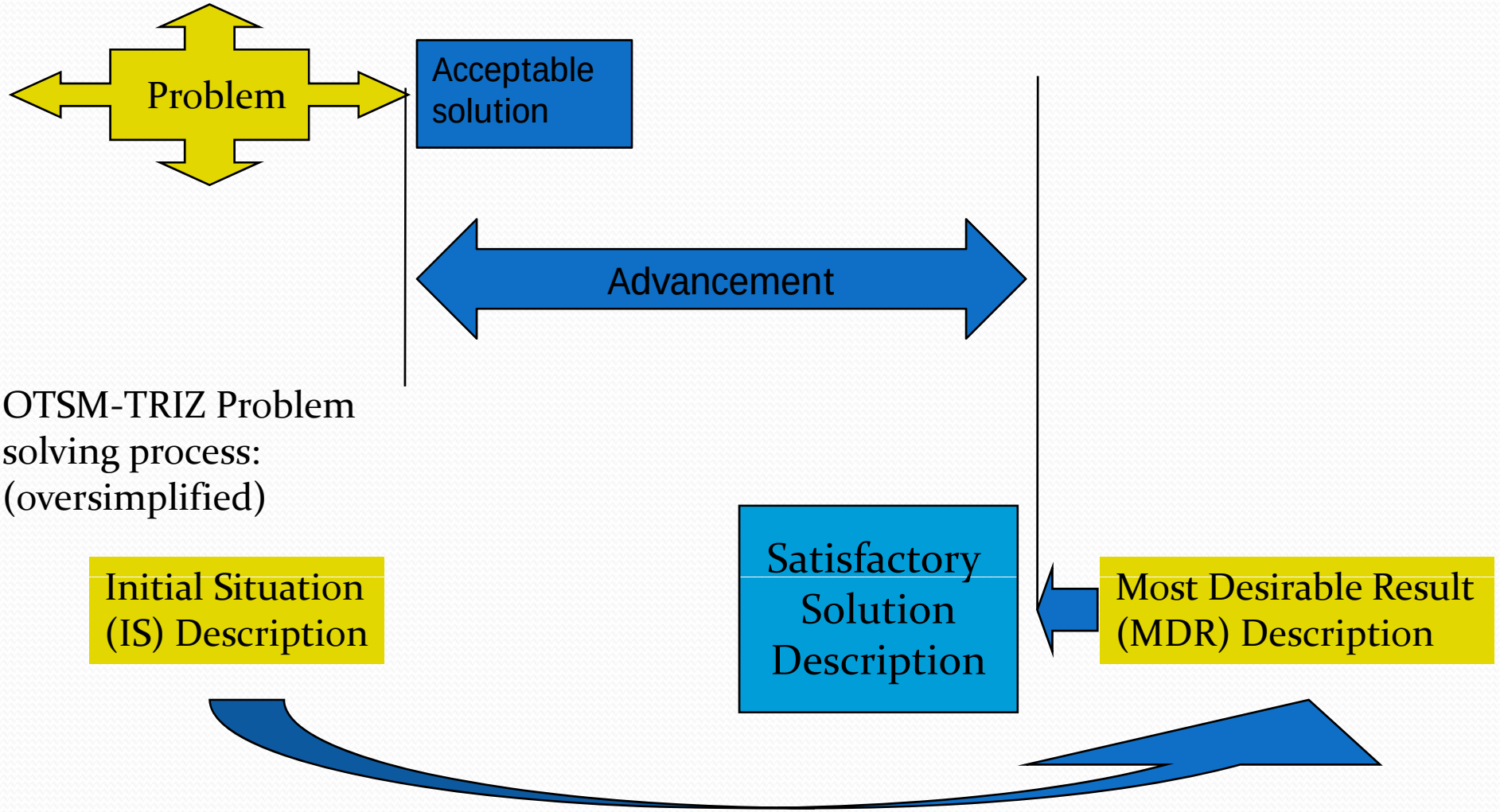


Classical TRIZ Problem Solving Process: "Tongs" Model



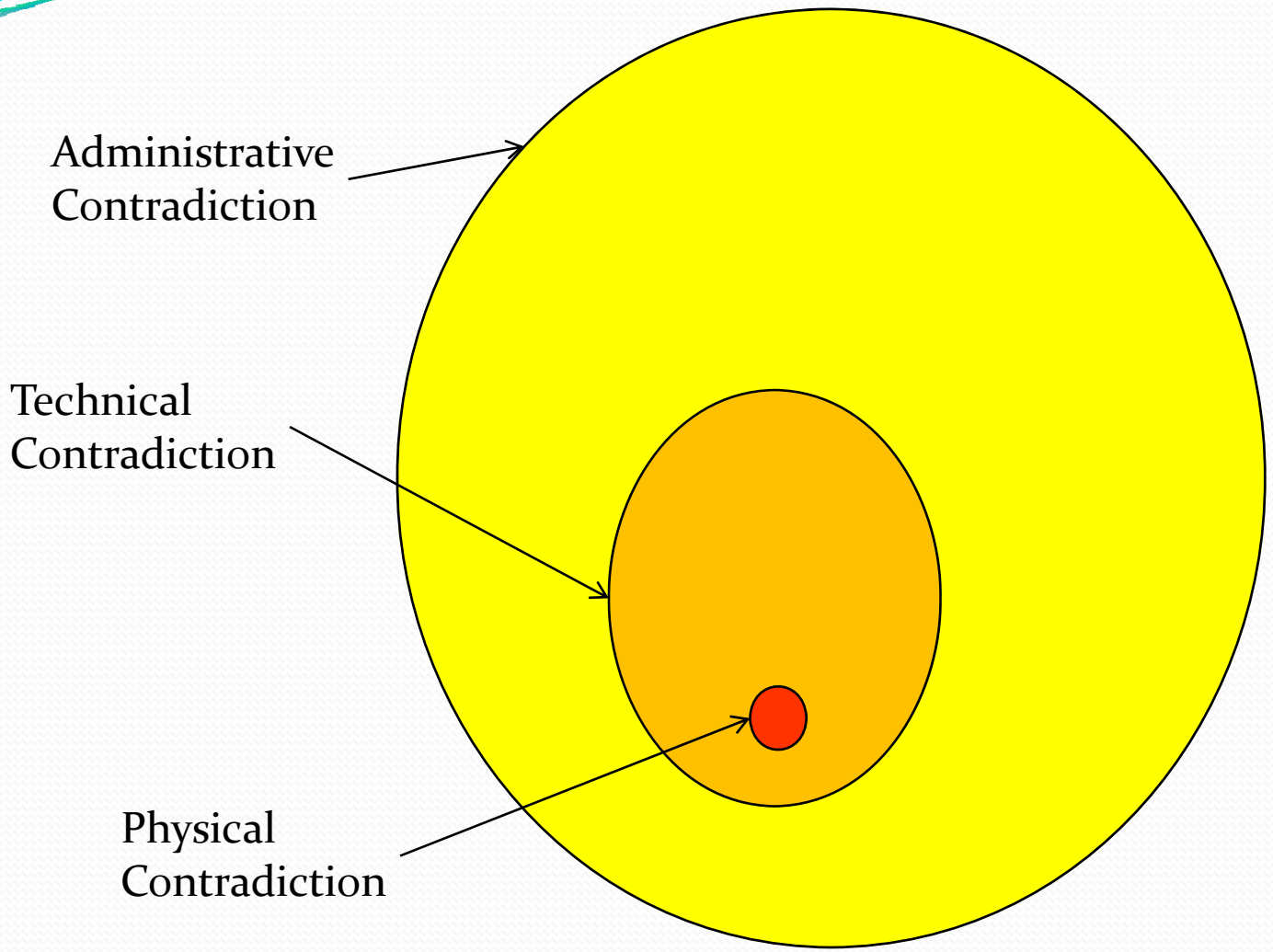
"Tongs" model make OTSM-TRIZ instruments efficient?

Typical stereotype on problem solving:
Generate as many ideas in different direction!!!



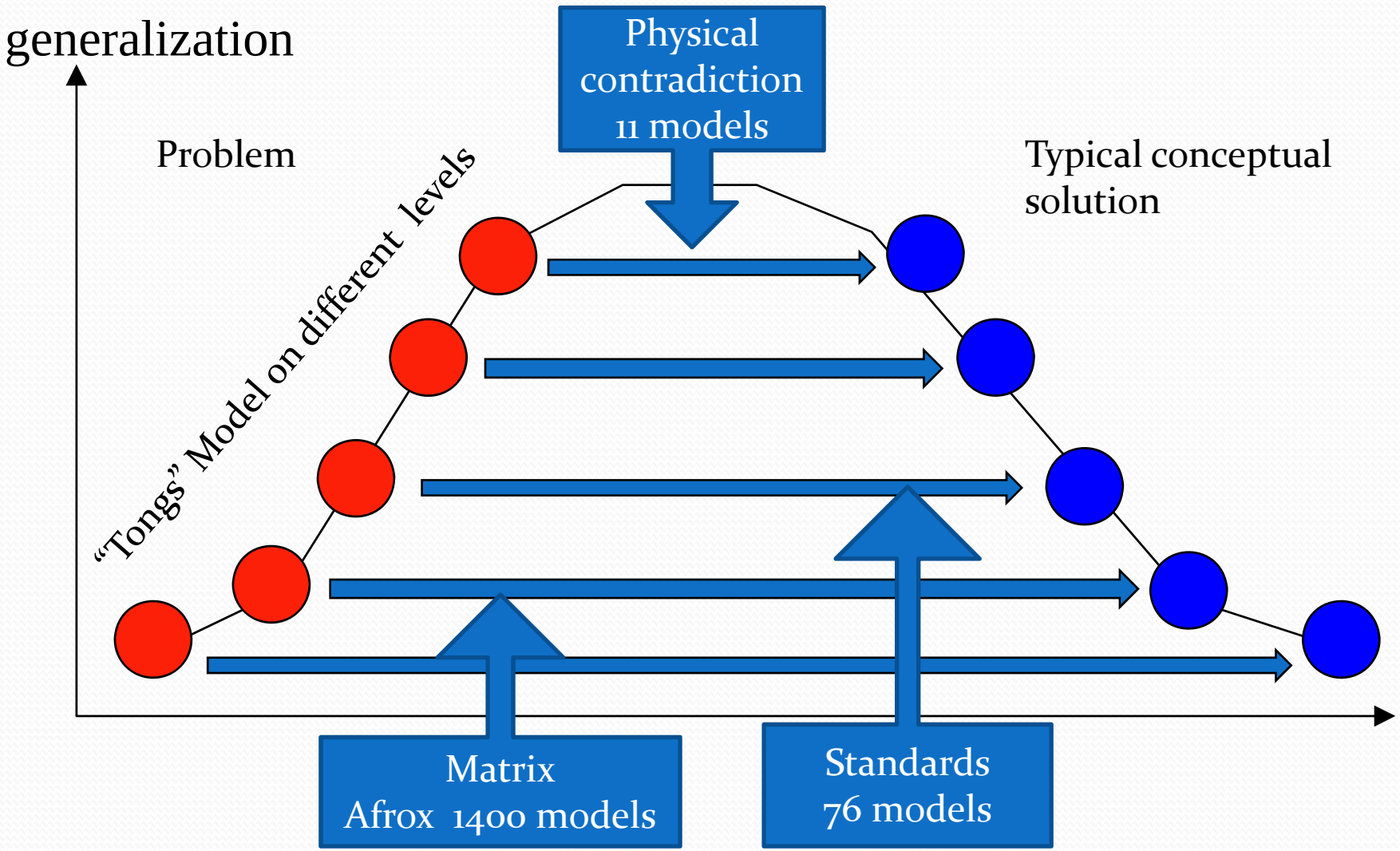
Discover the core of the problem

Classical TRIZ



Classical TRIZ problem solving process: "Hill" model

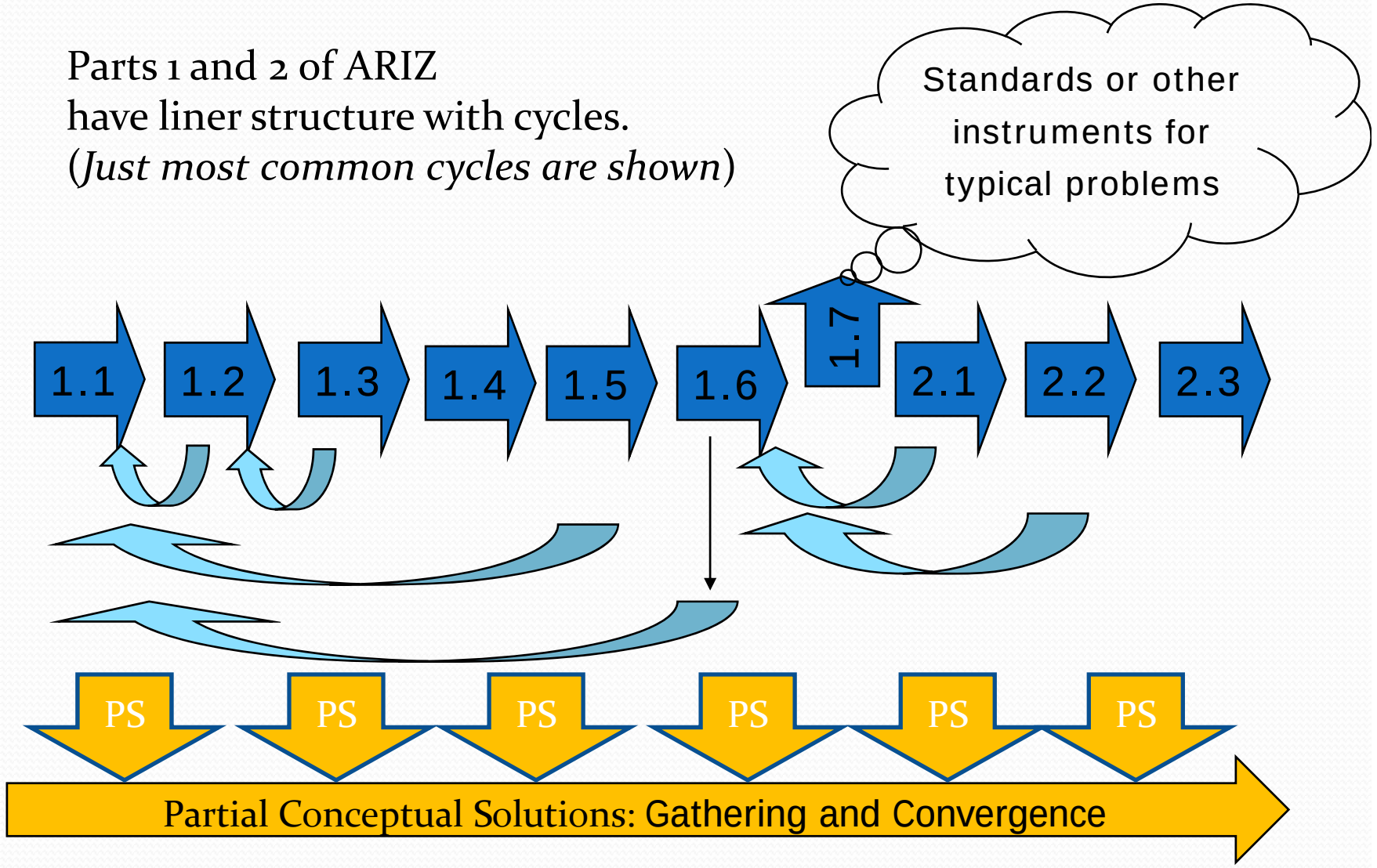
(This model was in use before ARIZ-85-C)



Classical TRIZ Problem Solving Process: Parallel Model

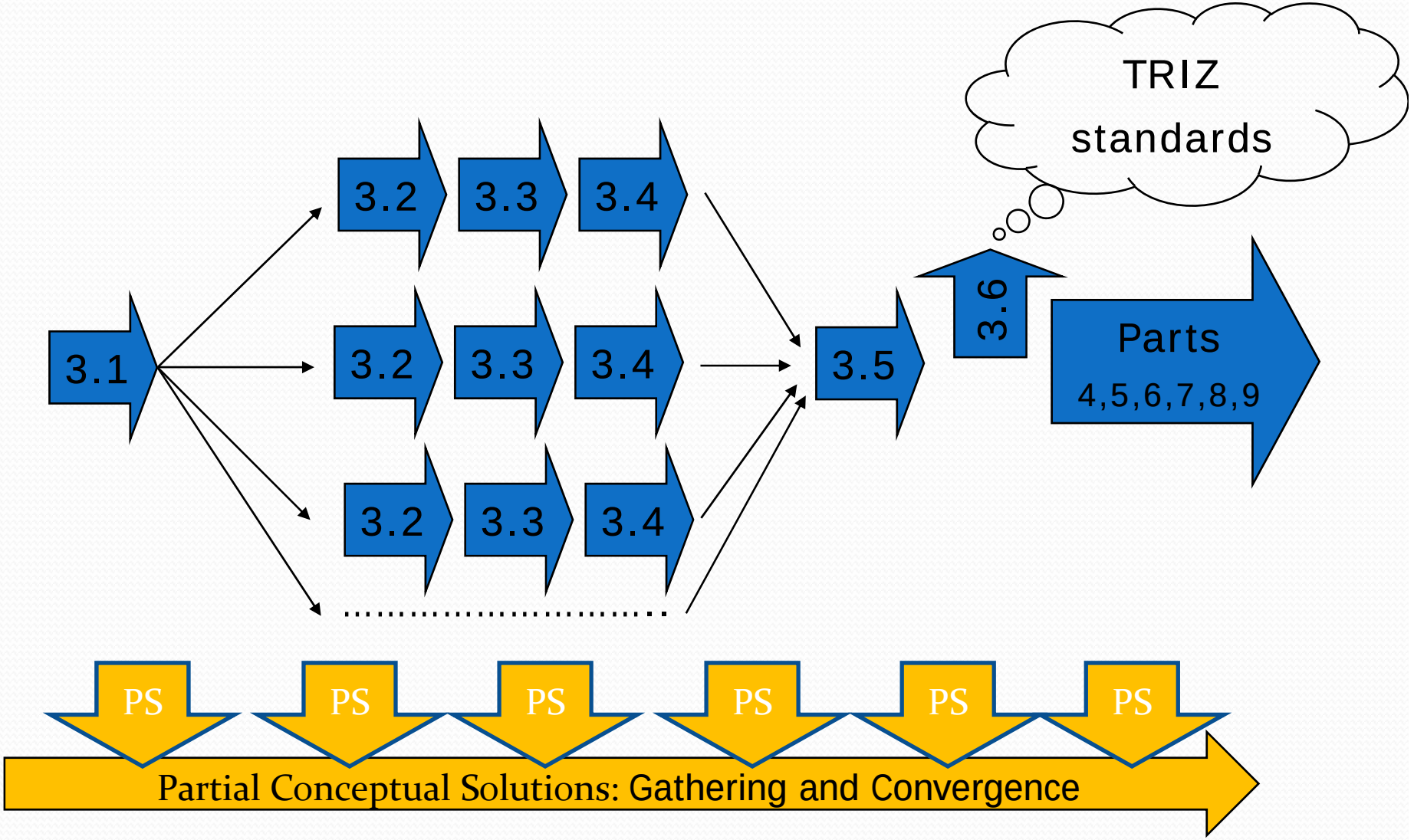
(Classical TRIZ problem solving Model since ARIZ-85-C)

Parts 1 and 2 of ARIZ
have liner structure with cycles.
(*Just most common cycles are shown*)



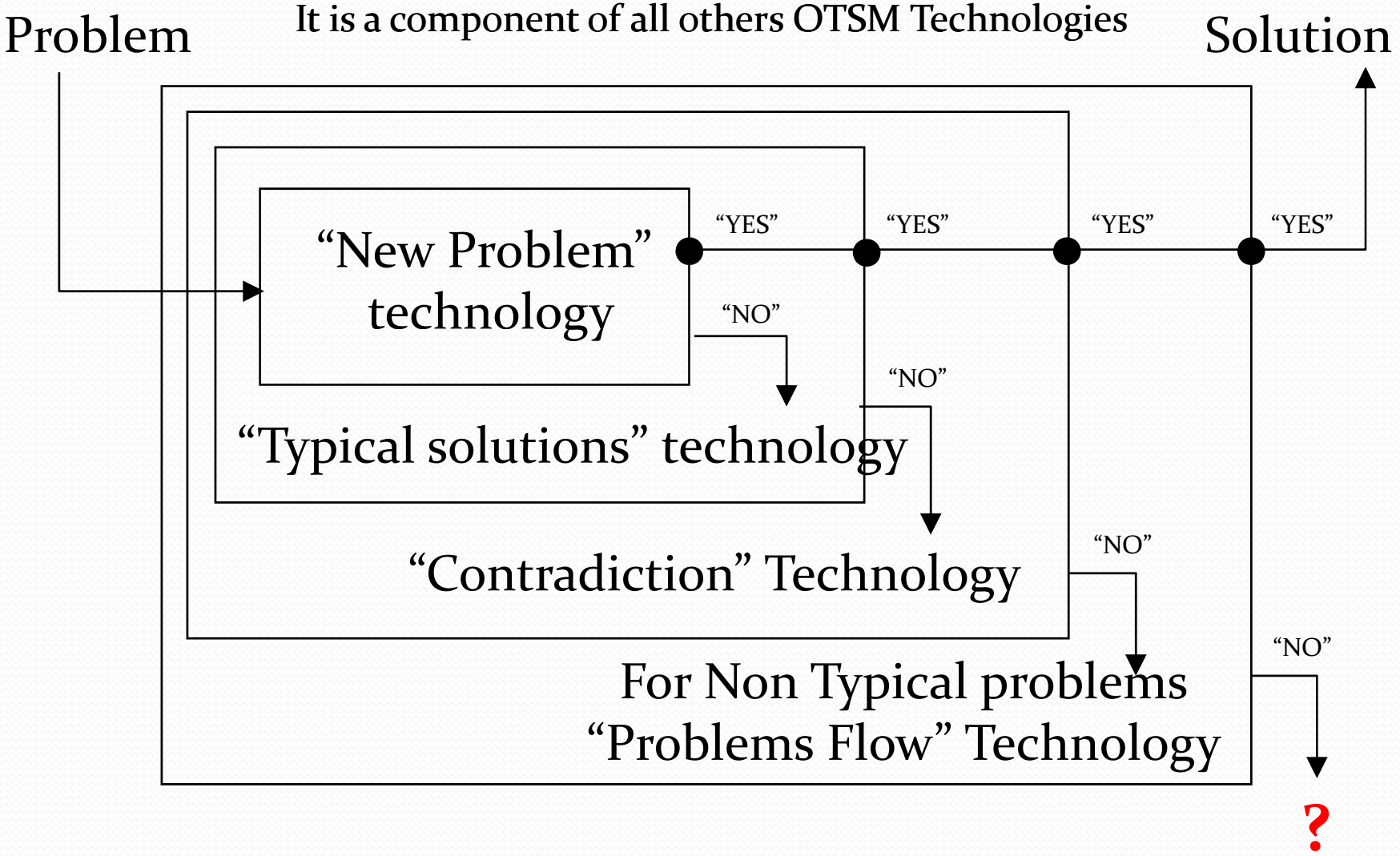
Classical TRIZ Problem Solving Process: Parallel Model

(Classical TRIZ problem solving Model since ARIZ-85-C)



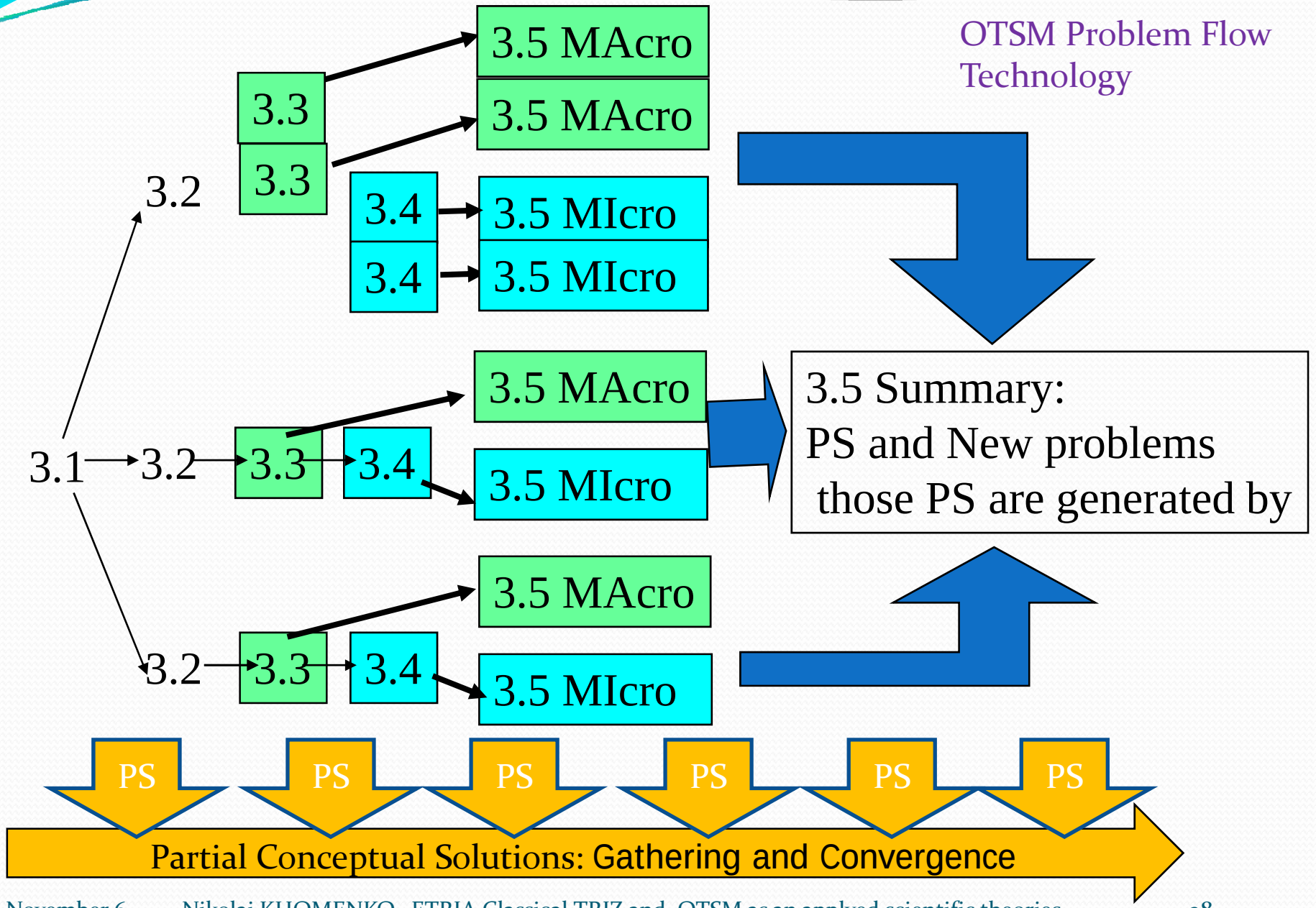
OTSM-TRIZ technologies

Today we will focus only on most important
OTSM Contradiction Technology
which is based on Altshuller's ARIZ.
It is a component of all others OTSM Technologies

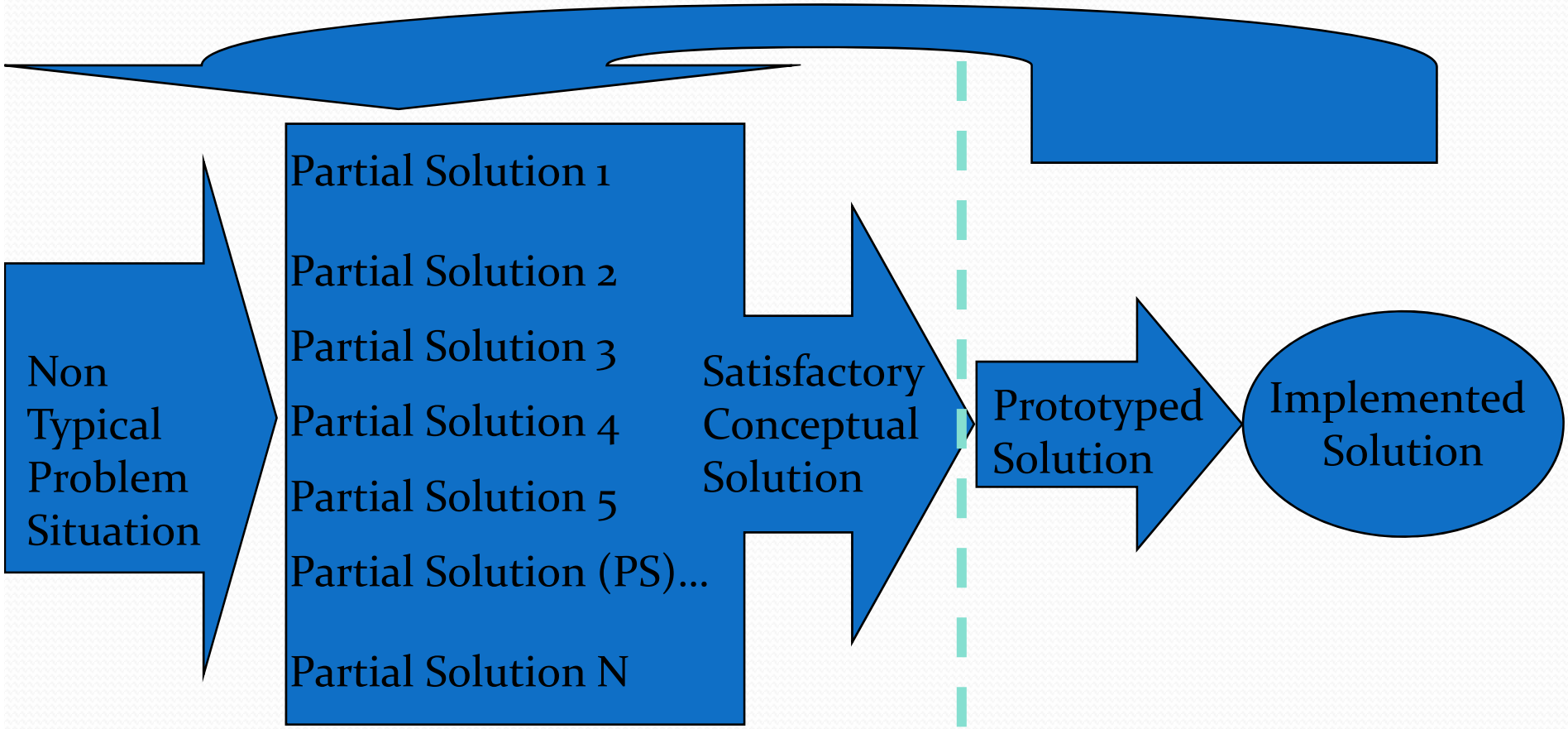


Classical TRIZ Problem Solving Process: Parallel Model (zoom in)

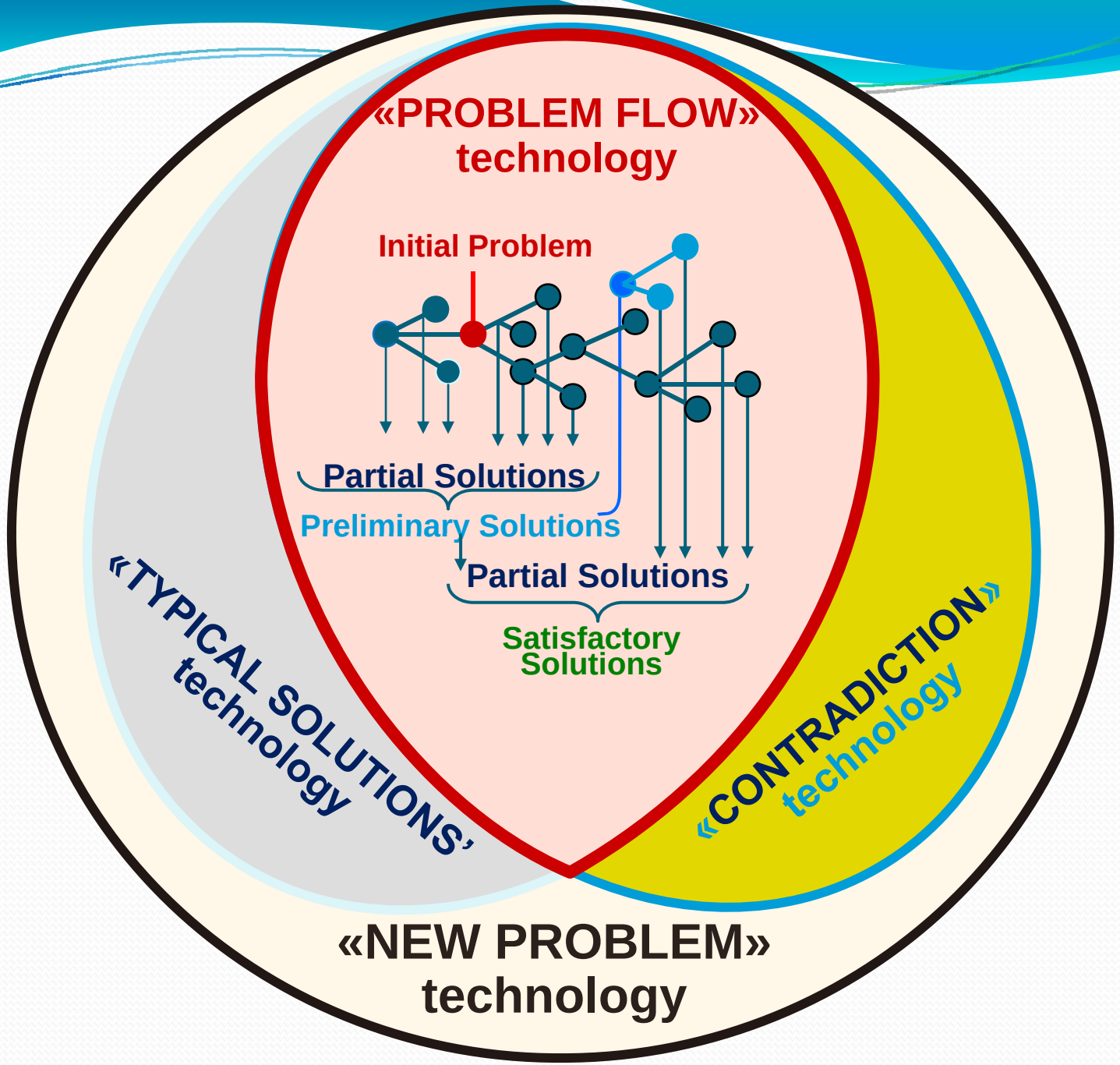
(Classical TRIZ problem solving Model since ARIZ-85-C)

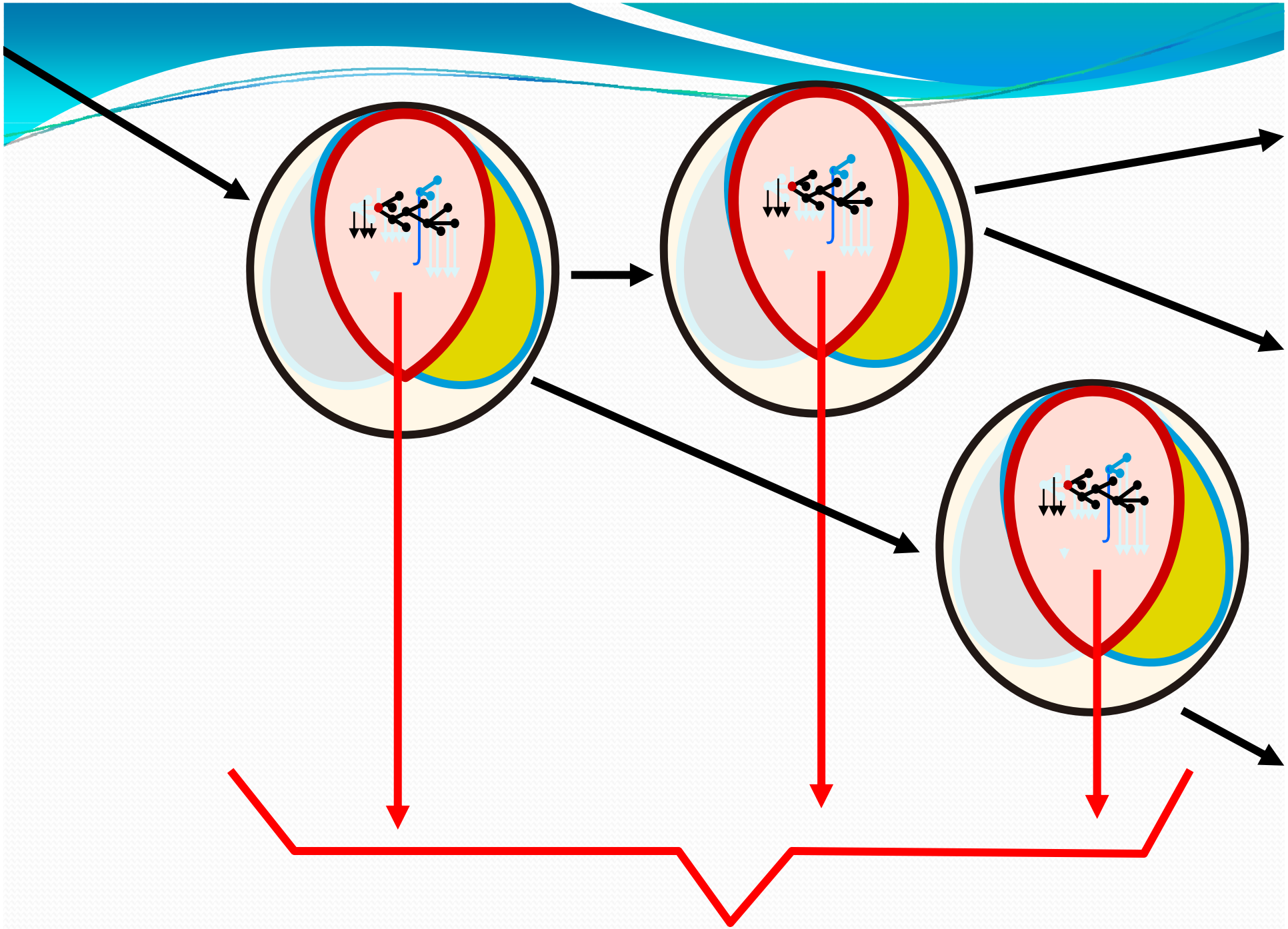


OTSM-TRIZ problem solving process:
Convergence of Partial solutions into Satisfactory Conceptual solution



Generation of Partial Conceptual Solution based on Typical solutions
And Convergence of the Partial Solutions into Satisfactory Conceptual Solution


«PROBLEM FLOW»
technology
Initial Problem
Partial Solutions
Preliminary Solutions
Partial Solutions
Satisfactory
Solutions
«TYPICAL SOLUTIONS'
technology
«CONTRADICTION»
technology
«NEW PROBLEM»
technology



Strategic results to garbage trash

1. Solution for “Today” – often accepted by low and meddle level management.

2. Solution for “Tomorrow” – “fifty-fifty” to the garbage trash by middle level management.

3. Solutions for “Future” – strategic potential of the organization – always to garbage trash by middle management

OTSM Problem Flow Networks approach has even better potential but … “new” dream of Blue Ocean is more then 20 years old as well as TRIZ tool for that….

OTSM based Problem Flow Networks approach

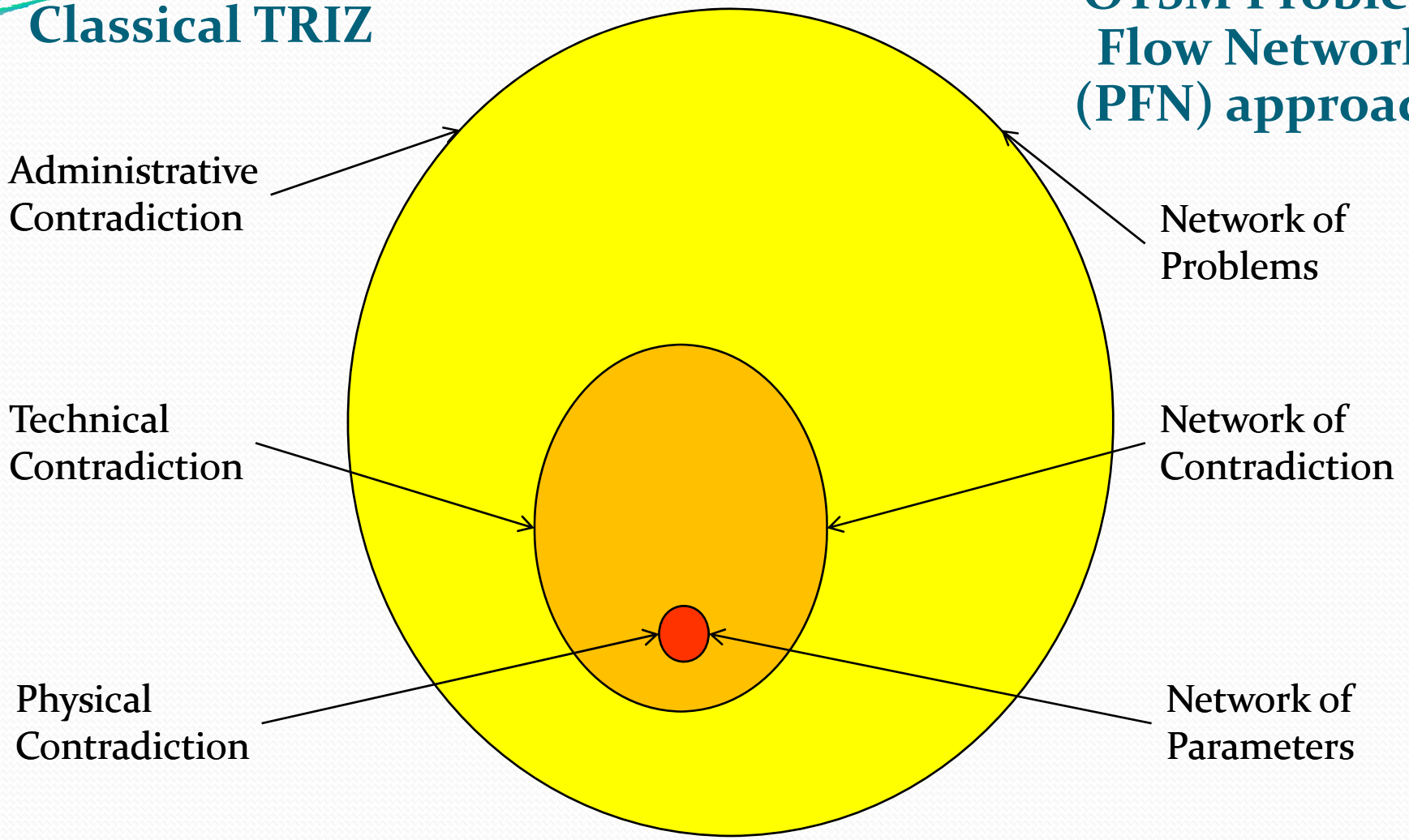
ARIZ
is a system integrator for Classical TRIZ Toolbox.

Problem Flow Networks (PFN)
is a system integrator for OTSM toolbox

Discover the core of the problem

Classical TRIZ

OTSM Problem Flow Networks (PFN) approach



OTSM Problem Flow Networks approach is devoted to handle complex interdisciplinary problem situations (dozens and hundreds problems). However it work for less complex problem as well

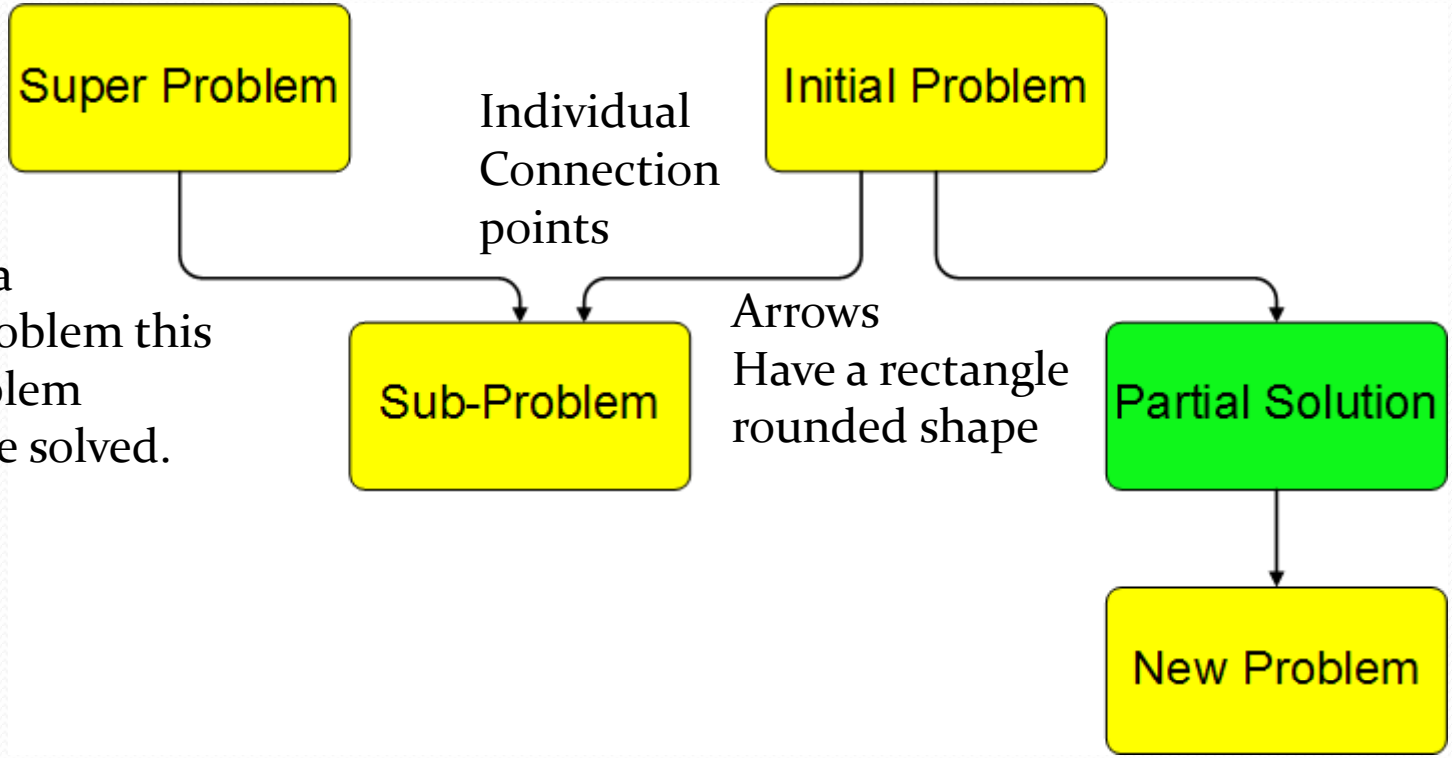
OTSM
Network of Problems

What is the right problem to be solved?
To solve or not to solve? – this is the question….

Some examples of formal topology that is helpful to analyze complex and not so complex problem situation to narrow research area for contradiction and parameters networks.

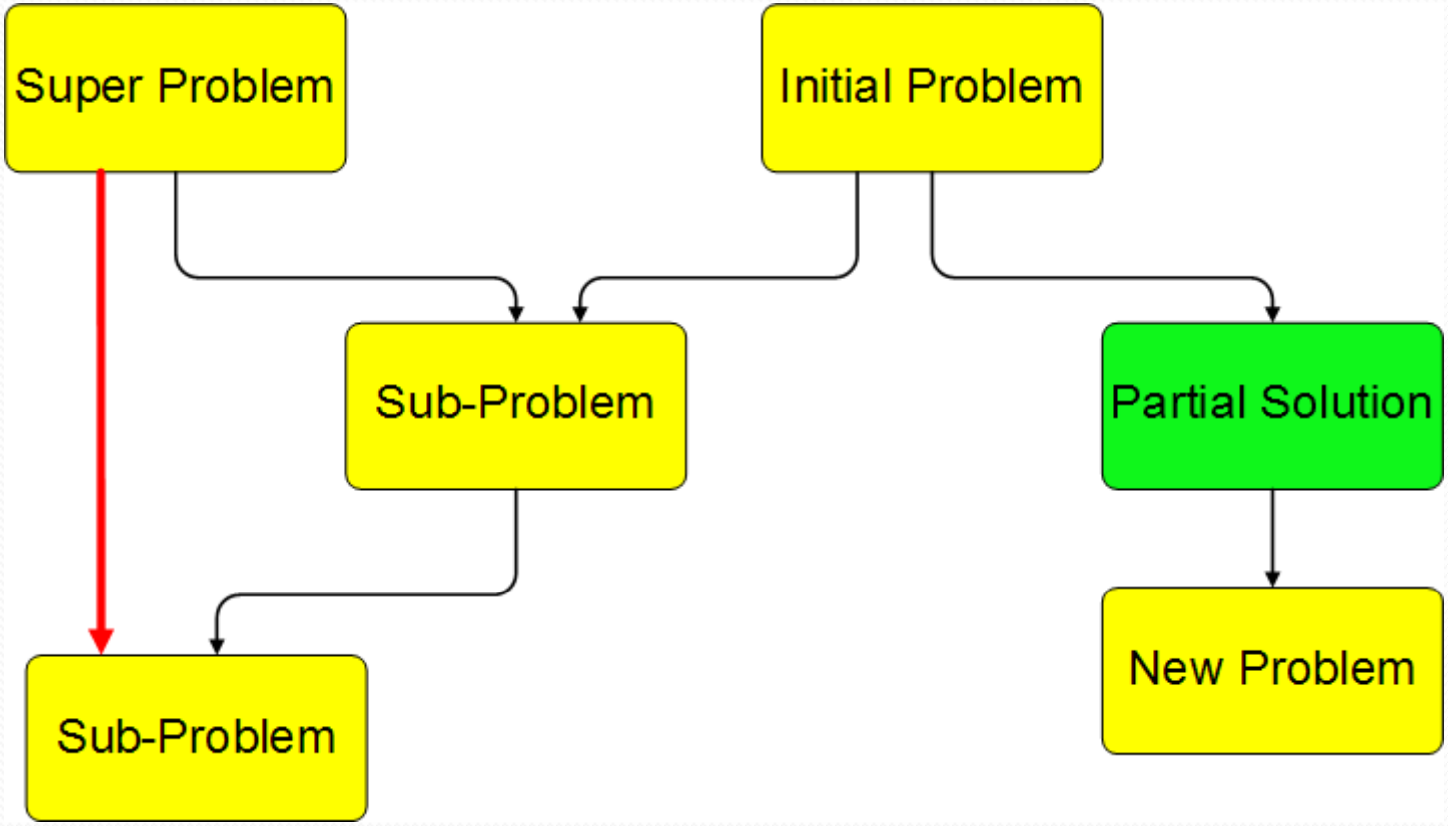
Example of a Network of problem

Super-Problem node and
Initial Problem node are goals
of the problem solving process



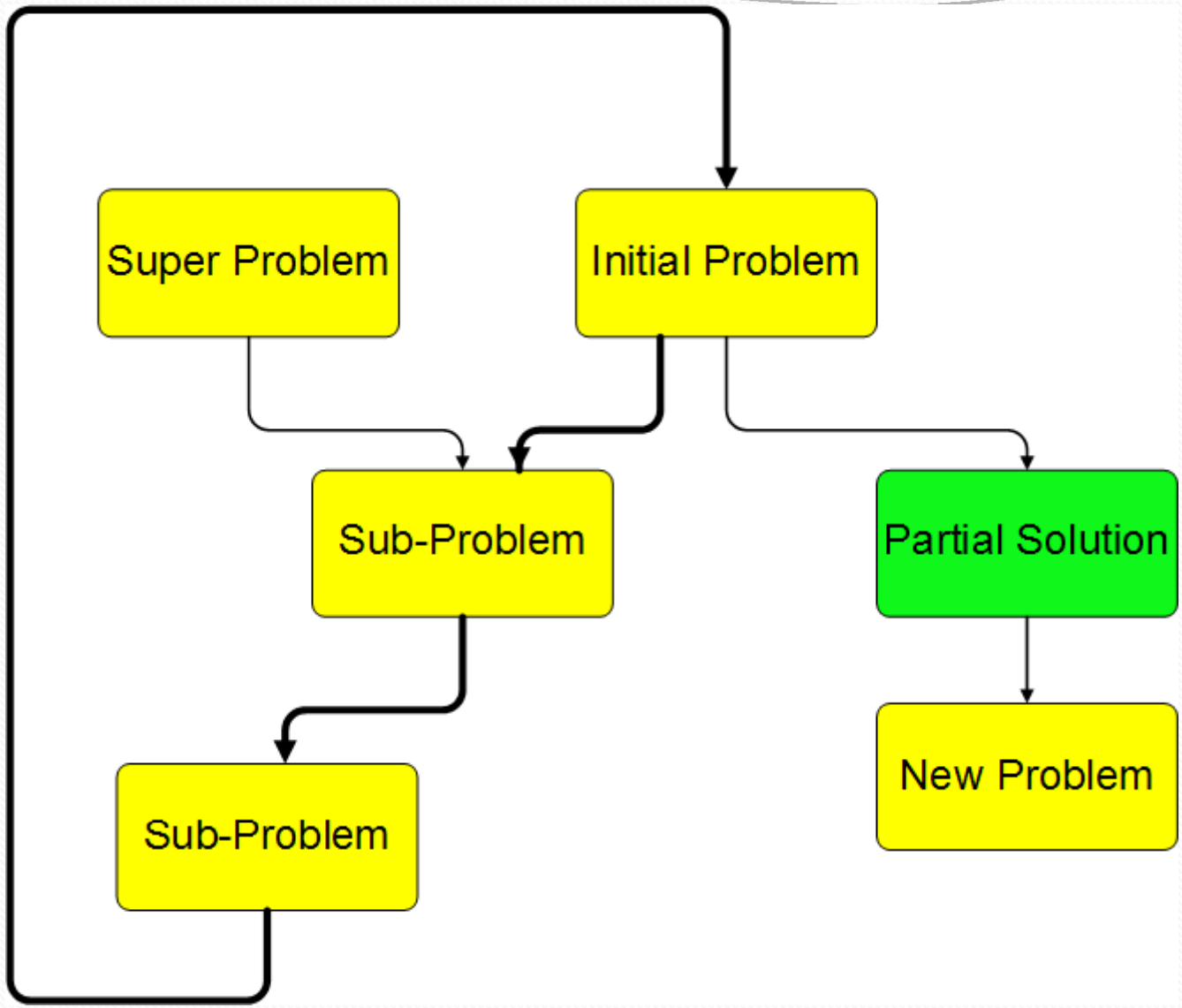
To solve a problem
a partial solution could be used
but this generate another problem.

Special attention topology: Short cut

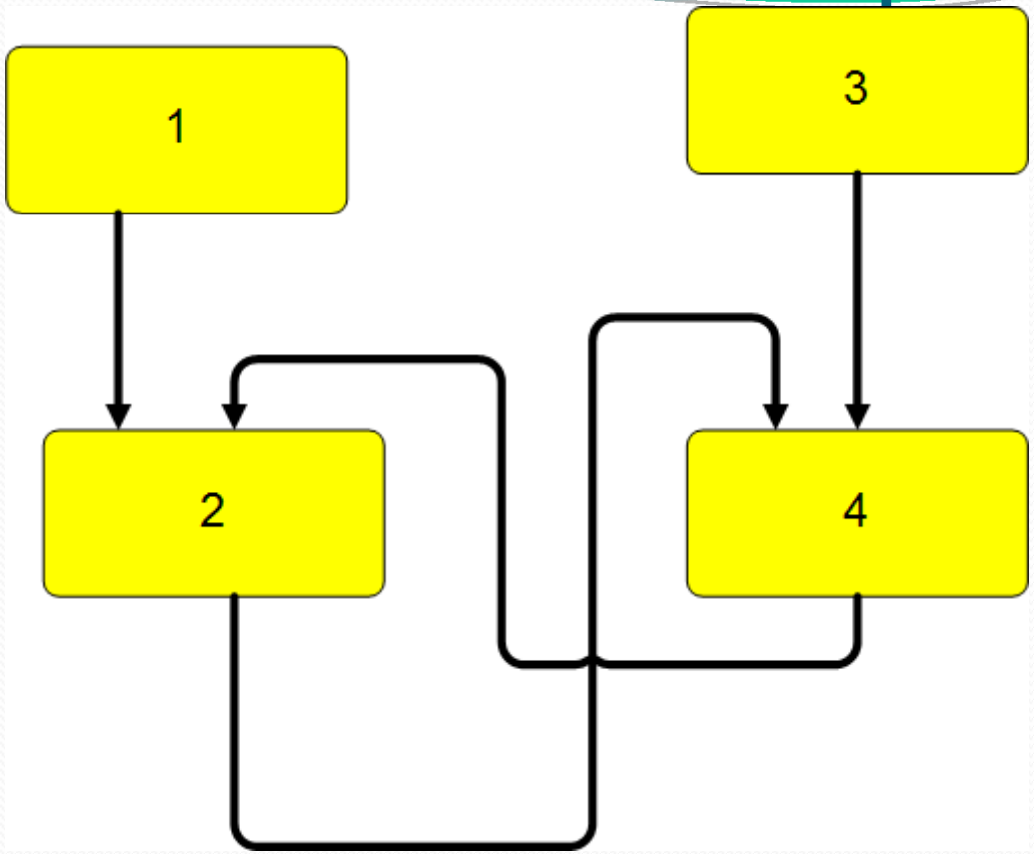


Short cut arrow are not allowed mostly.
However special analysis is required.

Closed loop


Super Problem
Initial Problem
Sub-Problem
Partial Solution
Sub-Problem
New Problem

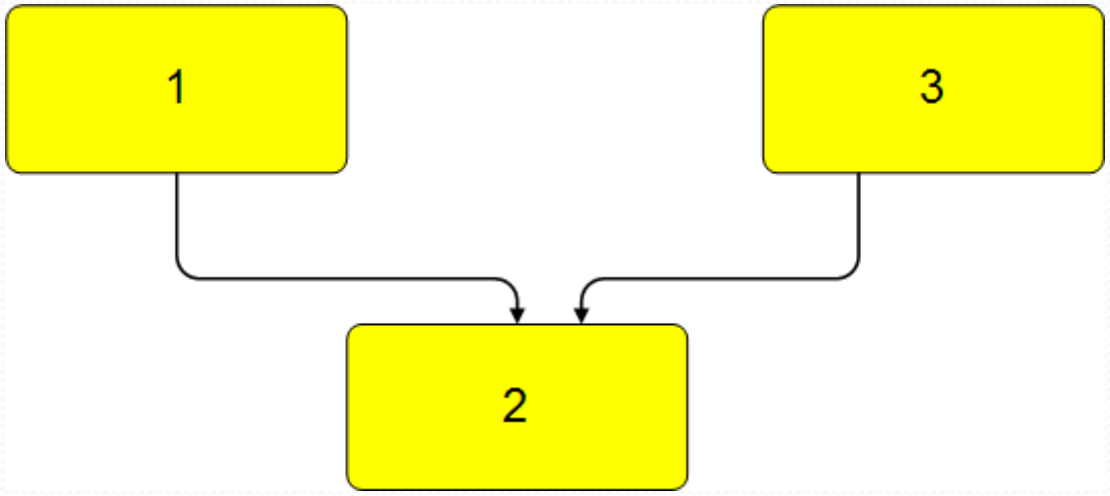
Cross-Closed loop



Problems 2 and 4 should be solved in order to solve Problem 1.
In order to solve problem 3 should be solved problems 4 and 2.
However, to solve Problem 2 it is necessary to solve Problem 4 and vise versa.

This kind of closed loops for real life problem situation was discovered in the course of developing network of problems for a scientific research planning.

Special attention topology: Bottle Neck



Thank you for your attention!

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