NPO法人 日本TRIZ協会 Japan TRIZ Society

TRIZ シンポジウム 2010 The Sixth TRIZ Symposium in Japan

6th TRIZ Symposium in Japan, 2010 -- Pre-Symposium Seminar

Nikolai Khomenko: OTSM-TRIZ Introductory Seminar

General Theory of Powerful Thinking (OTSM):

A methodology addressing to large and complex problems involving technologies, society, and humans together

envisioned by G. Altshuller and lately developed by N. Khomenko

Held by Japan TRIZ Society, NPO;

Sponsored by SANNO Institute of Management and "TRIZ Home Page in Japan" Foundation

Japan TRIZ Society is going to hold a one-day seminar on OTSM-TRIZ in Tokyo on the previous day of its 6th Japan TRIZ Symposium by Mr. Nikolai Khomenko, a Keynote Lecturer at the TRIZ Symposium.
SANNO Institute of Management is providing its Seminar Room, located very conveniently near Tokyo Station.
"TRIZ Home Page in Japan" Foundation is going to present its Award for the Contributions to TRIZ to Mr. Khomenko

Date : Sept. 8th, 2010 (Wed.) 10:00 – 17:00

Venue : SANNO Institute of Management, Tokyo Satellite Office, Seminar Room
(Sapia Tower 9F, a building next to JR Tokyo Station)

General Theory on Powerful Thinking (OTSM):

digest of evolution, theoretical background, tools for practice and some domains of application.

Nikolai Khomenko

TRIZ Master, certified by Genrich Altshuller.

Insight Technologies Lab, Canada.

Who is Nikolai Khomenko?

- First acquaintance with TRIZ –in 1979-80 First teacher – Val Tsourikov.
- Research about ARIZ that have finished up with new notion of Classical TRIZ – Resources. 1982-1984. Invitation from Altshuller for his training.
- Individual education from Genrich Altshuller 1983-1998. Subject: Why TRIZ named a theory? That is why my perception of TRIZ is so different.
- OTSM Research and Development since 1985.
- Leader of Minsk TRIZ school 1986-1998.
- Co-founder of Invention Machine Laboratory 1989. Member of the board and System architect for versions of IM 1.0 and IM 1.5.
- Founder and leader of the Jonathan Livingston Project since 1991.
- First Russian TRIZ expert invited to South Korea in 1997 by LG Production Research Center (LG-PRC). In 2000 invited by Samsung Advanced Institute of Technology (Samsung SAIT).
- Founder of Insight Technologies Lab, 1999, Toronto, Canada.
- Scientific Director of an unique educational program Advanced Master in Innovative Design. INSA Strasbourg, France, 2004-2009.
- Part time OTSM coach at European Institute for Energy Research (EIFER) 2004-2009, Karlsruhe, Germany.

Content of the presentation

1. 30 minutes journey through 25 years of research and breakthrough insights: Transition from Classical TRIZ to OTSM.
2. A few insights on OTSM-TRIZ Non-Linear open mind education versus traditional narrow mind professional Linear education.
3. Where the theory and its tools were tested?
4. Last but not least: insight on Creativity.

Before we start

REAL LIFE EXAMPLE OF OTSM BASED TOOLBOX APPLICATION.

One example of OTSM based toolbox application for Product development

- 6 Revolution in one product. Photos.
- Start video.

Some conclusion we can take of this example

- This product was developed by my student after training. It means that OTSM Knowledge are transferable and we have a good non traditional educational technology to make this transfer.
- What you have seen is just a first generation of the product development. By using OTSM network of problems they developed line of their product evolution in nearest future. It means that OTSM based toolbox provide users with a system of innovative solutions. This allowed to a company develop chain of permanent and sustainable innovations and be prepared in advance for next innovation.
- All of this solutions now seems simple and obvious. However before it was done all members of the design team have said that it is impossible to solve this problems and make the product so simple, nobody did it before. It means That OTSM based toolbox allowed us reframe problems in so unusual way that most of competitors believe those problem cannot be solved. At the same time OTSM Toolbox provide tools for transforming Impossible into Possible.
- All above helps any company sufficiently increase they competitive advantages and jump to a blue ocean not one time but whenever the company need it.

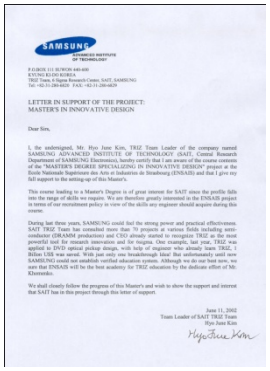
What main tools of OTSM Based Toolbox were used:

- OTSM Network of Problems and Solutions.
- “Tongs” Model of Classical TRIZ in order to describe correctly initial problems fro the OTSM Network of problems.
- OTSM Contradiction technology that include:
  - OTSM Express analysis of an initial situation
  - ARIZ-85-C
  - Additional Steps to the ARIZ and recommendations on how fulfill all other steps better and self check quality of this work.

Some other applications of OTSM Toolbox and results.

- Planning:
  - Economics reform of an Region.
    Results: *Deutsche Bank* gave a very positive reference. French Bank – *Credit Agricole Bank* – was ready to finance the program.
  - Strategic planning for the division of a worldwide company.
    On going project.
- Energy:
  - Power plant improvement new technology of biomass gasification was proposed.
    Result: First patent has already filed. Research is going on it show that Ideas seems feasible and should be developed further.
- Computer science and software development:
  - Software development for VISA system.
    Results: were proposed system of solution to solve important problem - structure of the Software, some devices for the Hardware and organizational structure improvement. In the step by step implementation now.
- Environment:
  - Decreasing pollutions produced by woodstoves.
    Results: We found a set of non traditional solutions. Research program is going one. First results show that the ideas do work.


European Institute for Energy Research
Brevet n°0602840 déposé en France le 31 mars 2006
«Gaséfication de Biomasse a Traitement simplifie»
INVENTEURS
- Igor KAIKOV
- Guillaume BOURTOURAULT
- Laurent LELAIT
- Nikolai KHOMENKO
DEPOSANTS
- EDF



As you can see using theoretical notions of OTSM & TRIZ could be very practical.

Especially in case when we are know how to apply general OTSM techniques to a specific problem.

Students learn all of these during system of OTSM classes.

Some of background ideas of Classical TRIZ and OTSM.

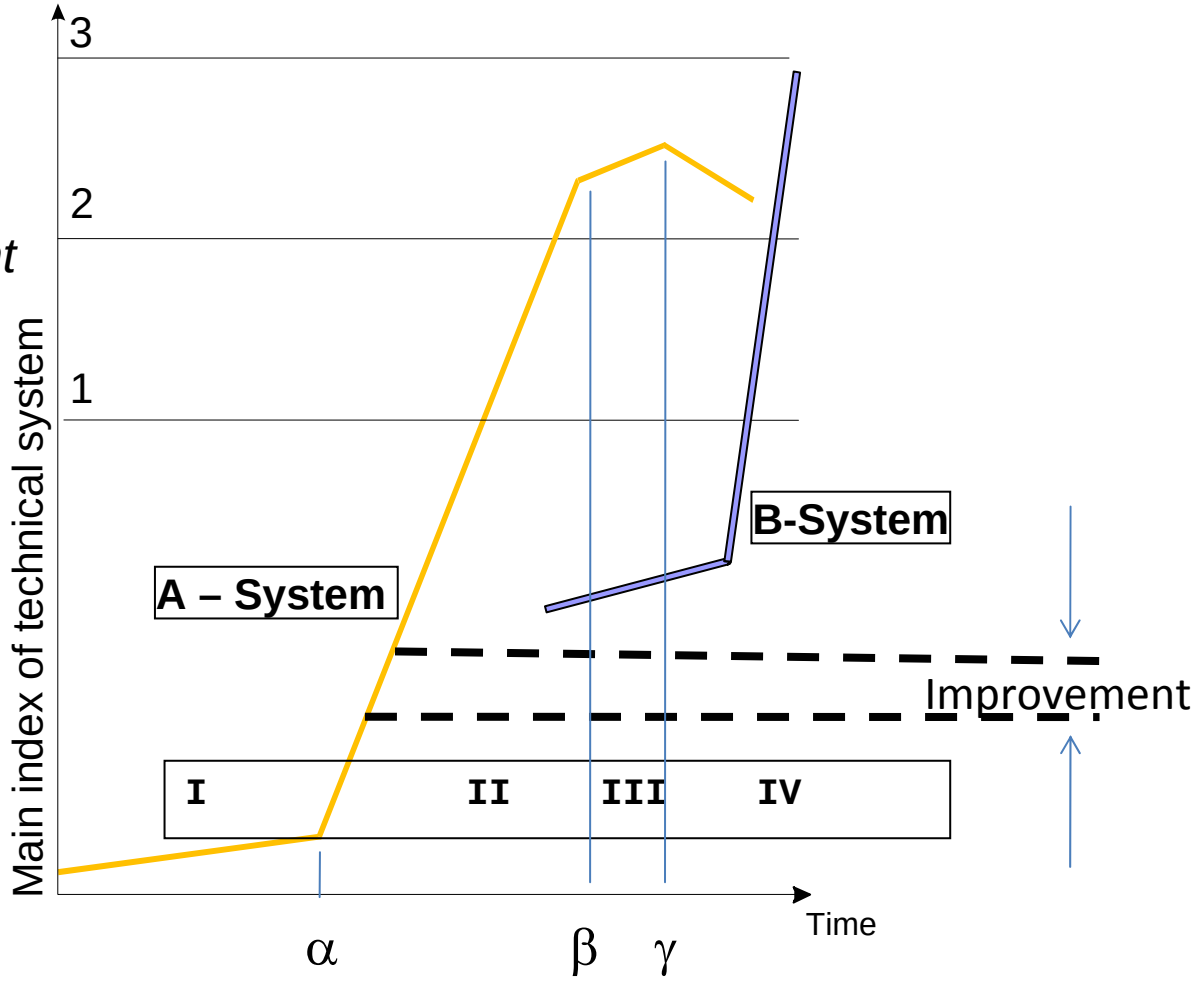
WHAT WE DO WHEN WE SOLVE PROBLEM?

What does it mean Solve a Problem? Improvement of the system?

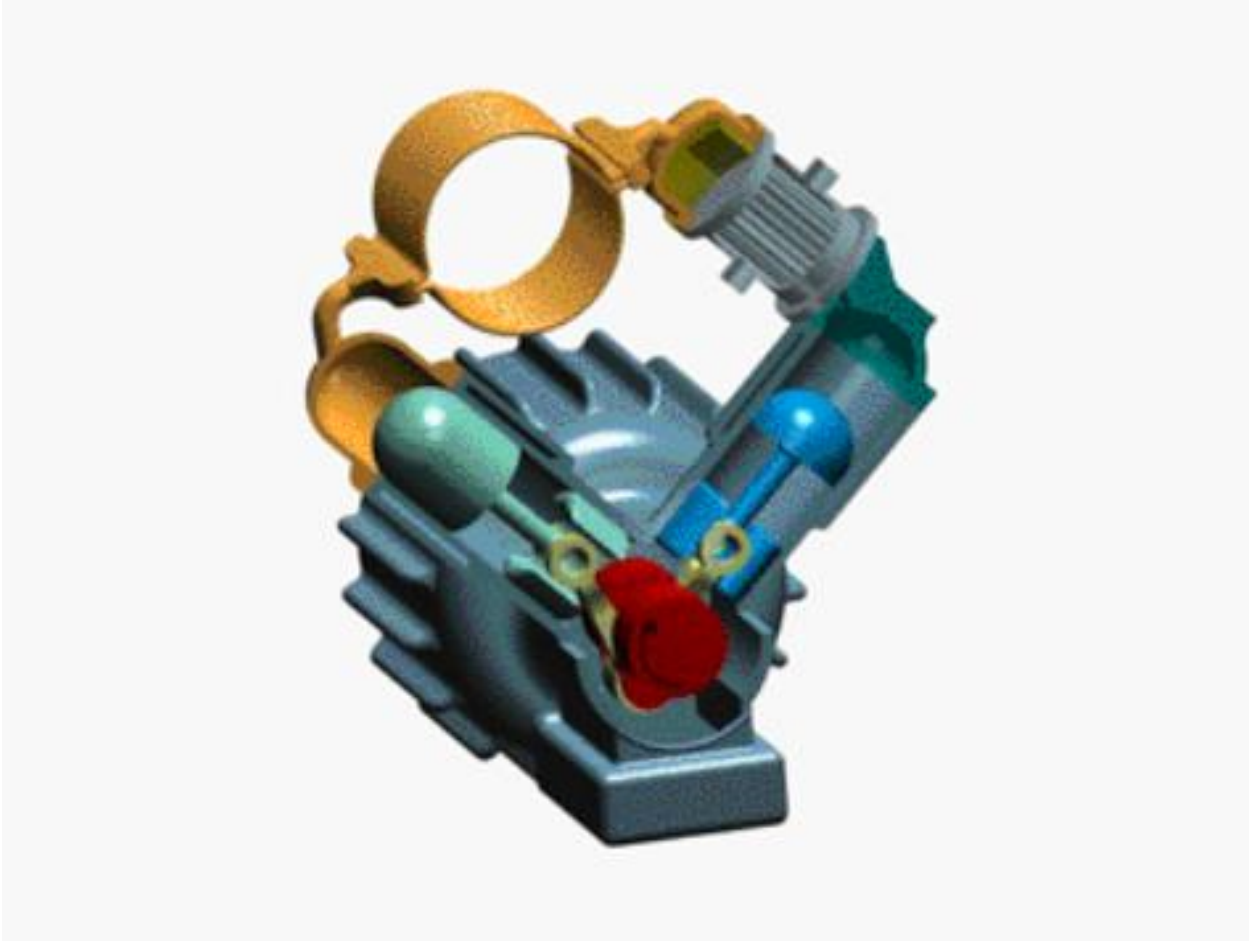
Natural limits:
Objective Factors:
Laws or/and
Resources

Limits of Environment consumption

Limits of working Principle Concept



The Sterling engine

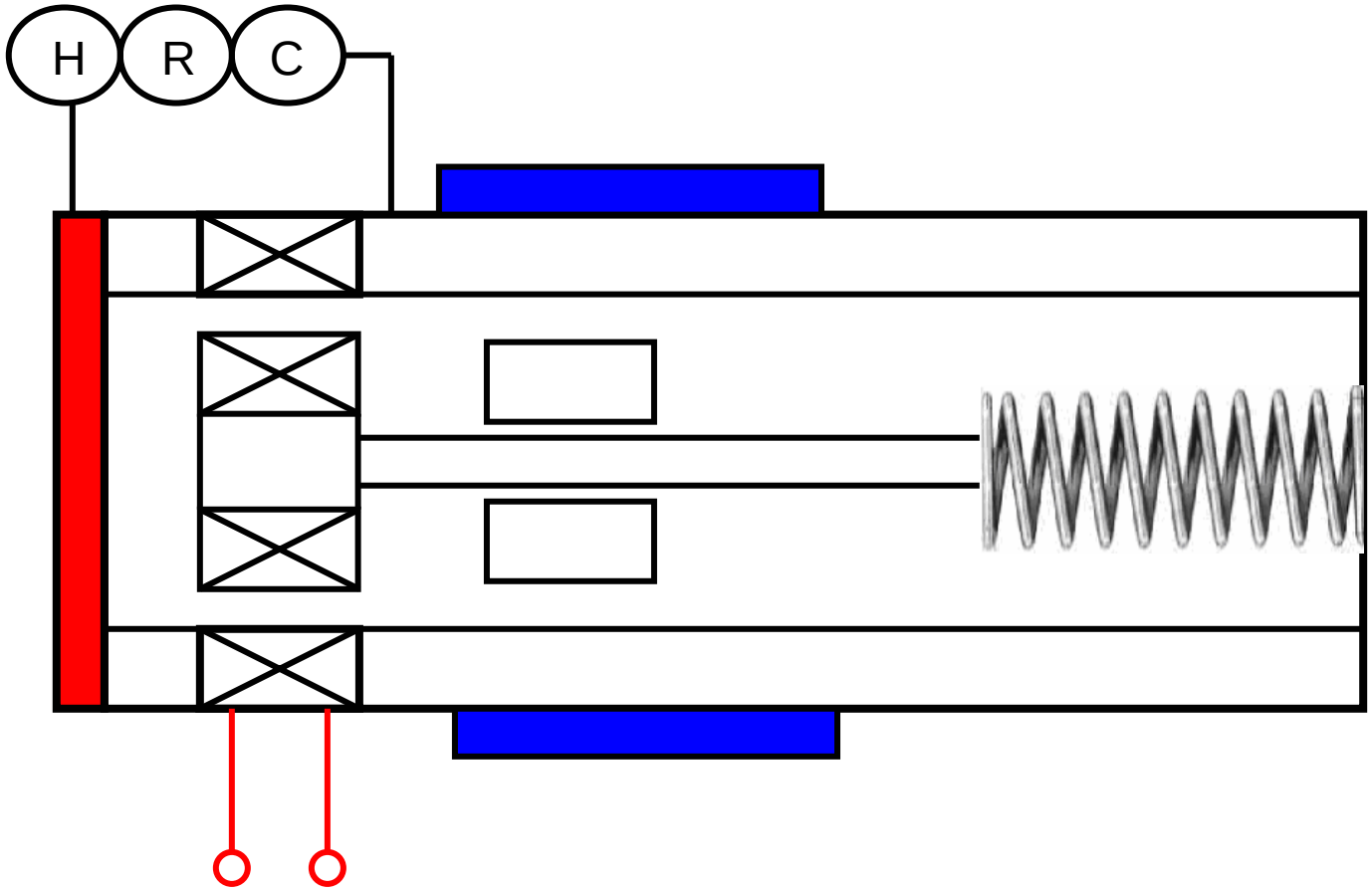


Law of evolution: Transition to super-system

When a System reach end of S-curve of its evolution
it could continue its evolution
as a part of certain Super-System. Typical way:

- Mono-system
- Bi-system
- Poly-system
- New Mono-system which is convergence of previous generation multi system
- Etc.

Patent FR 1981

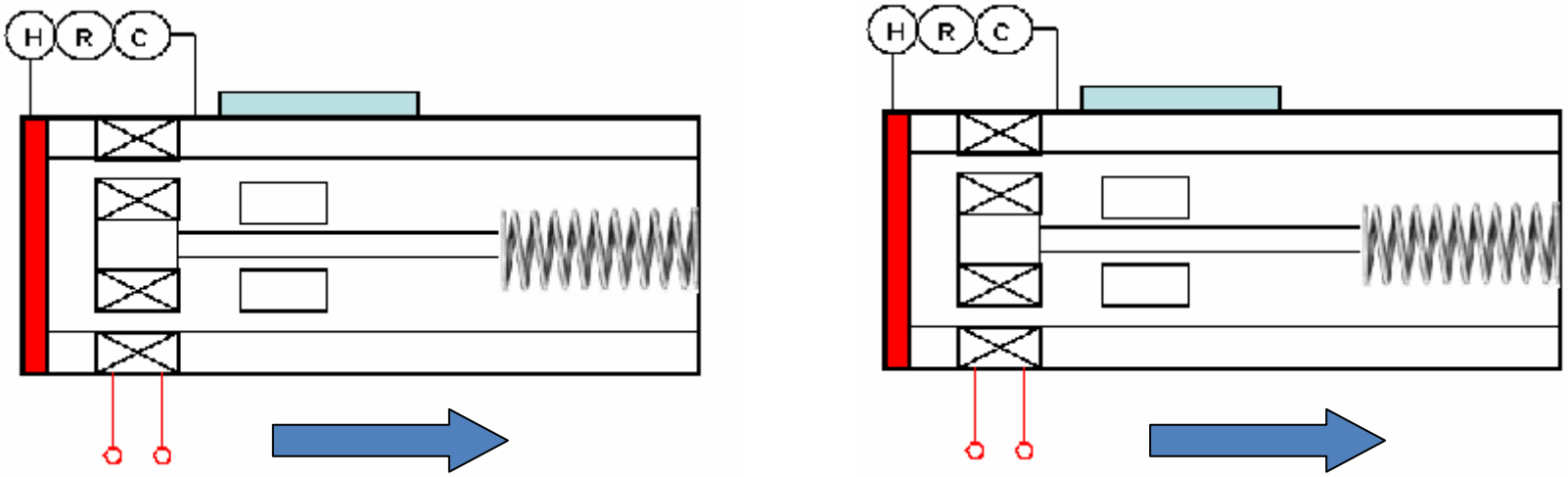


Bi-system of Sterling Engines

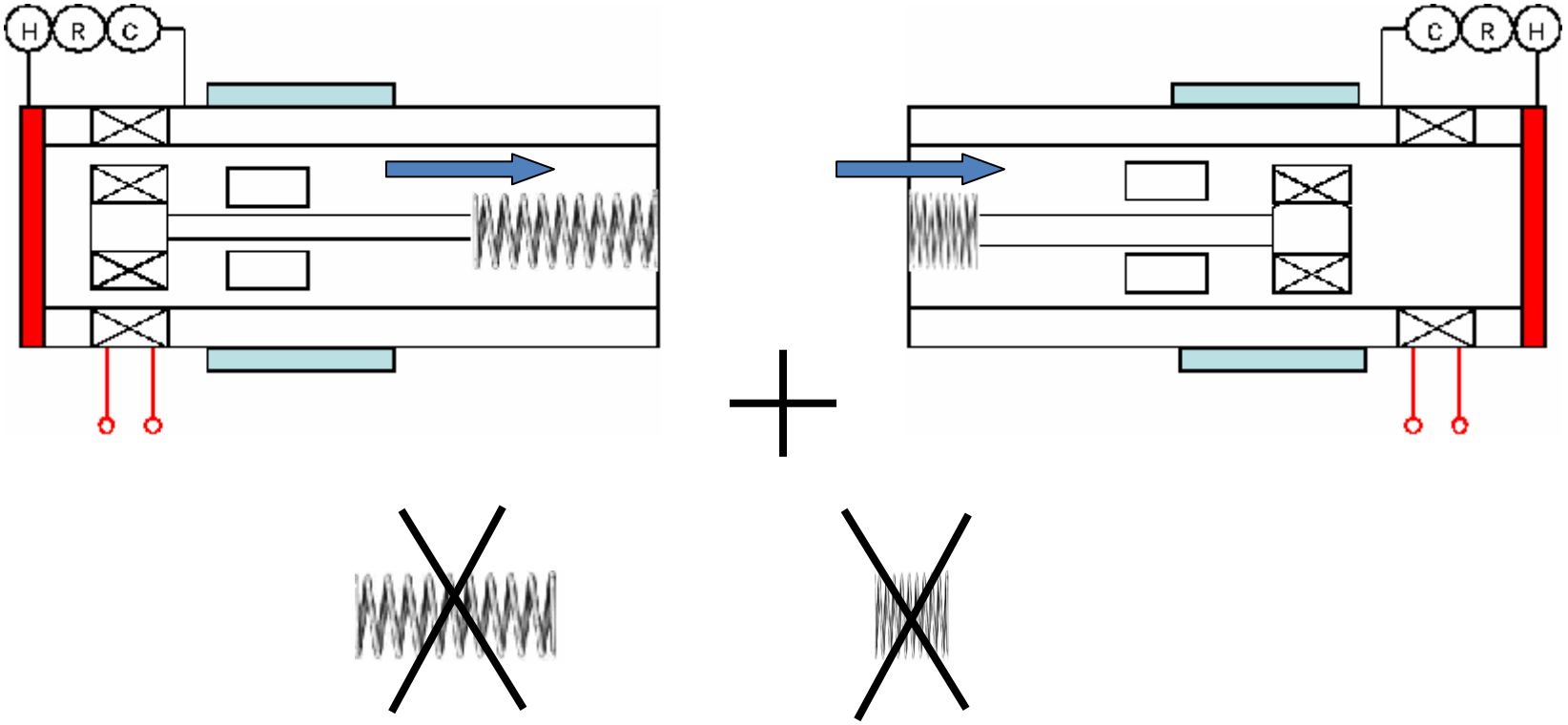
- The Function of the spring in the Sterling engine - to save energy for the next stage of piston moving.

- Converge two Sterling engines and coordinate they work. Then function of the spring could be performed by the displacer of the other engine.

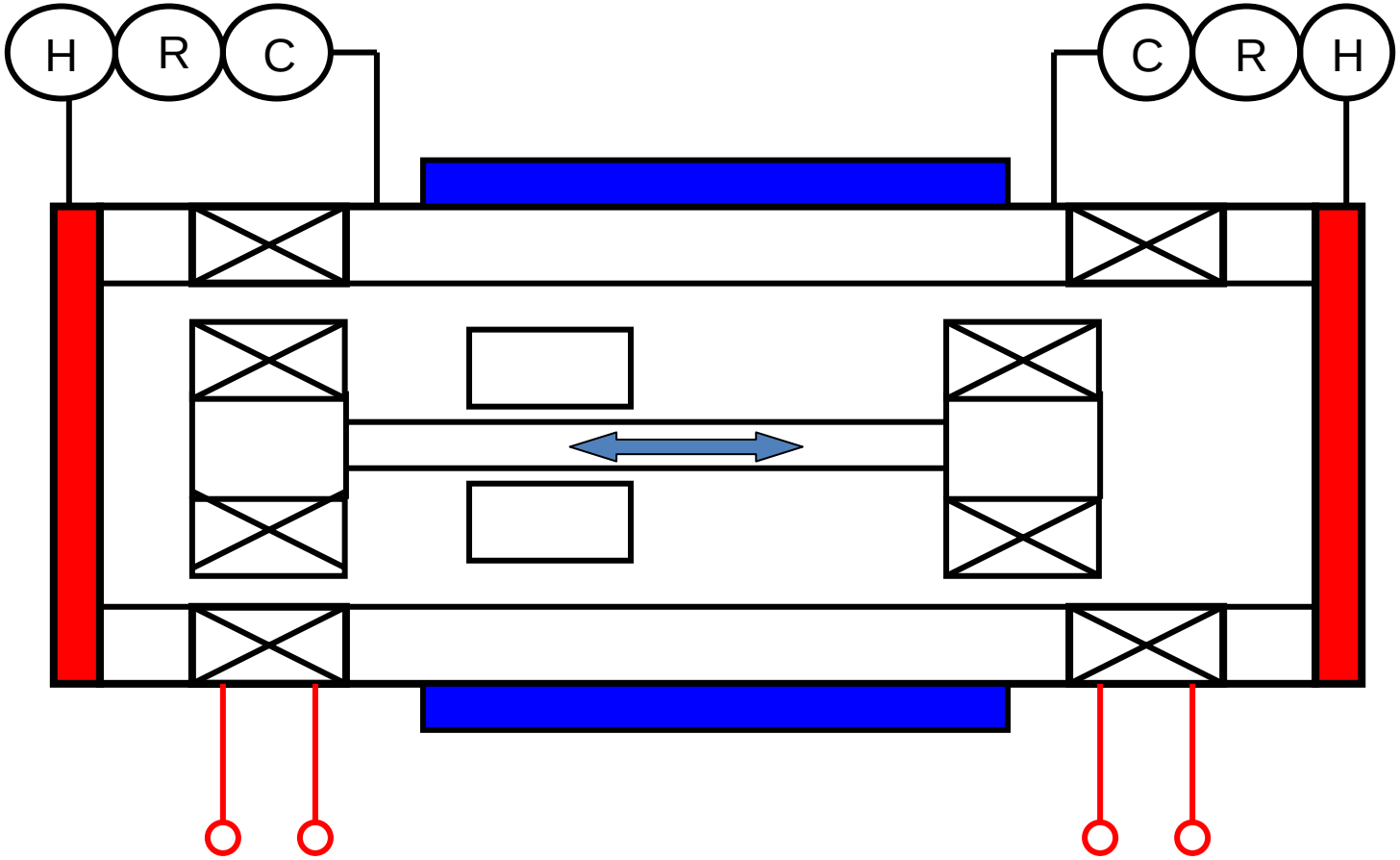
2 Sterling engines, STEP 1



2 Sterling engines, STEP 2



Double Sterling engine, STEP 3



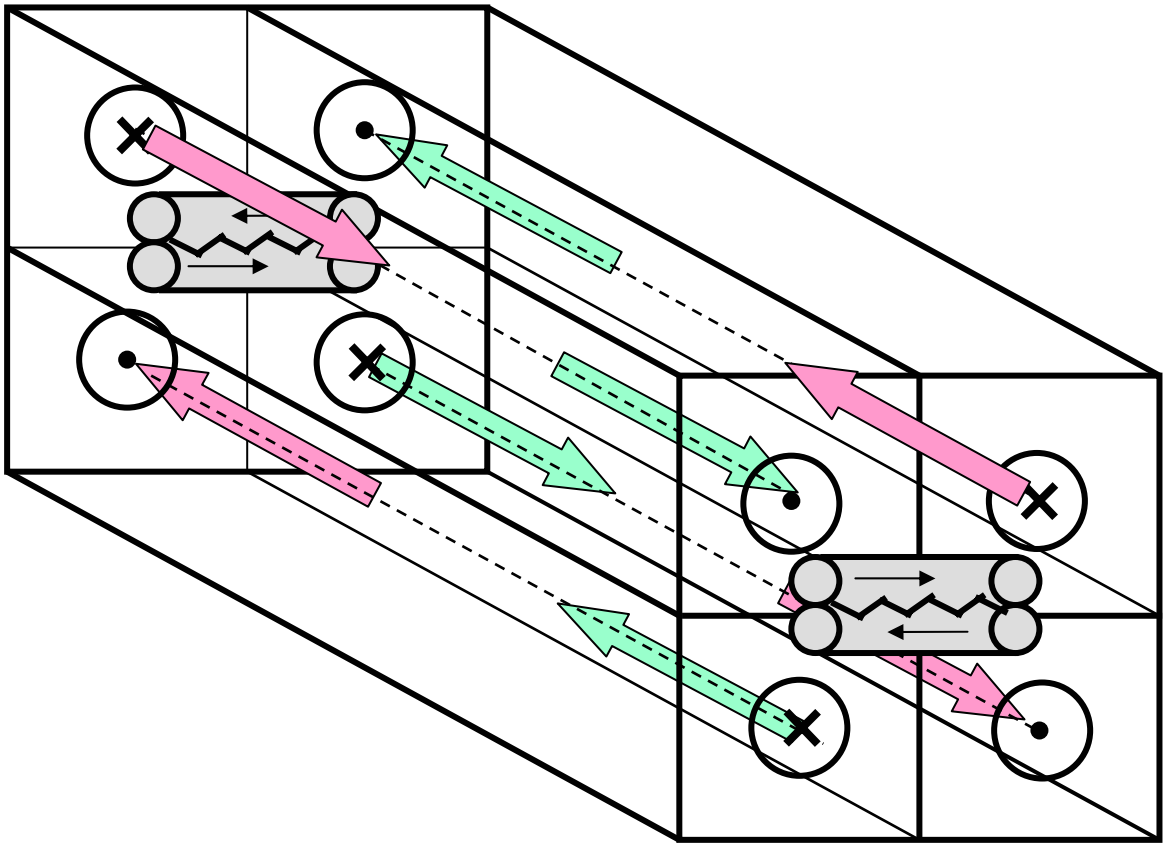
Poly-system

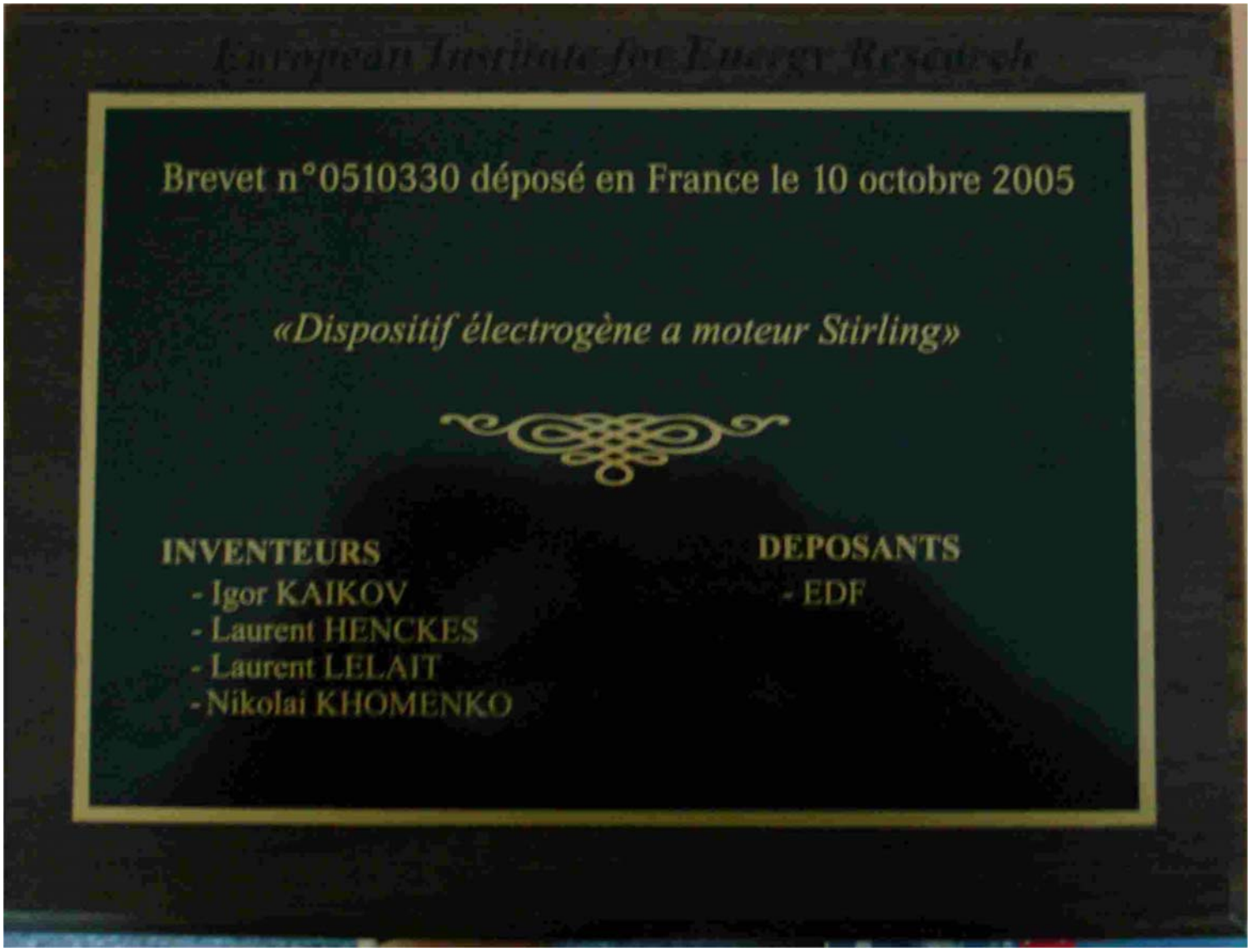
Function of the Regenerators in SE to accumulate heat energy in order to warm up cold gas during the cycle.

Regenerator could be eliminated if there is no need to accumulate heat.

It is possible if hot gas go through heat exchange and heat cold gas flow of other sterling engine.

Regenerator in 4 double SE

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Problem: An umbrella

Contradictions generated by known typical solutions:

An umbrella must be large in order to defend from the rain well;

but an umbrella must be small in order to prevent from wind break up.

An umbrella must have holes to prevent from wind break up.

but an umbrella must not have holes in order to defend from the rain well;

The more contradiction we discover,
the more precisely we will describe an MDR and satisfactory solution

Law of transition a system to a super-system

- Mono system

  - First mono-system: Small umbrella without holes.

  - Second mono-system: big umbrella with a big hole.

  Two partial solution we are not happy with…

- Double system.

  - What should be a double system?

  - How combine two the umbrellas into one system?

  Law of Evolution give us a direction to think of.

- New Mono system which is convergence (integration) of previous generation multi system.

  What it could be? Any ideas?

Solution: Big hole is covered by small umbrella and air could go through but rain not.

What should we do with Complex interdisciplinary problematic situations?

- Laws of Evolution is a powerful tool. However this laws often contradict to each other.
- Altshuller's System of Standards partially resolve this issue for engineering system.
- But what should be done when we faced with complex interdisciplinary problems?
- OTSM proposed Network of Problems. It work for networks of TRIZ laws as well as a networks of many other problems when we have system of problems linked to each other in many ways.

What was before the journey….

OTSM DEBUT IDEA BY ALTSHULLER

Altshuller's Paradigms for Non-Typical problem solving

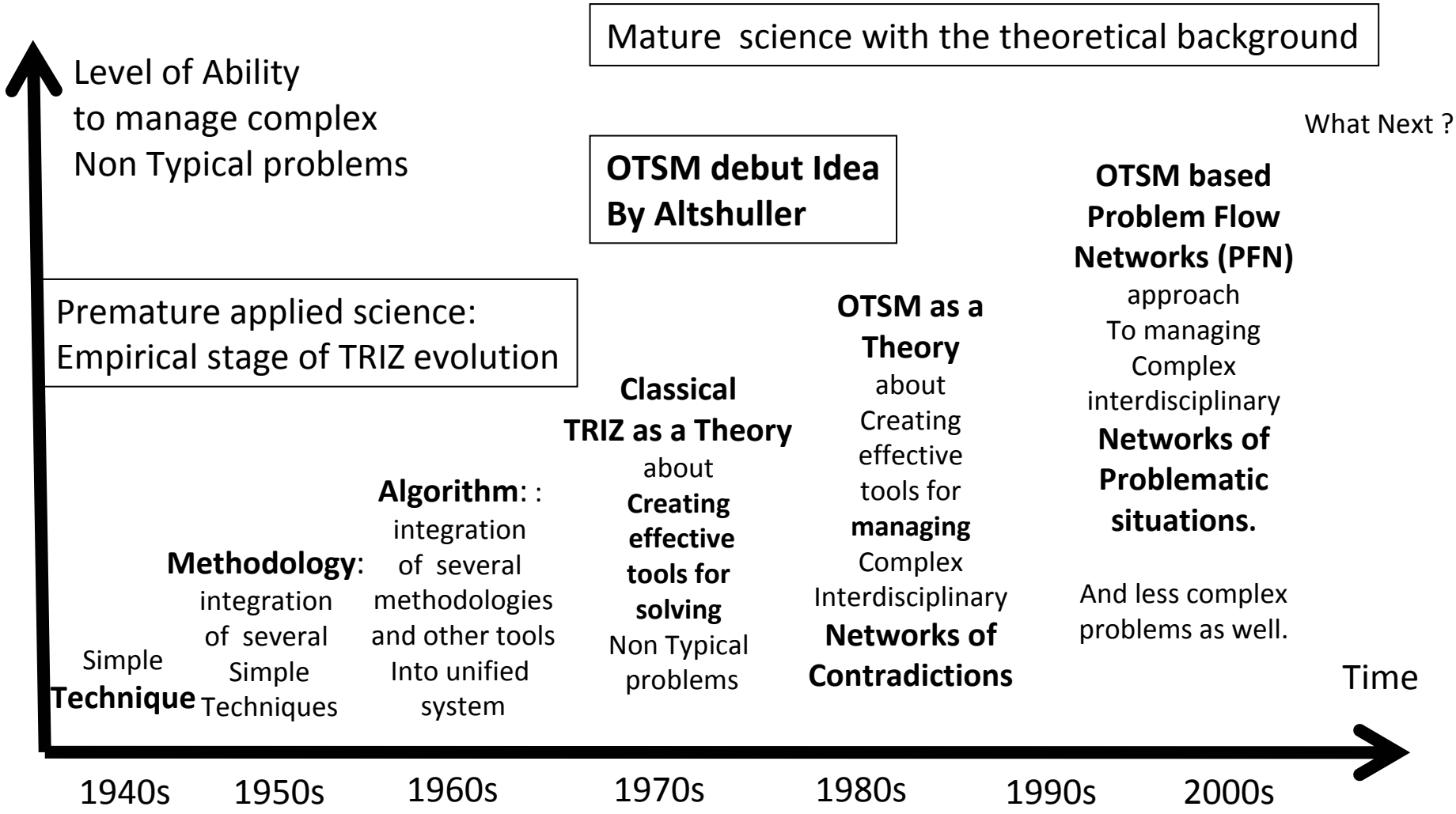
Altshuller's breakthrough for Classical TRIZ:

Just the best useful ideas should be generated. Evaluation should be objective and converged with idea developing process. Not looking for idea but develop it step by step according objective laws of engineering system evolution. Trials & Errors method is a catastrophe that regularly take away millions of lives. It should be eliminated.

Altshuller's breakthrough for OTSM:

Now we have powerful instruments for engineering problem solving. It is time to make it universal - domain free. Available for everybody, not only engineers. It should be typical procedure for Non-Typical problem solving.

Evolution of Classical TRIZ from simple Technique to OTSM Problem Flow Networks (PFN) approach



What is OTSM?

- OTSM is a Russian acronym proposed by Genrich Altshuller to describe the next evolution of Classical TRIZ. The acronym can be translated into English as the “General Theory on Powerful Thinking”
- In the middle of 1970s G. Altshuller considered Classical TRIZ had matured as a theory about creating tools for solving technical creative (non-typical) problems.
- Mr. Altshuller proposed the idea to transition from Classical TRIZ to OTSM in the mid 1970‘s. Some background ideas for this transition were developed by him in the 1980‘s. Those ideas initiating the formal development of OTSM.
- Altshuller posed the question: “How should TRIZ be transformed from a theory for creating tools on solving technical problems into a domain-free theory for creating tools on solving complex generic problems?”

Altshuller's background ideas on OTSM

- There are infinite amount of square equations that describe many domain of human activity.
- Several hundred years ago solving a square equations was a very creative (non typical) problem.
  Today kids learn at school the universal routine procedure for solving square equation. They just transform particular equation into canonical form and apply canonical procedure. Even computer can do it without Human.
- ***Conclusion:***
  OTSM should be able to propose a domain free tool for presenting various kind of non typical problems into canonical form and propose routine procedure for solving the canonical problem. This routine procedure should activate hidden creative skills of the personality. Same as TRIZ tools do it for engineering problems.

Examples of Classical TRIZ and OTSM based tools that use various canonical forms (IF…):

- **If** something seems impossible to you,
  Then apply Altshuller's Gold Fish method procedure to discover contradiction that underlining the impossibility.
- **If** you can present problem as a system of contradictions according step 1.1. of ARIZ-85-C
  Then apply ARIZ to develop a solution.
- **If** even after Gold Fish method you still have difficulties to present your problem as a step 1.1. of Altshuller's ARIZ
  Then apply OTSM Express analysis to present your problem as a step 1.1. of Altshuller's ARIZ.

Comment:

All of these tools devoted to the particular case presented after the word **IF**

We need the better universal tool.

What kind contradiction we have to overcome to create theoretical background for creating universal (domain free) tools for solving non typical problems? Let think together.

Just to remind you

CLASSICAL TRIZ AS AN APPLIED SCIENTIFIC THEORY FOR CREATING TOOLS THAT AVOID US MAKE LOT OF TRIALS AND ERRORS WHILE SOLVING NON TYPICAL PROBLEMS.

A Structure of an applied scientific theory

In general	TRIZ according Altshuller's standing point
1. The key problem or contradiction to be solved by the applied scientific theory	How narrow area of research and avoid useless trials and errors when we develop an appropriate solution for our non typical problem?
2. Postulates or axioms of the theory: Key assumptions were done to solve the key problems	First Postulate of Objective laws of systems evolution (1956). Second Postulate of Contradiction (1956) Third Postulate of the Specific Situation Context (1997)
3. Main models used by the theory. All other models can be derived from these main models.	A. Altshuller's Schema of powerful thinking to represent elements of the problem (4 axes). B. Four main models of a problem solving process: "Funnel" Model; "Tongs" Model; "Hill" model; Initial point of the "Problem Flow" Model.
4. Toolbox for practical needs. The more effective the toolbox the more effective the theory that underlining the tools.	A. Tool for solving NON typical problems – Altshuller's ARIZ-85-C. B. Tool for solving Typical problems – Altshuller's Inventive Standards

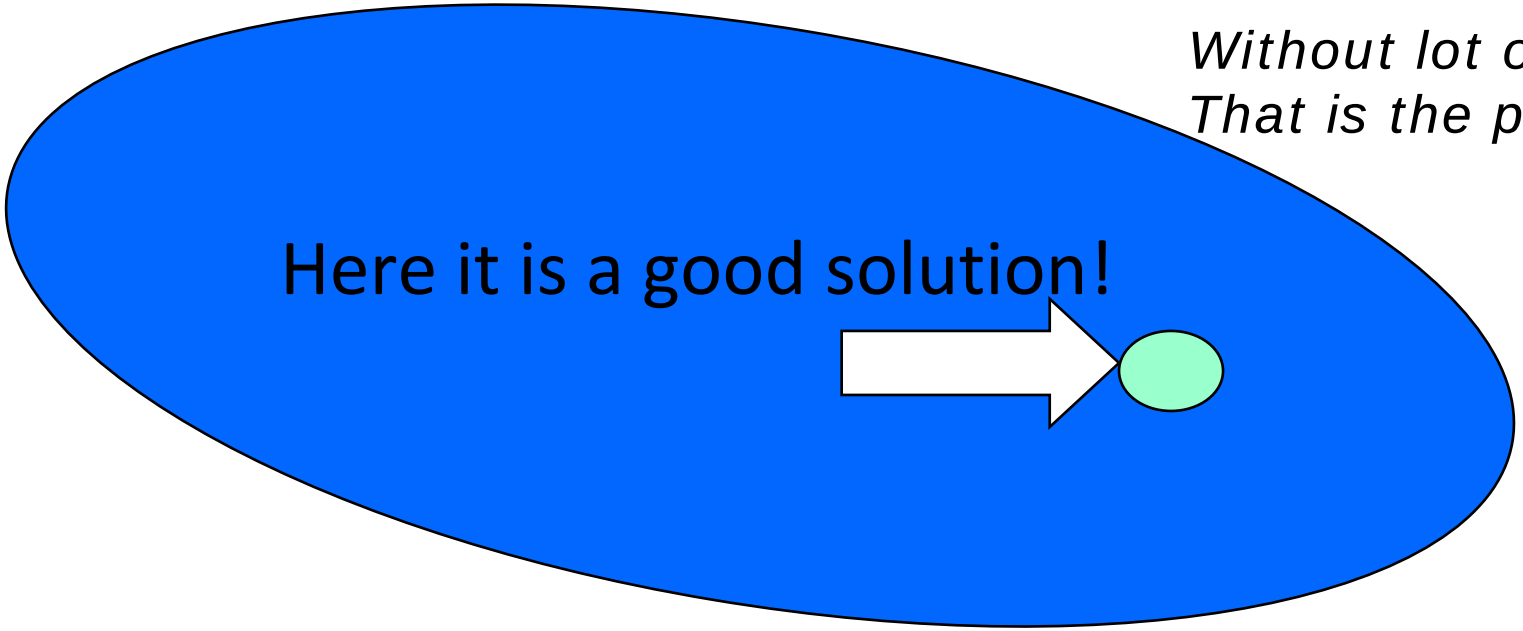
What for do we need applied science in general?

- First of all it helps to avoid expensive trials and errors.
- Second. It helps to make result better predictable.
- It allowed to switch from randomness to well formalized methodology and tools. It transform Creative problem into routine one.
- The more mature the theory the less randomness.
- As a result we obtain opportunity for work on even more difficult problems.
  Example in Art: Linear prospective.

End of Cycle of the Science evolution: Typical Solution

- Typical solutions could be learned and use without deep learning of the background knowledge.
- For many other profession in the past and present it was enough to be a good professional. Learn ones and use forever.
- Today we live in the world of accelerated rapid changes. New and new non typical problem appear. Typical solutions become out of date quicker and quicker.
- We need typical self-evolved procedure to handle non typical problem efficiently and timely: Science.

How could we understand where is good solutions without useless Trials & Errors ?



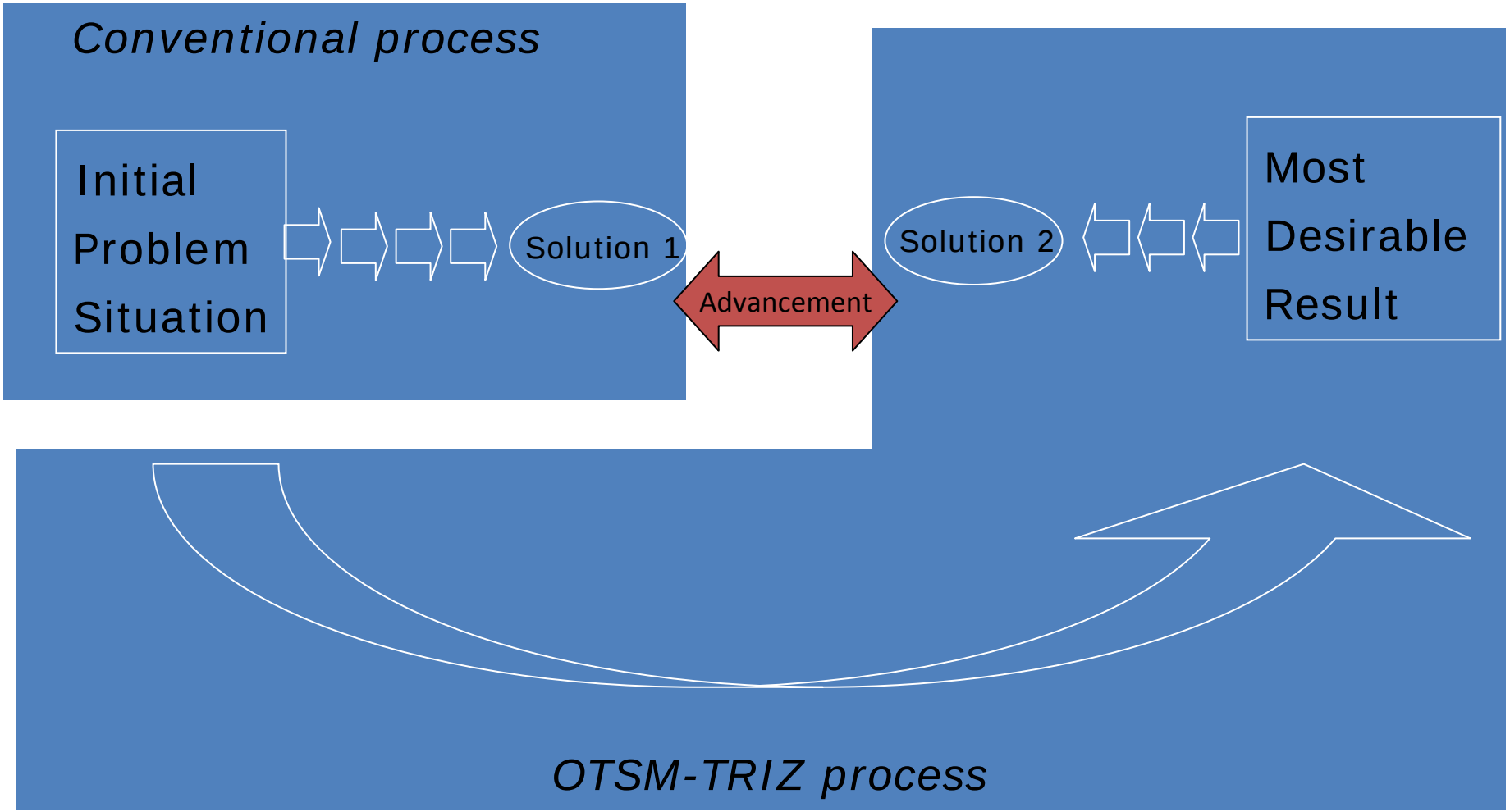
Without lot of trials…
That is the point!!!

In addition to contradiction model we could apply rule of exaggeration (intensification) of problem situation.
This combination of two rules could dramatically narrow research area to construct a solution by eliminating useless trials and focus on the most desirable result.

Example:

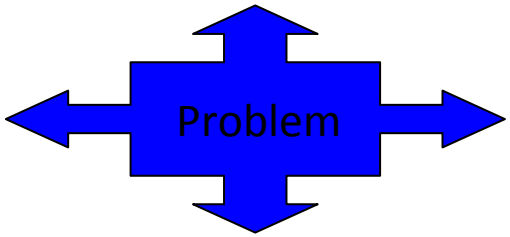
How to move branch of the regional library to a new building.

Why OTSM & TRIZ processes usually bring advanced solutions



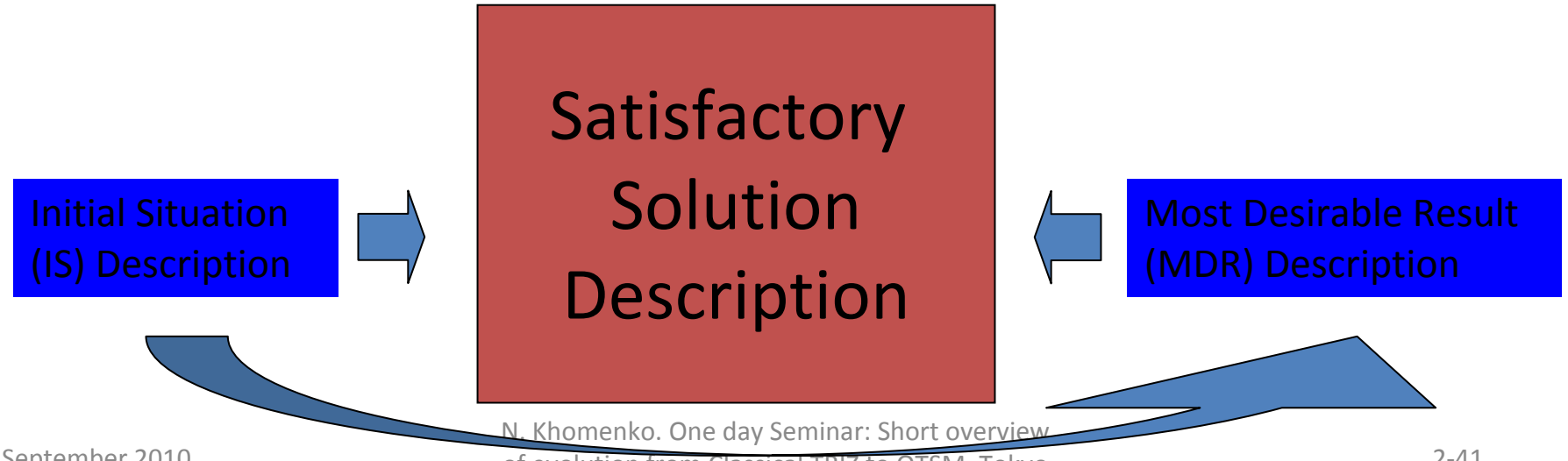
"There is no tail-wind for the sailing ship that have not idea where to go…."

Typical way of problem solving as well as Creative Problem solving Methods:
Generate as many ideas as you can in different direction!!!

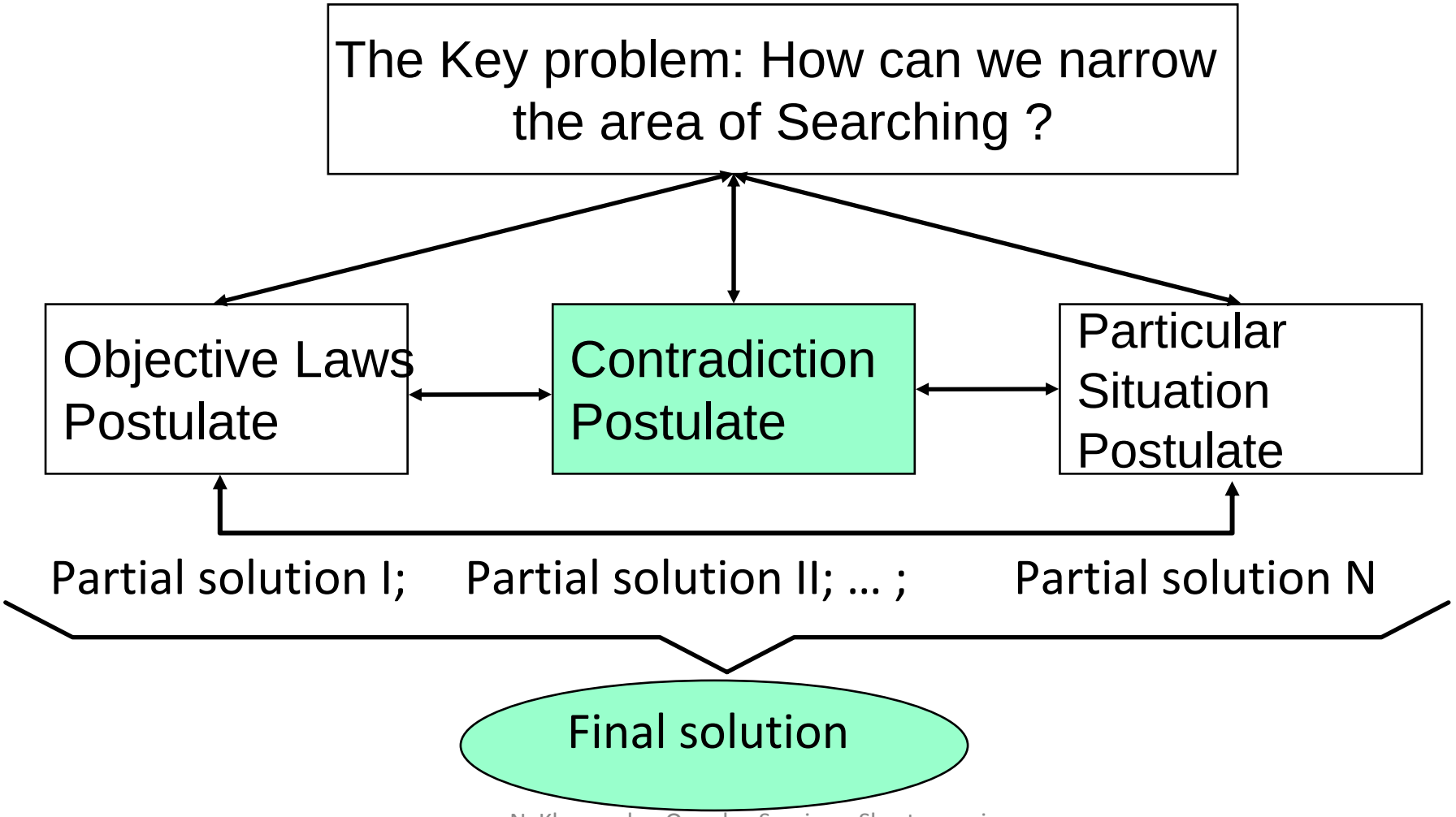


OTSM Problem solving process:
(oversimplified:
"Tongs" Mainstream)

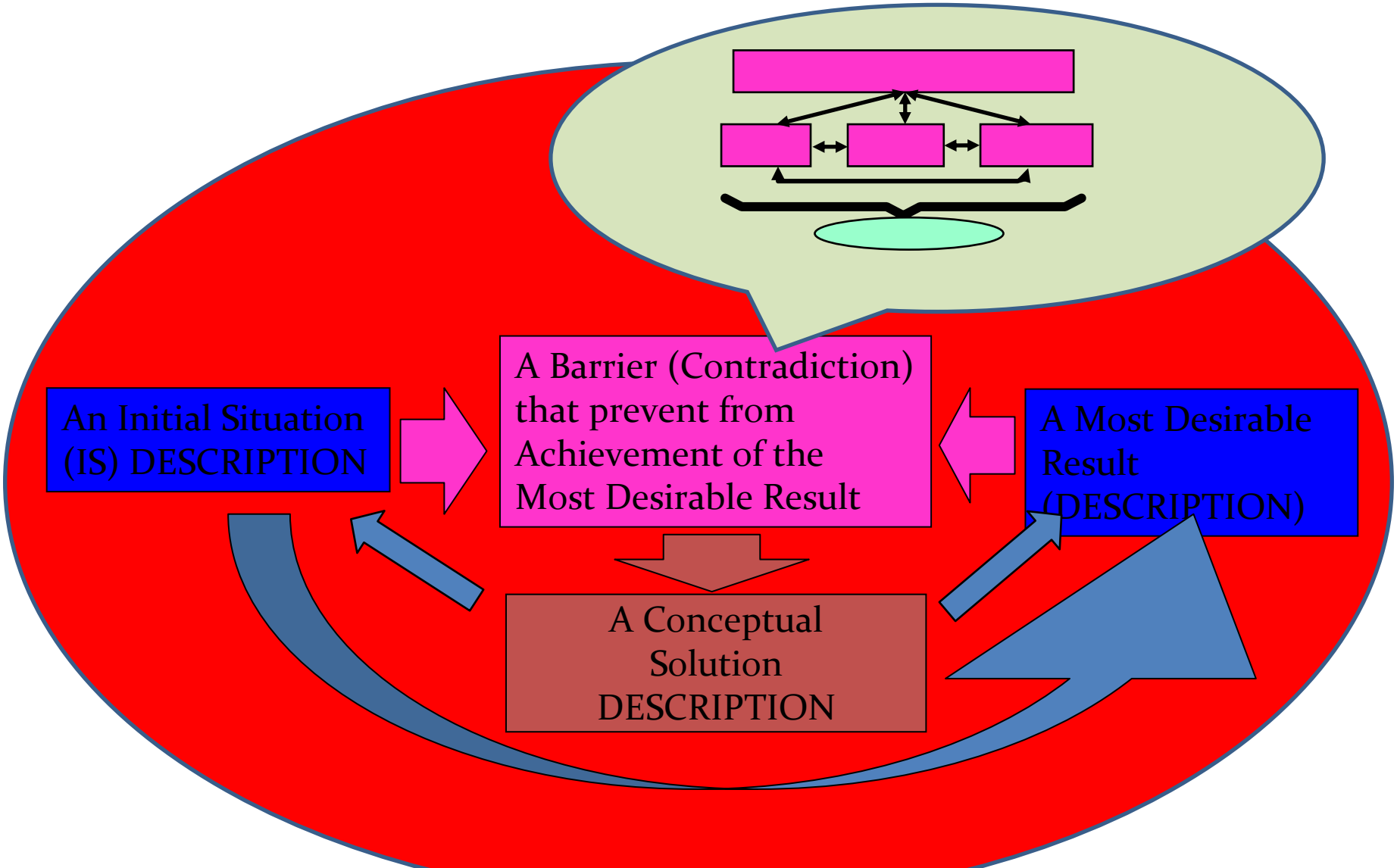
Step 1: Clarify Initial Situation Description (ISD).
Step 2: Clarify the Goal to be achieved (MDR).
Step 3: Identify Barrier between ISD and MDR.
Step 4: Eliminate the Barrier.



System of rules for solving "New Problem"



Complete “Tongs” Model



Example: Library's Problem

Small and not so reach Regional Library should move to a new building. Typical solution – rent several tracks – too much expensive.

What should be done?

Let do it together by using "Tongs" model.

What should be a structure of the new applied science?

Analogy with Classical TRIZ.

STARTING POINT OF THE JOURNEY FROM TRIZ TO OTSM

What is the Key problem to be solved by OTSM?

- In order to be universal the tool must be as general as possible.
  (Advice of IBM for better innovative company: THINK Bold and Wide).
- However general tools bring just general solutions. The ideas are so general that they are useless for practice.
  (See Advice of IBM for better innovative company).
- It means we need to develop specific tool to be useful for our specific case, but this tool can not be universal.

First Conclusion for OTSM development:

We need theoretical background to create universal (domain free) tool that can activate our creative skills in order to solve various Non typical problems and obtain appropriate solution useful for practices.

How the key problem was resolved in the course of OTSM evolution?

- General Watchband Principle of the Classical TRIZ :
  Each part of the system fulfill one demand but the system as a whole fulfill opposite demand.
  Example: Watchband.
- Specific Application of the principle for OTSM case:
  Each rule of the tool is as general as possible **BUT** the tool as a system of the rules provide appropriate satisfactory solution for the specific case.

Second Conclusion for OTSM development:

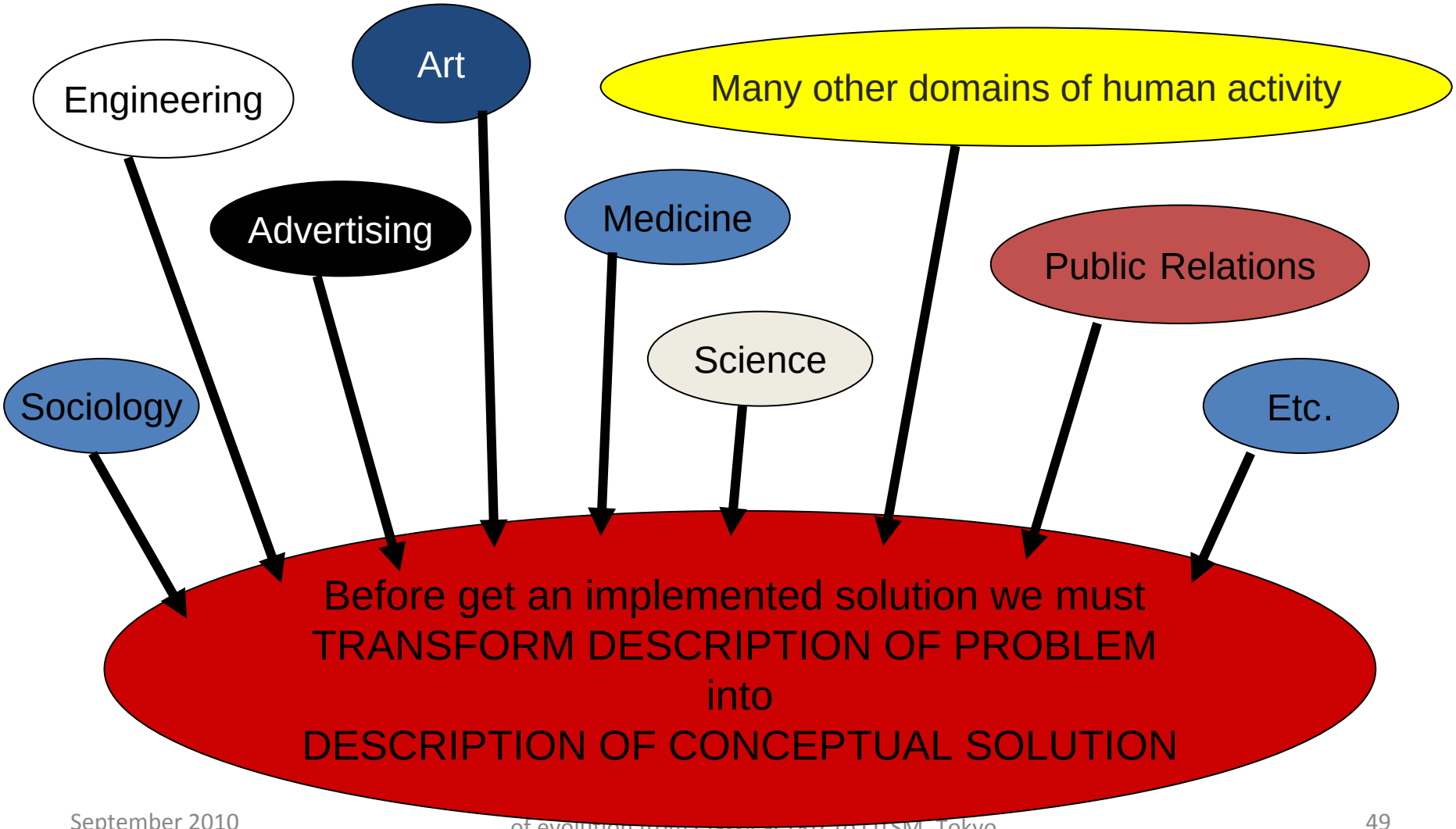
Image of the solution of the key problem.

To create a domain free tool we need a set of very generic rules, however we have to organize the rules into a system that will deliver a satisfactory solution useful for practice.

Understanding the core of the Canonical Procedure

WHAT CANONICAL PROBLEM UNDERLINING EVERY NON TYPICAL PROBLEM SOLVING PROCESS?

What do various problem solving processes have in common?



What do we do when we use the most universal 'Trials and Errors' method to solve particular problems?

1. Describe our initial problem in better and clear form.
2. Develop an image (description) of an appropriate satisfactory solution that suite our particular case.

Third Conclusion for OTSM Development:

Image of the Canonical Procedure:

OTSM theoretical background should be useful for transition from fuzzy initial situation description to a precise description of an appropriate satisfactory solutions.

Ideally without useless trials and errors at all!

Summary about Key Problem to be solved by OTSM:

First Conclusion for OTSM development:

We need theoretical background to create universal (domain free) tool that can activate Human creative skills in order to solve various Non typical problems and obtain appropriate solution useful for practices.

Second Conclusion for OTSM development:

Image of the solution of the key problem.

To create a domain free tool we need a set of very generic rules, however we have to organize the rules into a system that will deliver a satisfactory solution useful for practice

Third Conclusion for OTSM Development:

Image of the Canonical Procedure:

OTSM theoretical background should be useful for transition from fuzzy initial situation description to a precise description of an appropriate satisfactory solutions.

Paradox

- In order to solve a non typical problem we should not looking a solution. We should develop image of a Most Desirable Result, instead.
- OTSM Tools should be able develop more and more details for the MDR description.
- The process can be stopped when Image of MDR allowed us create precise description of a Satisfactory Conceptual Solution.

Next stop of the journey – OTSM Axioms

OTSM AXIOMS – THE MOST GENERAL RULES WE HAVE TO KEEP IN MIND WHEN USE OTSM TOOLBOX

OTSM Axiom of Descriptions (Models)

- For thinking process we use models (descriptions) of elements that we are thinking about but not element itself. In Turn: Each model just partially represent the element and produce mental barriers and restrictions for our thinking.

Main consequences for practice:

In order to solve problem we have to re-frame model of problem description to overcome mental inertia and obtain deep insight on the root of problematic situation.

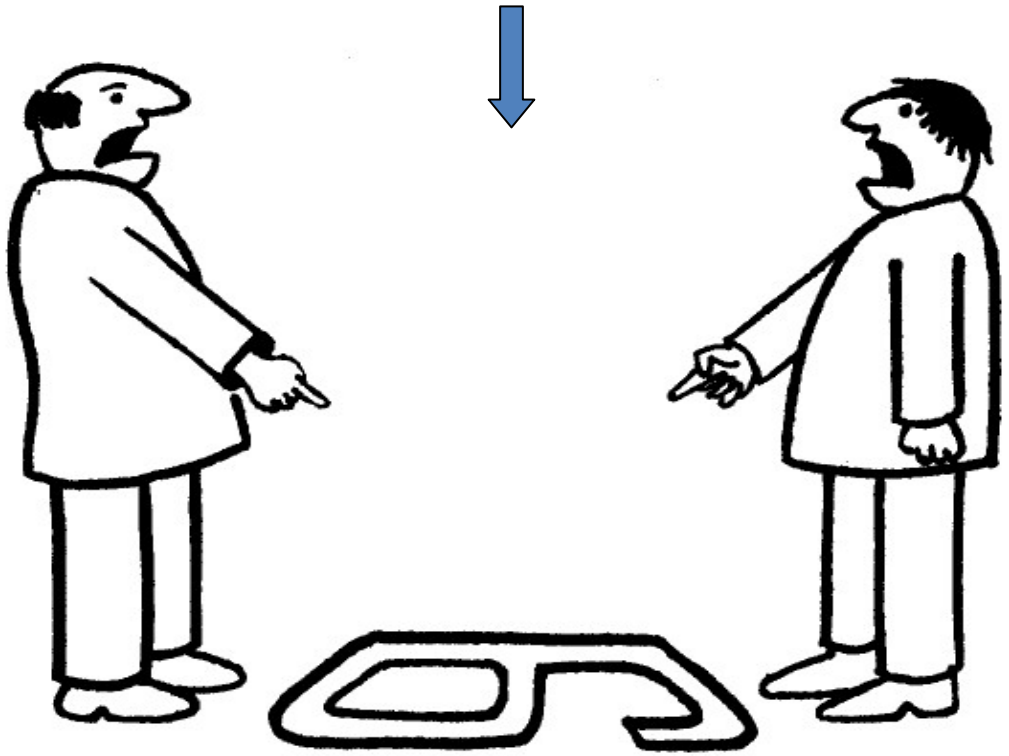
Comment:

An Appropriate Description of a problem is a description that could be helpful to simplify developing of a satisfactory conceptual solution description.

In fact an Appropriate Description of a problem depend on the instruments we use to develop description of a satisfactory conceptual solution.

Which Model is better?

Root-Cause of many Disagreements and problems:



Nobody wrong! Everybody describe their perception about something from their own standing point.
OTSM provide a solution - OTSM Network of Problems.

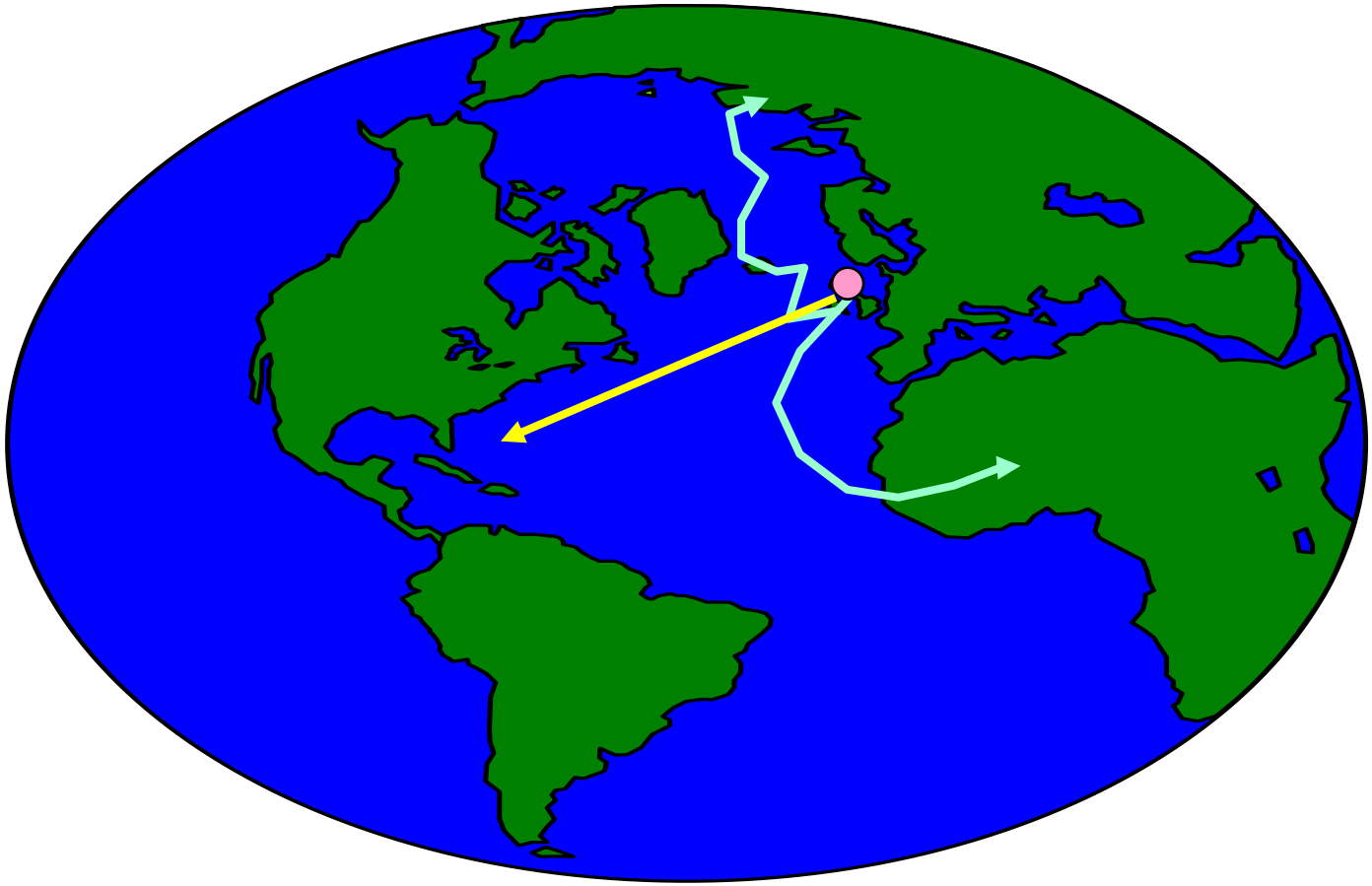
What makes a Problem Difficult?

…The problems that exist in the world today
cannot be solved by the level of thinking
that created them…
attributed to Albert Einstein

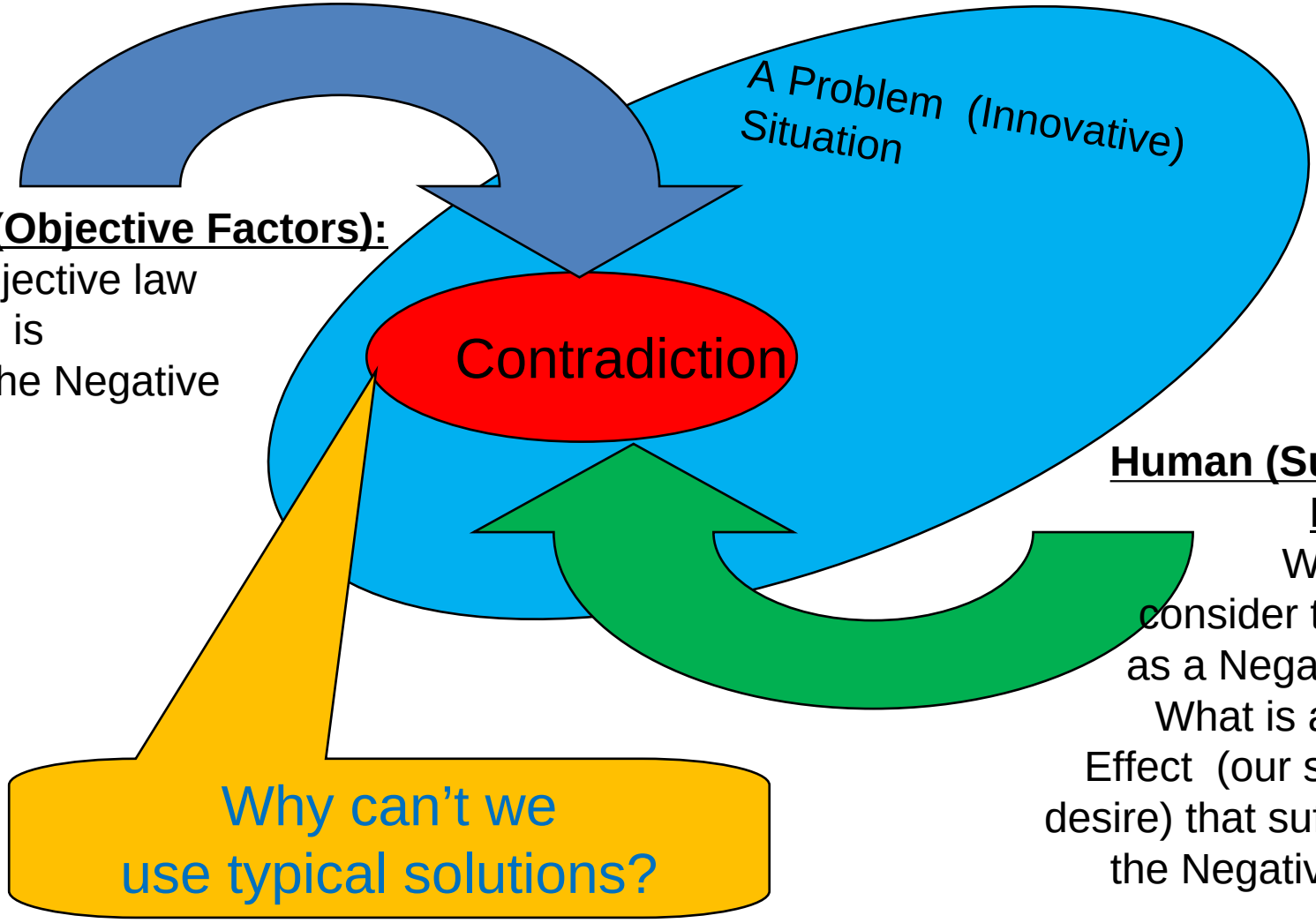
"Making knowledge workers productive
requires changes in basic attitude"
Peter Drucker
Management Challenges for the 21-st century.

Conclusion:
in the world of rapid changes we have to handle effectively Non-Typical problematic situations, i.e. we must change our way of thinking and change the basic attitude every time we faced with Non-Typical problem.
Developing those skills require very innovative – Non Linear Education.

To solve a difficult problem
(to discover new continent of our thinking)
we **must** use unusual ways of thinking



Art of Victory:
OTSM Axiom of the Core of our Problems



Nature (Objective Factors):
What objective law (factor) is behind the Negative Effect?

Human (Subjective Factors):
Why do we consider this effect as a Negative one? What is a Positive Effect (our subjective desire) that suffers from the Negative Effect?

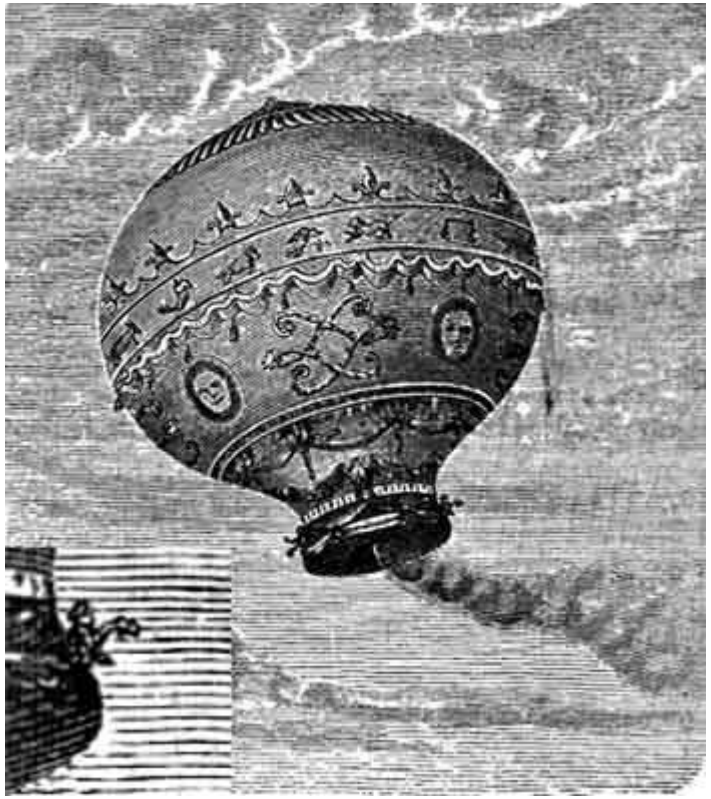
OTSM Axiom of Impossibility

When we think about problem solving we have to use descriptions that look impossible at first.

Conclusion for the problem solving:

- On certain stages of the problem solving process we have to forget about real word and let go of our imagination.
- On other certain stages we have to use “Golden Fish” Method for eliminating everything that seems impossible.

Conclusion: How can we “broke” Objective Law?



To “broke” particular objective law we have to recognize it and ….
Follow it!!! Just formulate and resolve the contradiction.
What produce negative effect will help us “eliminate” the effect.

Some more Examples:

- Example: Archimedes' Principle and floating piece of metal.
- Example: Flying Machines, Montgolfier, Airplane.
- Example: Marconi - cross continental Radio transmission. Opponent prove that it is impossible but… Ionosphere was forgotten and rediscovered.
- Example: Fuel Cell corrosion. Contact between oxygen and metal. We need contact with metal but we do not need it. What we need is free ions but not metal (solved). Or. All oxygen should react with Hydrogen. How it could be done (not solved yet)? New problems arise.
- Example: Ph.D. By Val Tsourikov. Opponent prove by mathematical science that it is impossible to speed up the algorithm for statistical analysis. Valery Tsourikov increase the speed up to 240 times in his Ph.D.

All eight OTSM Axioms

- Main Group:
  - Axiom of Descriptions (models)
  - Axiom of Process
- Axioms of Thinking:
  - Axiom of the core of any problem.
  - Axiom of impossibility.
  - Axiom of independent observers.
- Axioms of World vision:
  - Axiom of Unity
  - Axiom of Disunity
  - Axiom of Connectedness Unity and Disunity

OTSM Axiom of independent observers

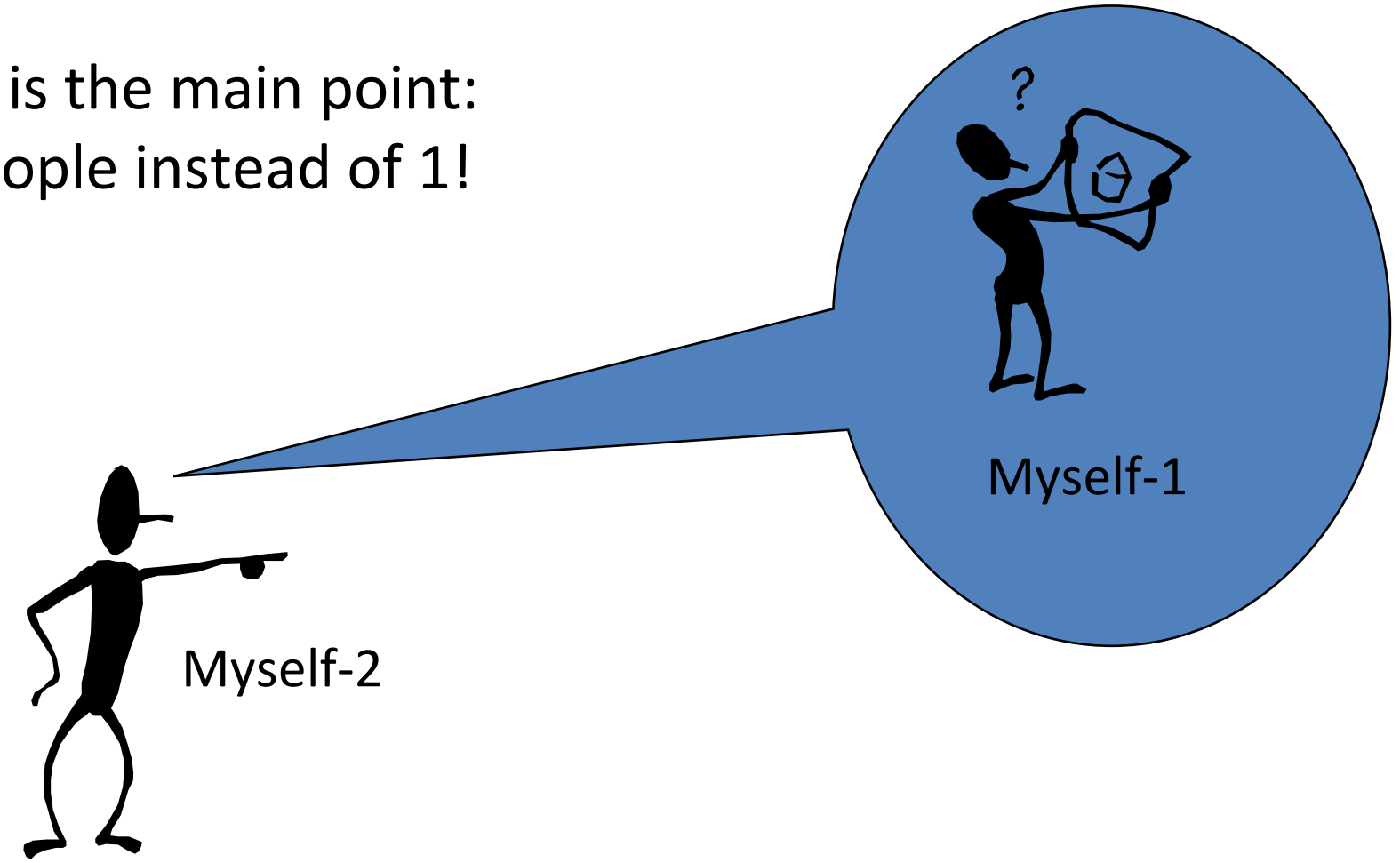
During problem solving process we have to stop and reflect all that was done before and what we are going to perform after. This reflection must be done from several points of view

Usually our Unconscious deliver concept solutions during reflection stage of problem solving process. That is why we have to perform reflection stages regularly.

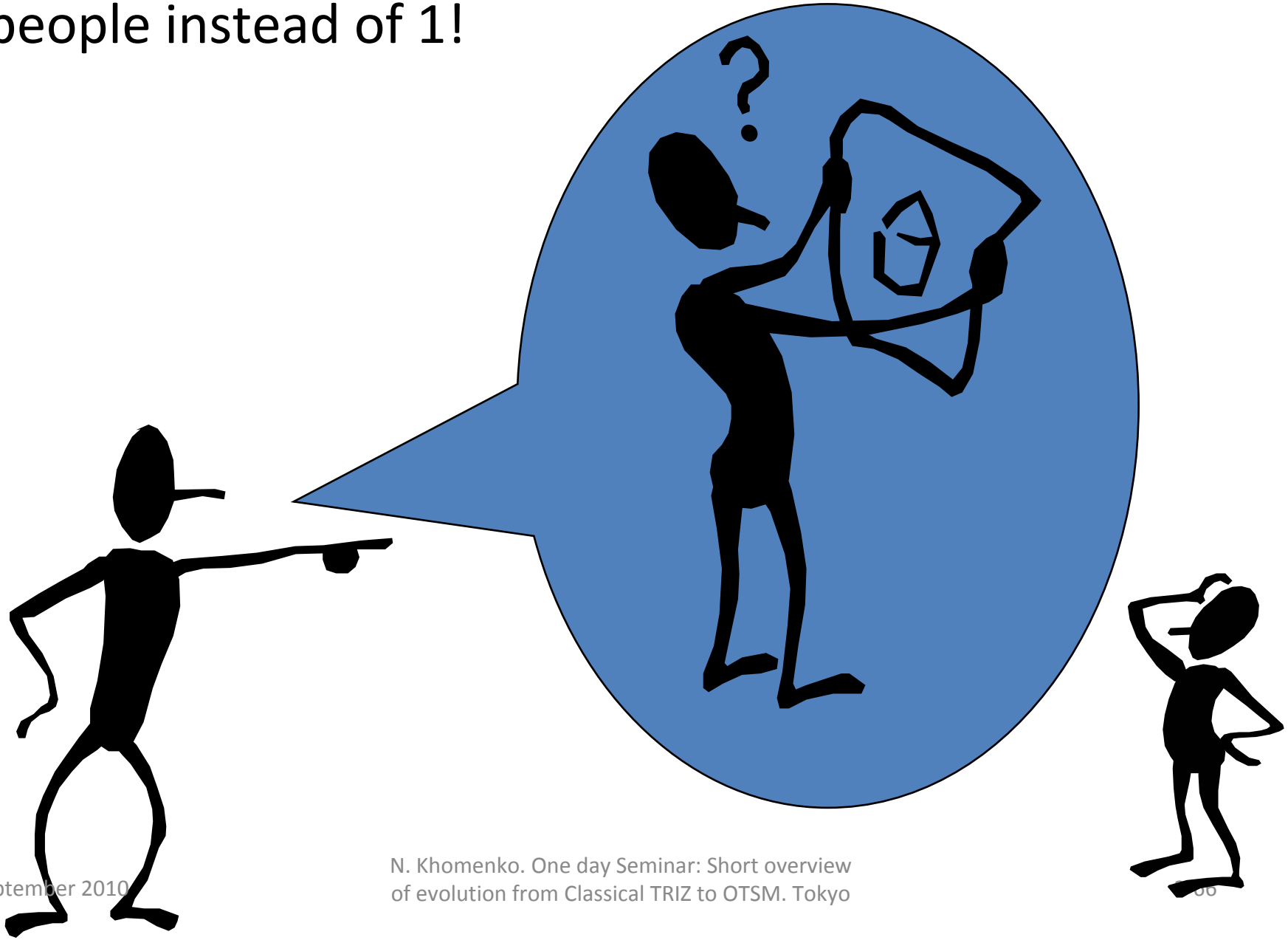
In case people or other alive beings appear as elements of a problematic situation we should try to make reflection from their point of view either.

OTSM Axiom of independent observers

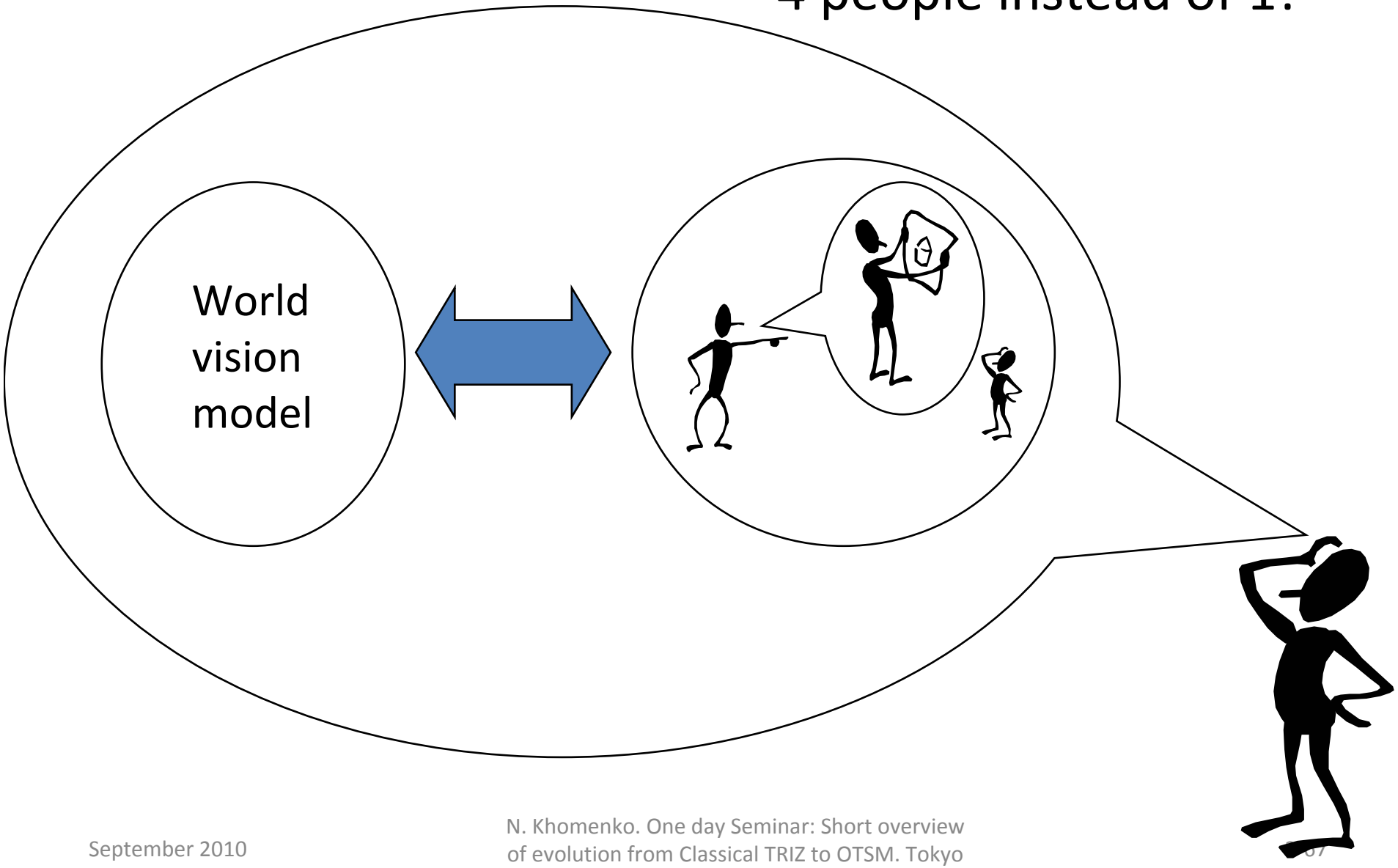
This is the main point:
2 people instead of 1!



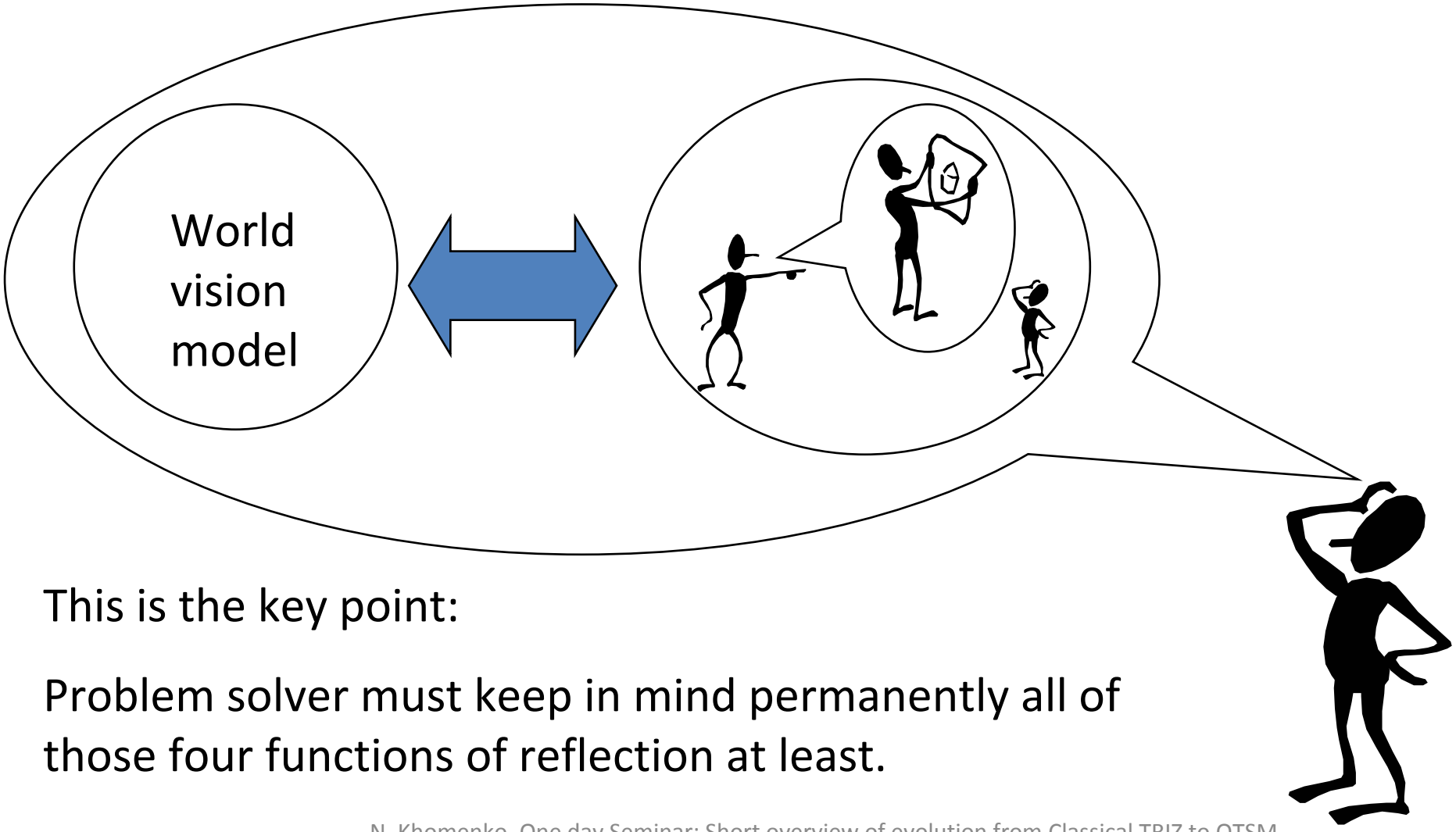
This is the main point:
3 people instead of 1!



This is the main point:
4 people instead of 1!



OTSM Axiom of independent observers



This is the key point:

Problem solver must keep in mind permanently all of those four functions of reflection at least.

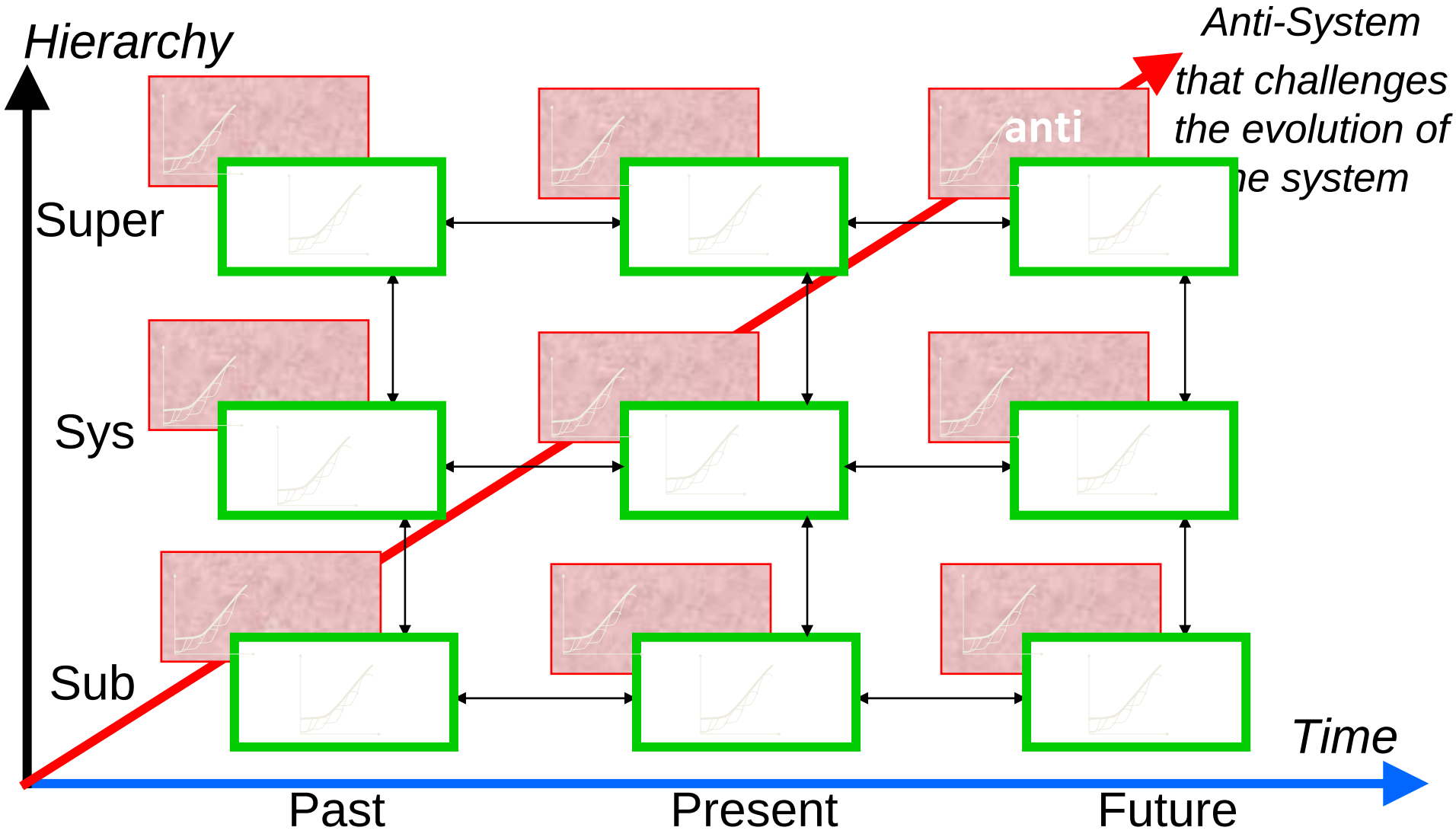
Next stop of our journey – Models of an applied theory

FUNDAMENTAL MODELS OF OTSM WE HAVE TO KEEP IN MIND WHEN WE USE OTSM TOOLBOX OR DERIVE NEW ONE FOR THE THEORY AND NEW TOOLS DEVELOPMENT

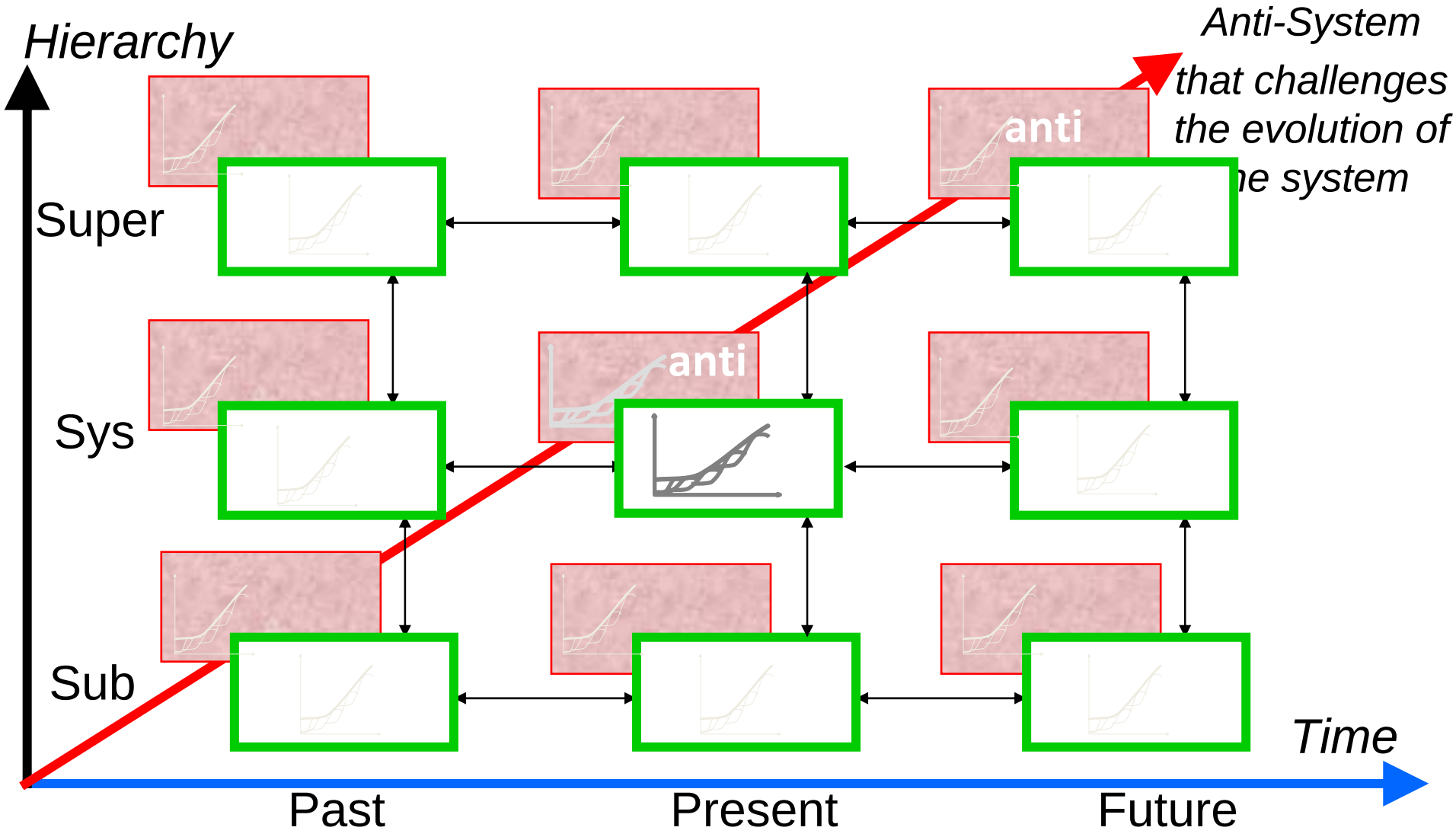
Fundamental OTSM Models

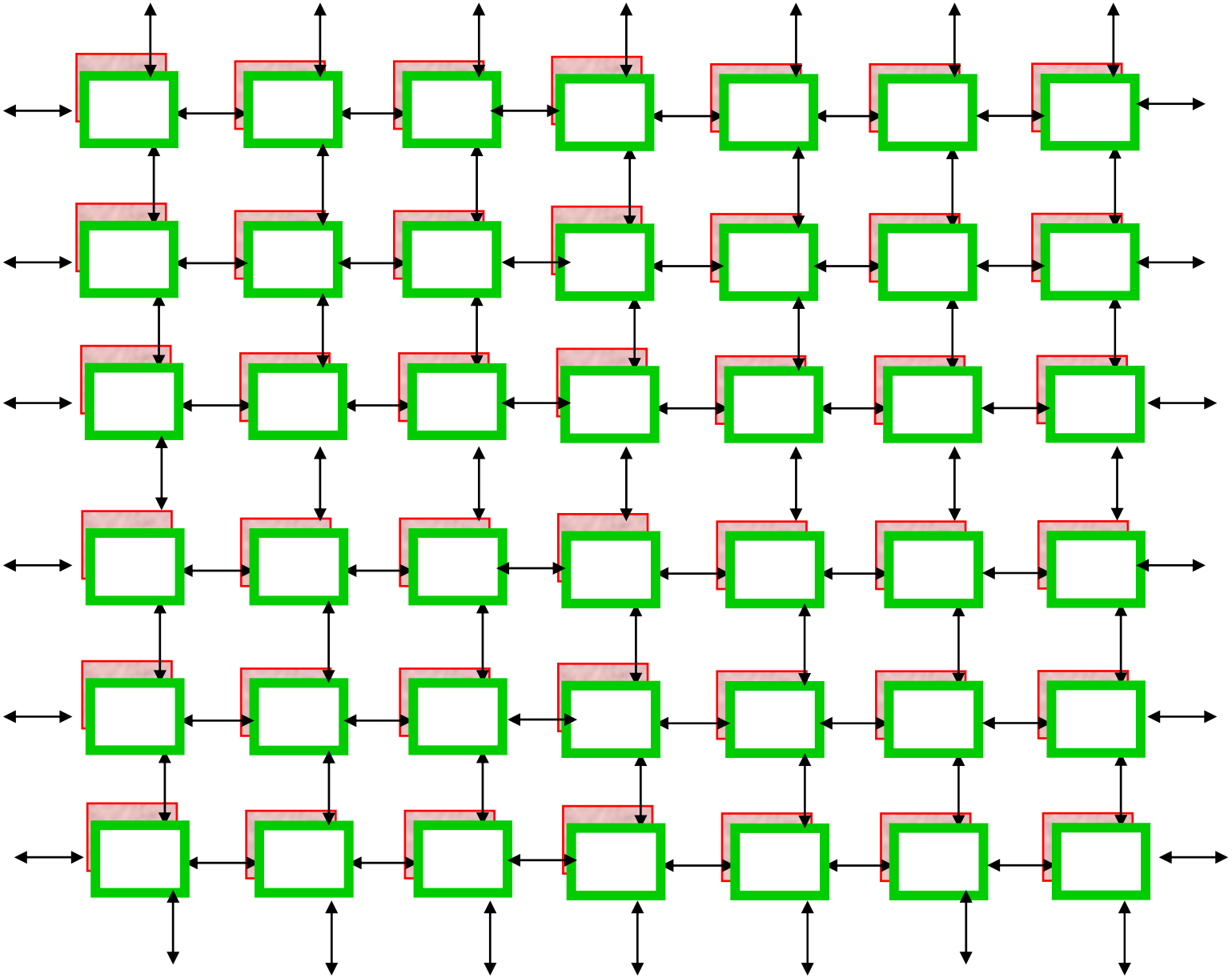
- Models for elements and systems description:
  - OTSM ENV Fractal Model.
  - OTSM advanced Schema for Powerful Thinking.
- Models of a problem solving process:
  - Advanced Problem Flow Model of ARIZ-85-C (all other four Classical TRIZ models Included).
  - OTSM Fractal Model (Integration of all previouse models of a problem solving process).

Classical TRIZ: Scheme of Powerful Thinking



Classical TRIZ: Scheme of Powerful Thinking

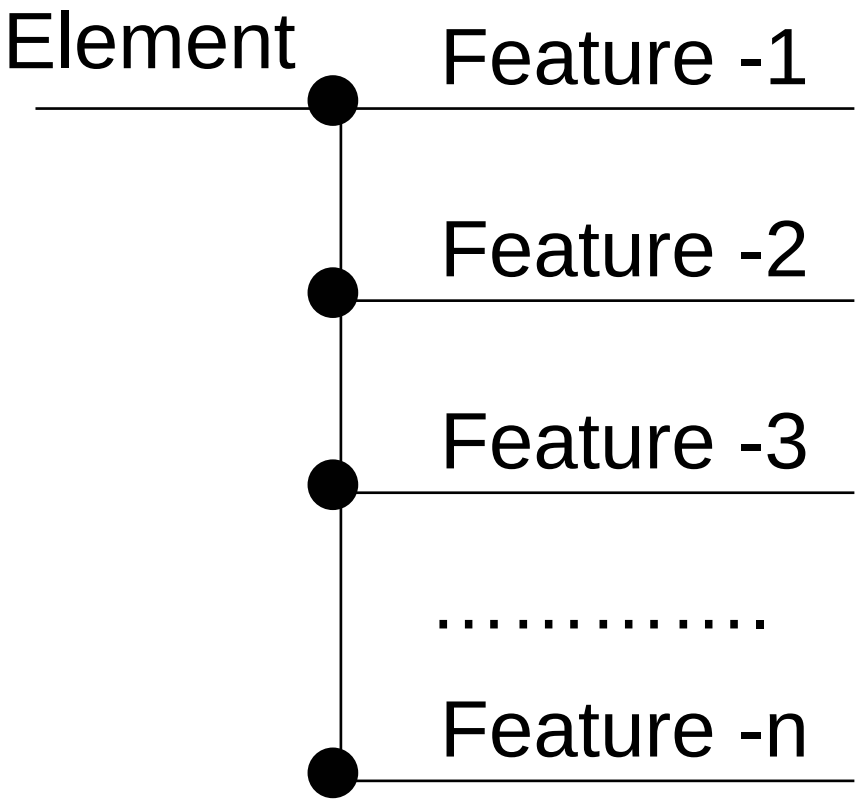




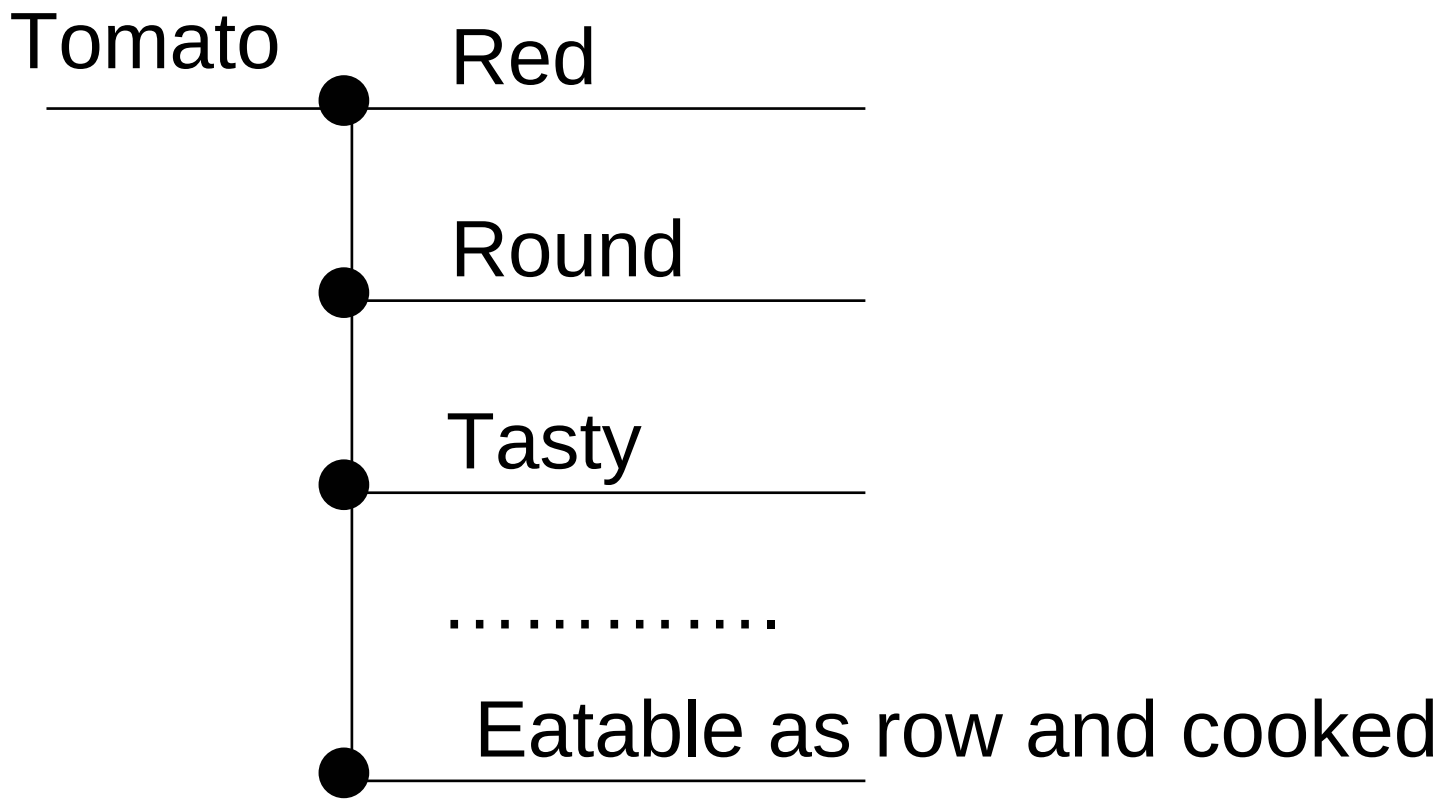
What model can we use to describe something?

OTSM ENV FRACTAL MODEL

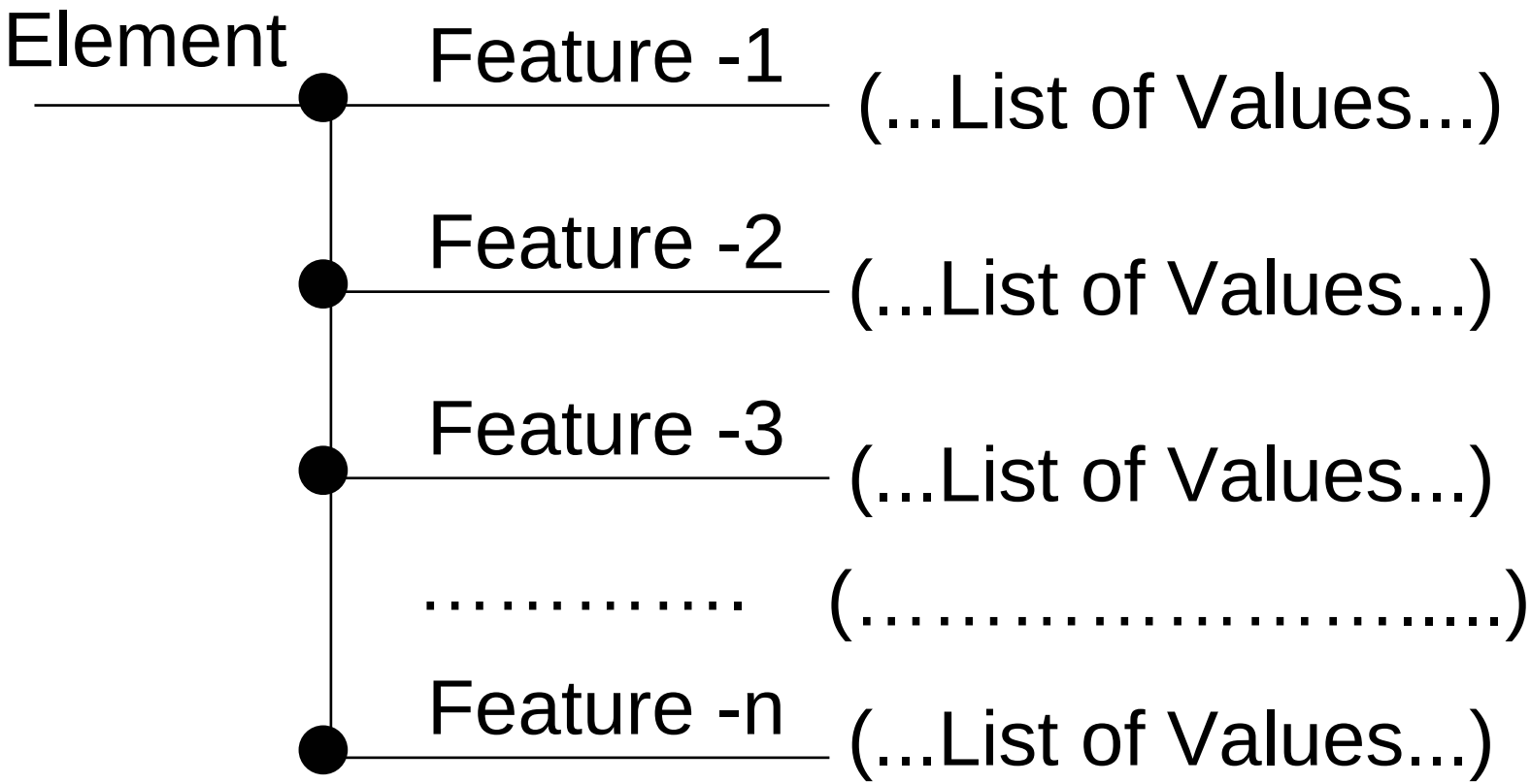
Common life usage:
Name of Element and List of its Features



Example:



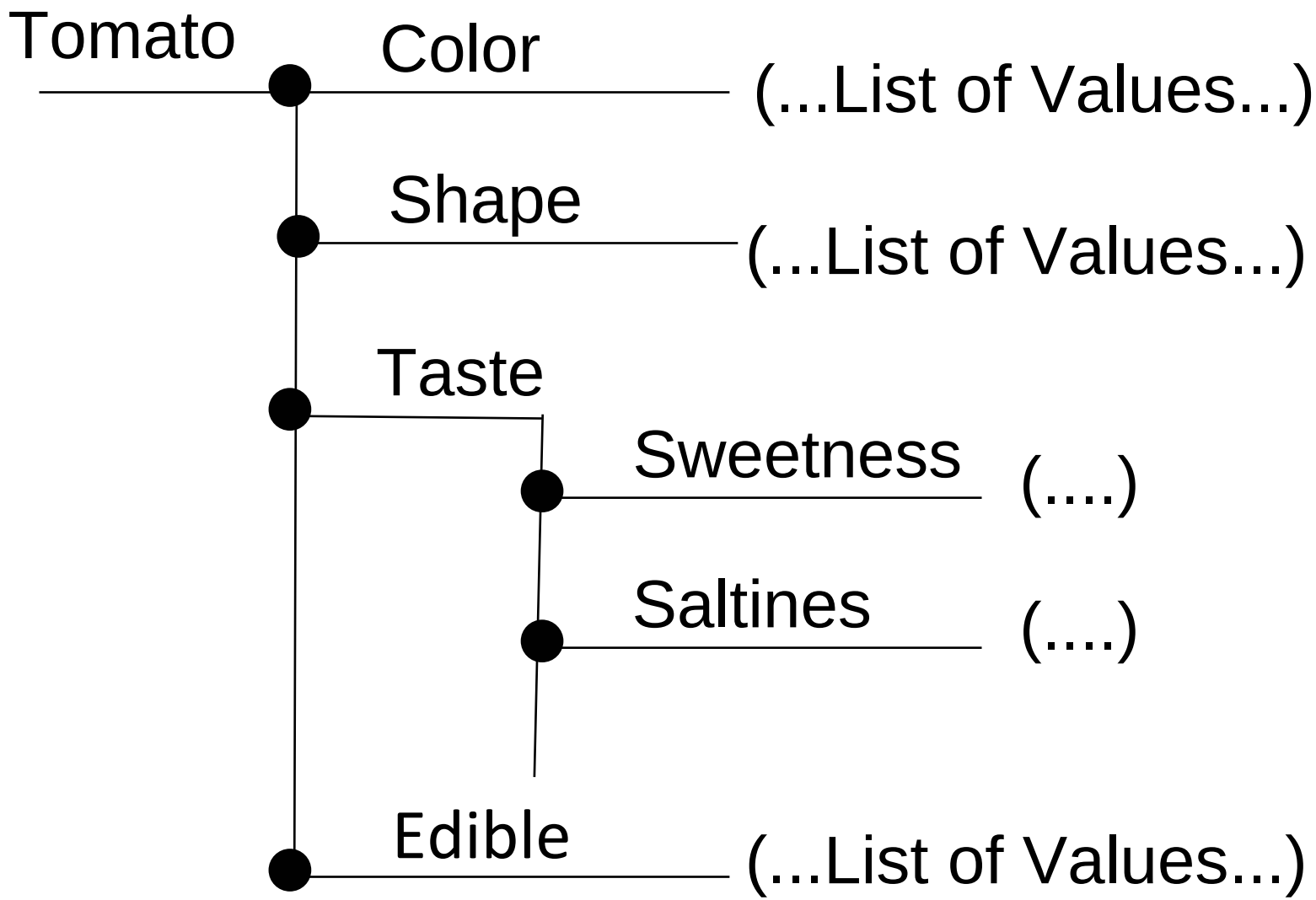
Model useful for problem solving: Element - Name – Value (ENV)



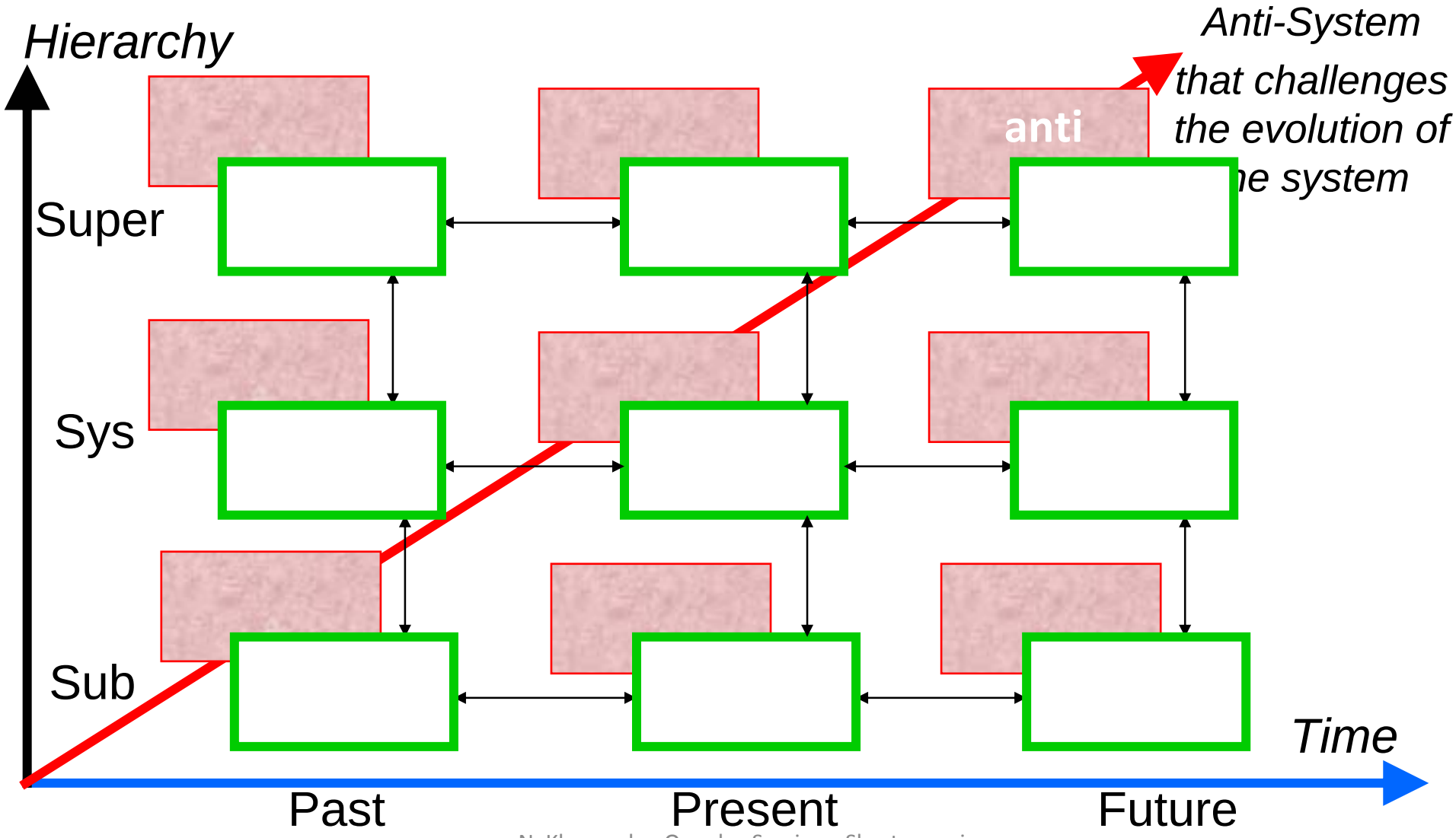
Example:


Tomato
Color
(...List of Values...)
Shape
(...List of Values...)
Taste
(...List of Values...)
.....
(.....)
Eatability
(...List of Values...)

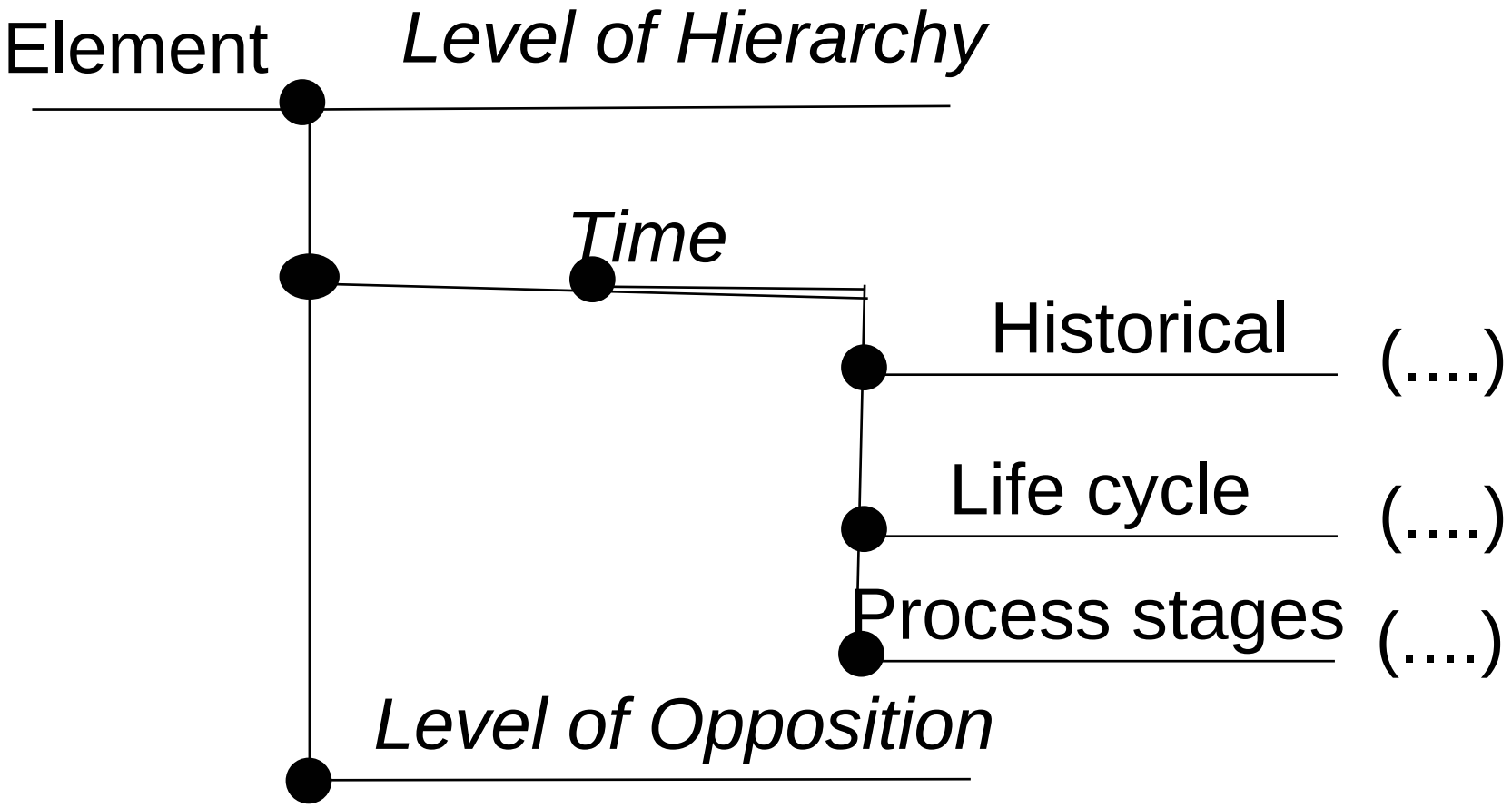
Fractal Example:



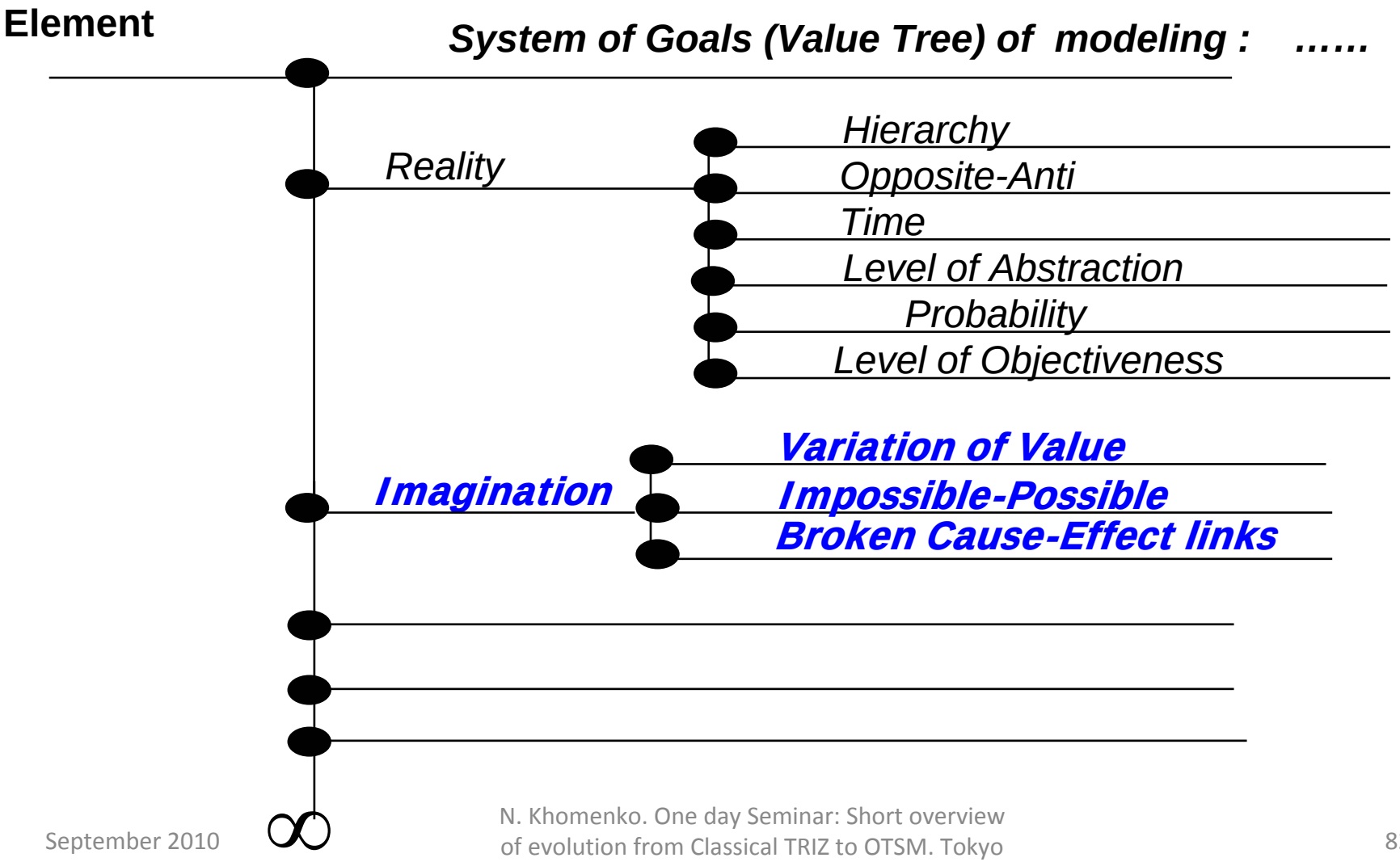
Altshuller's Scheme of Powerful Thinking



ENV Representation of Classical TRIZ System Operator

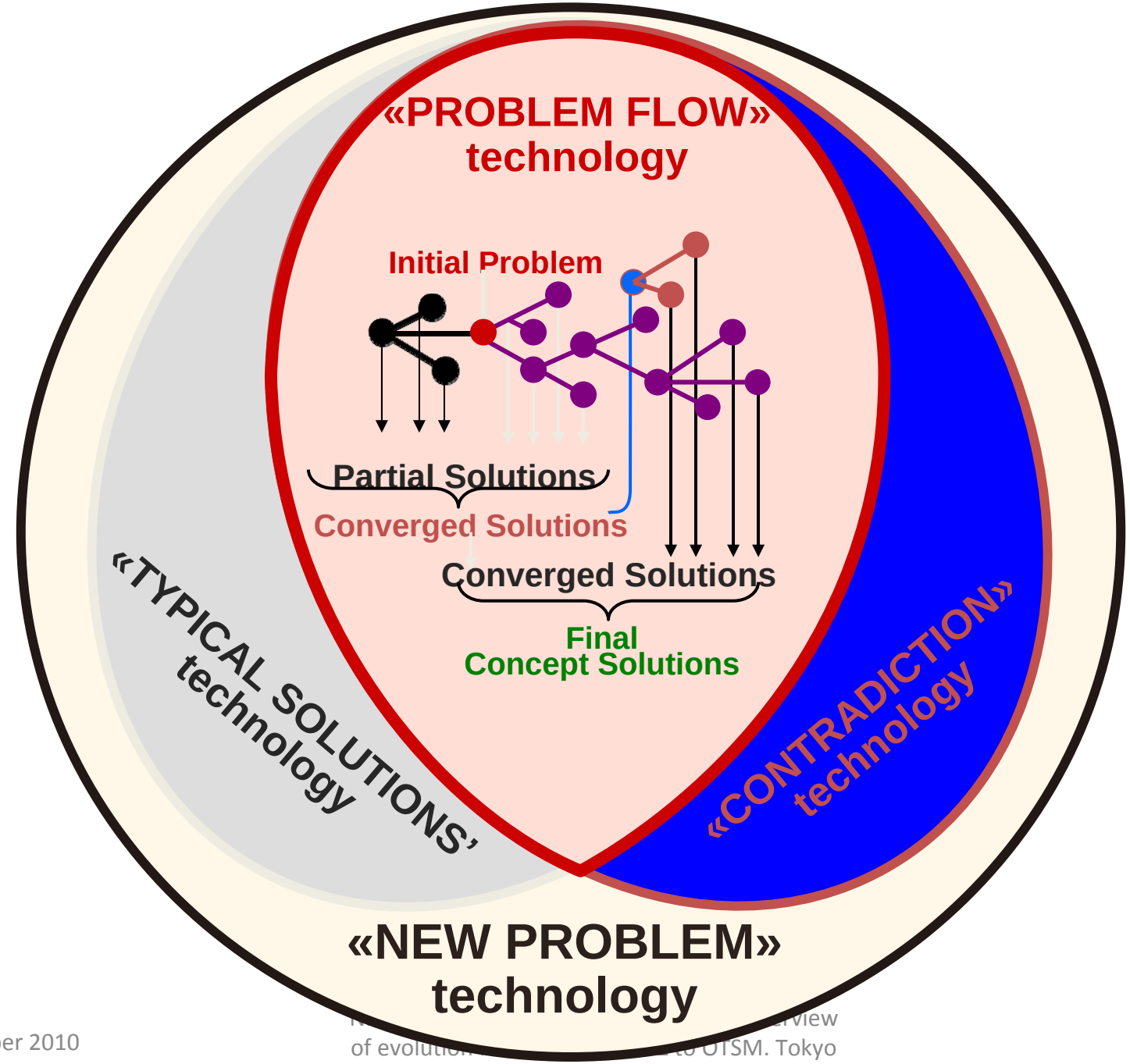


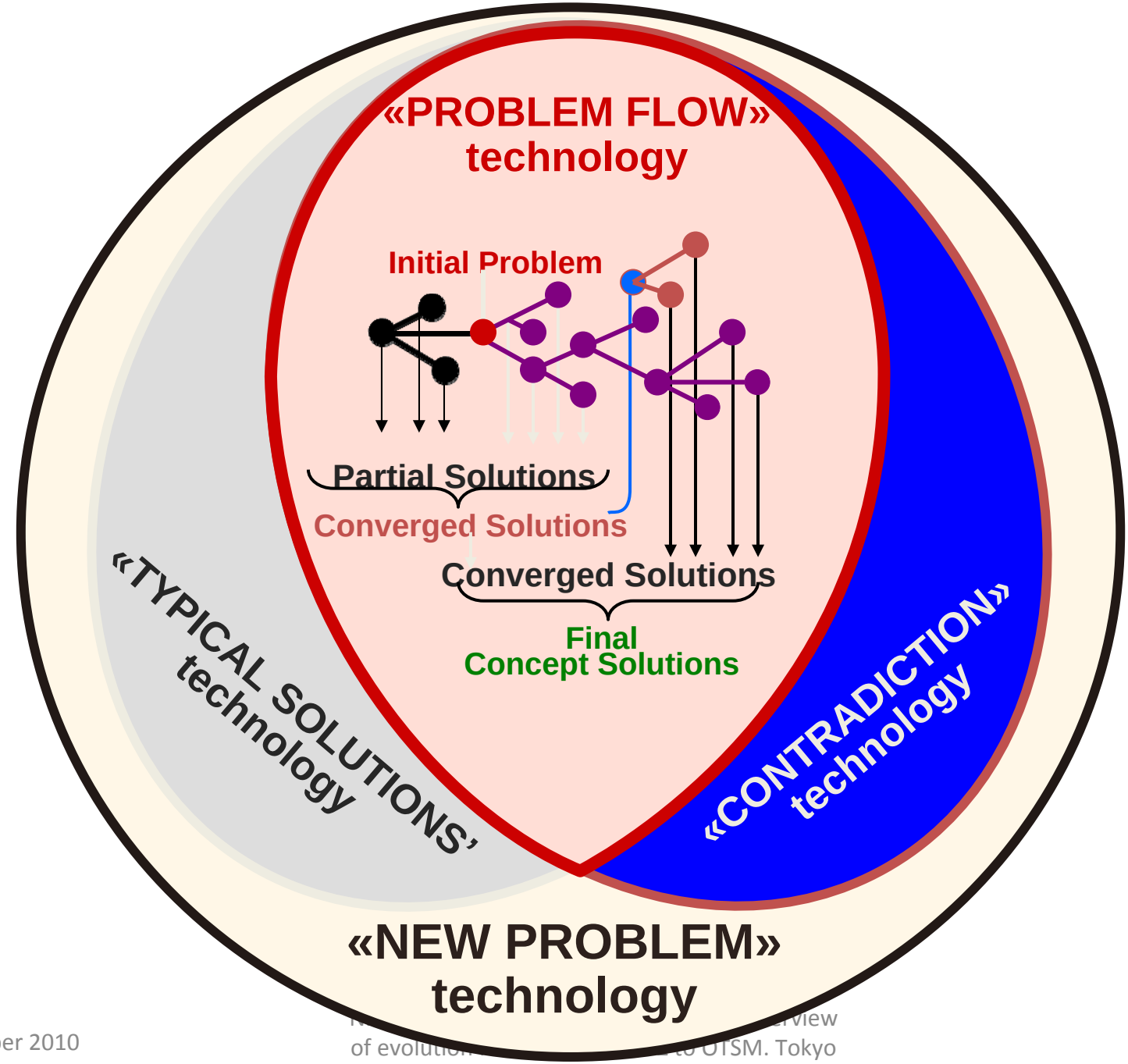
OTSM Advanced Schema of Powerful Thinking: Factors we have to keep in mind for successful problem solving process:



What make a problem difficult?

OTSM FRACTAL MODEL OF A PROBLEM SOLVING PROCESS


«PROBLEM FLOW» technology
Initial Problem
Partial Solutions
Converged Solutions
Converged Solutions
Final Concept Solutions
«TYPICAL SOLUTIONS' technology
«CONTRADICTION» technology
«NEW PROBLEM» technology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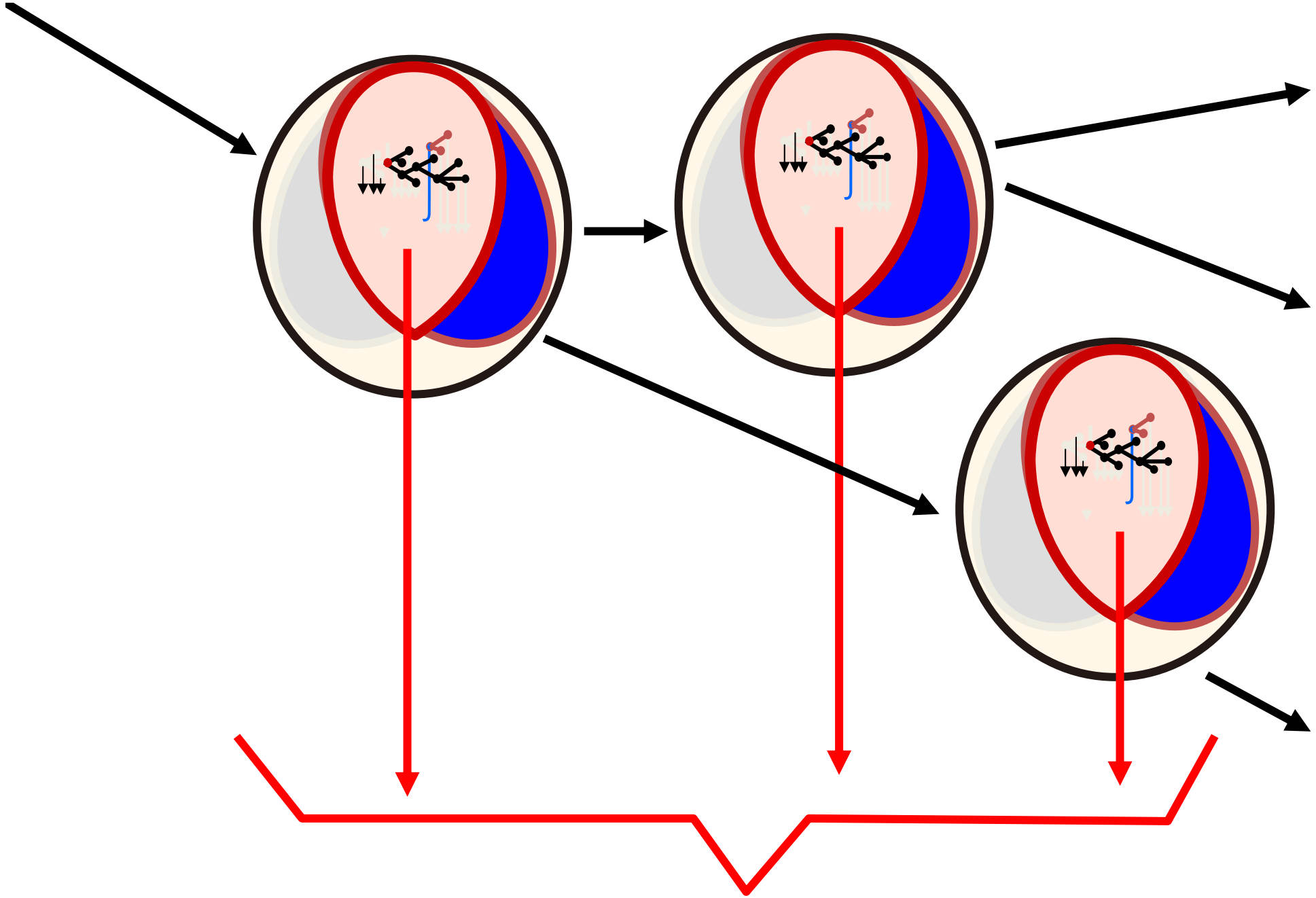


Next Stop – OTSM Toolbox.

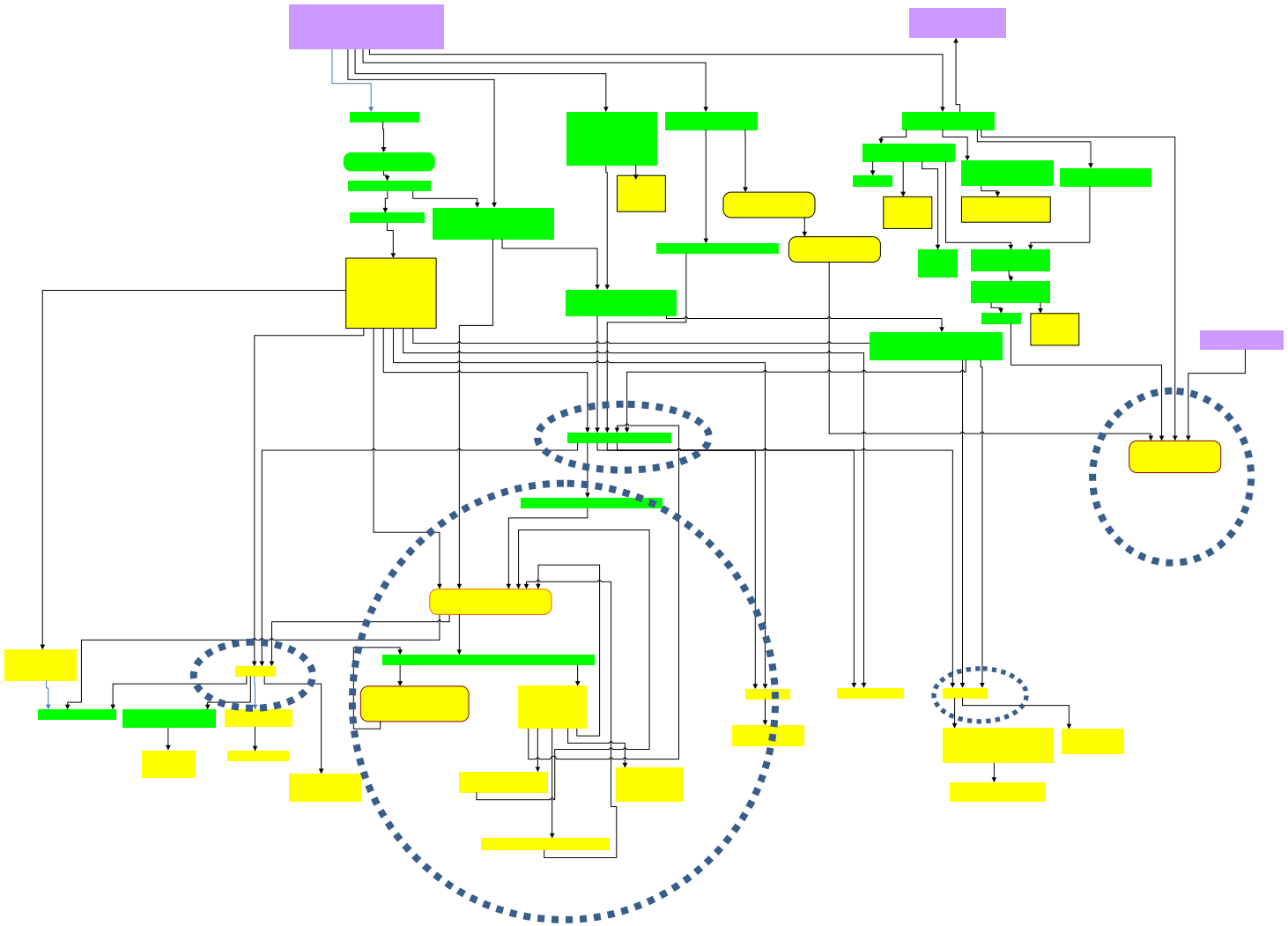
From problem solving to a problem flow managing

THE MOST GENERAL DOMAIN FREE TOOLS FOR COMPLEX INTERDISCIPLINARY PROBLEMATIC SITUATION MANAGING

Most general OTSM Based Tools:

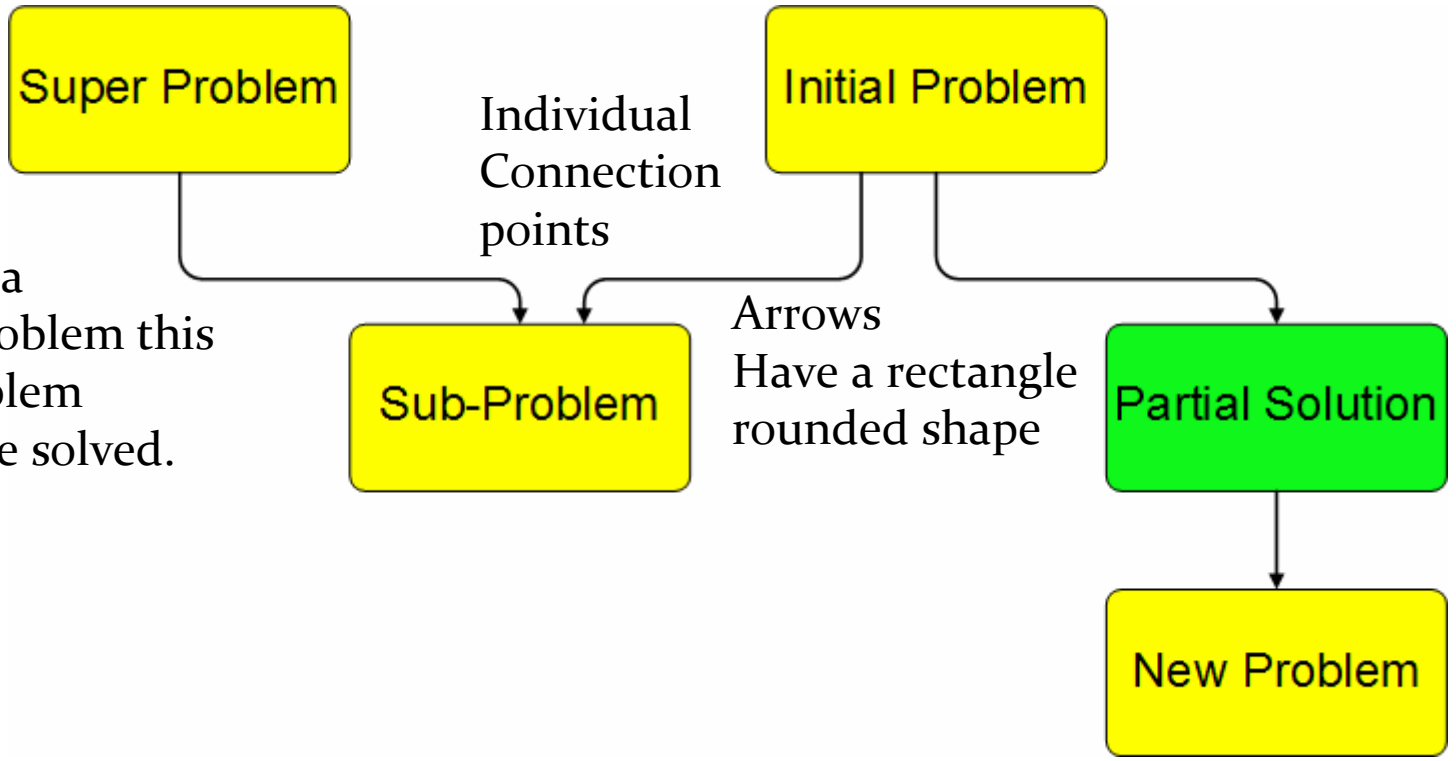
- First Generation - Four Main Technologies:
  - New Problem Technologies.
  - Typical Solution Technologies.
  - Contradiction Technology (based on ARIZ-85-C).
  - Problem Flow Technologies (based on ARIZ-85-C).
- Second Generation – Problem Flow Networks approach:
  - Network of Problems/Solutions
  - Network of Contradictions
  - Network of Parameters specific problem
  - Network of Parameters specific domain
  - Network of Parameters general

Example: Fragment of an Interdisciplinary Network of Problems



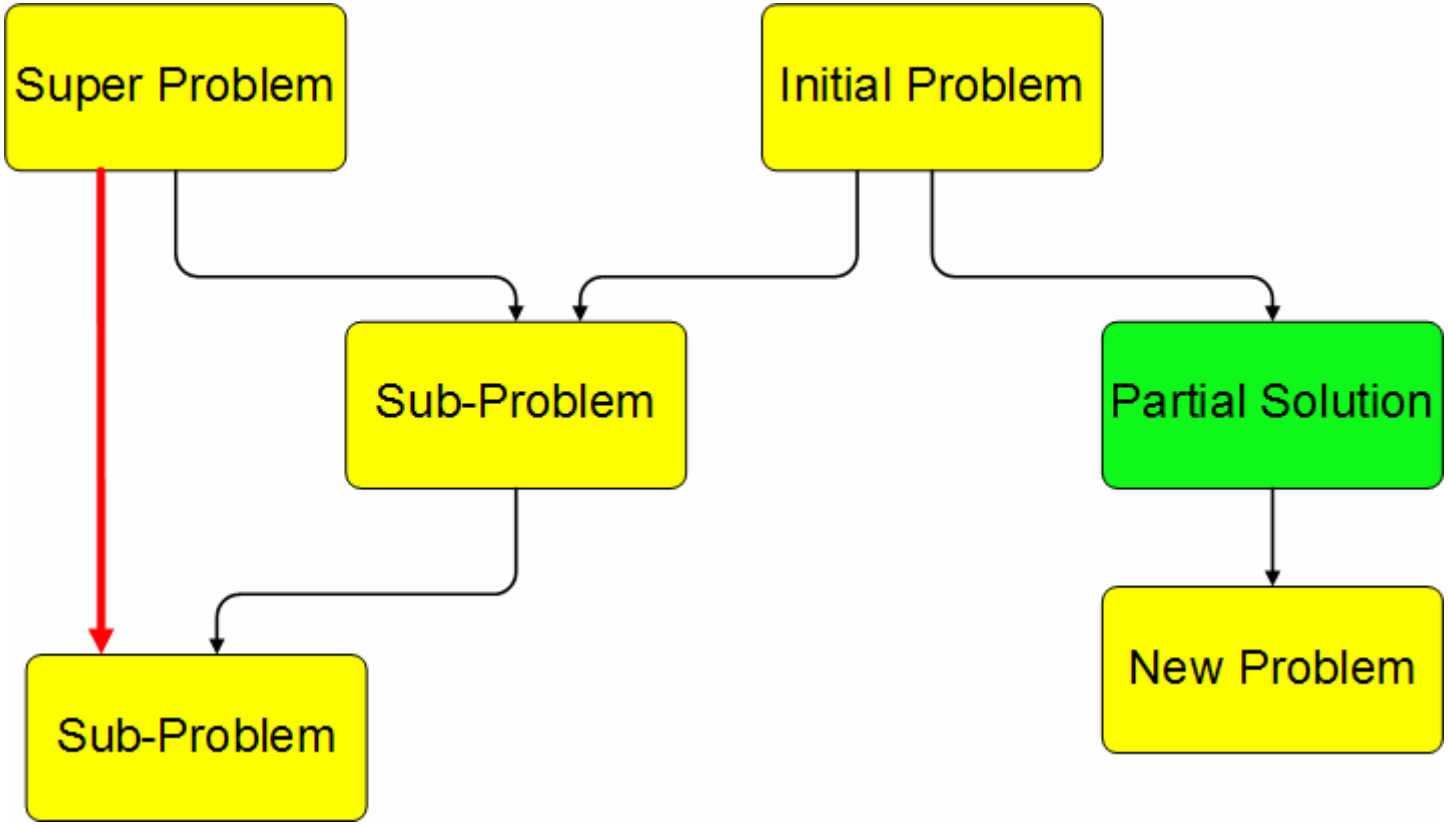
Example of a Network of problem

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



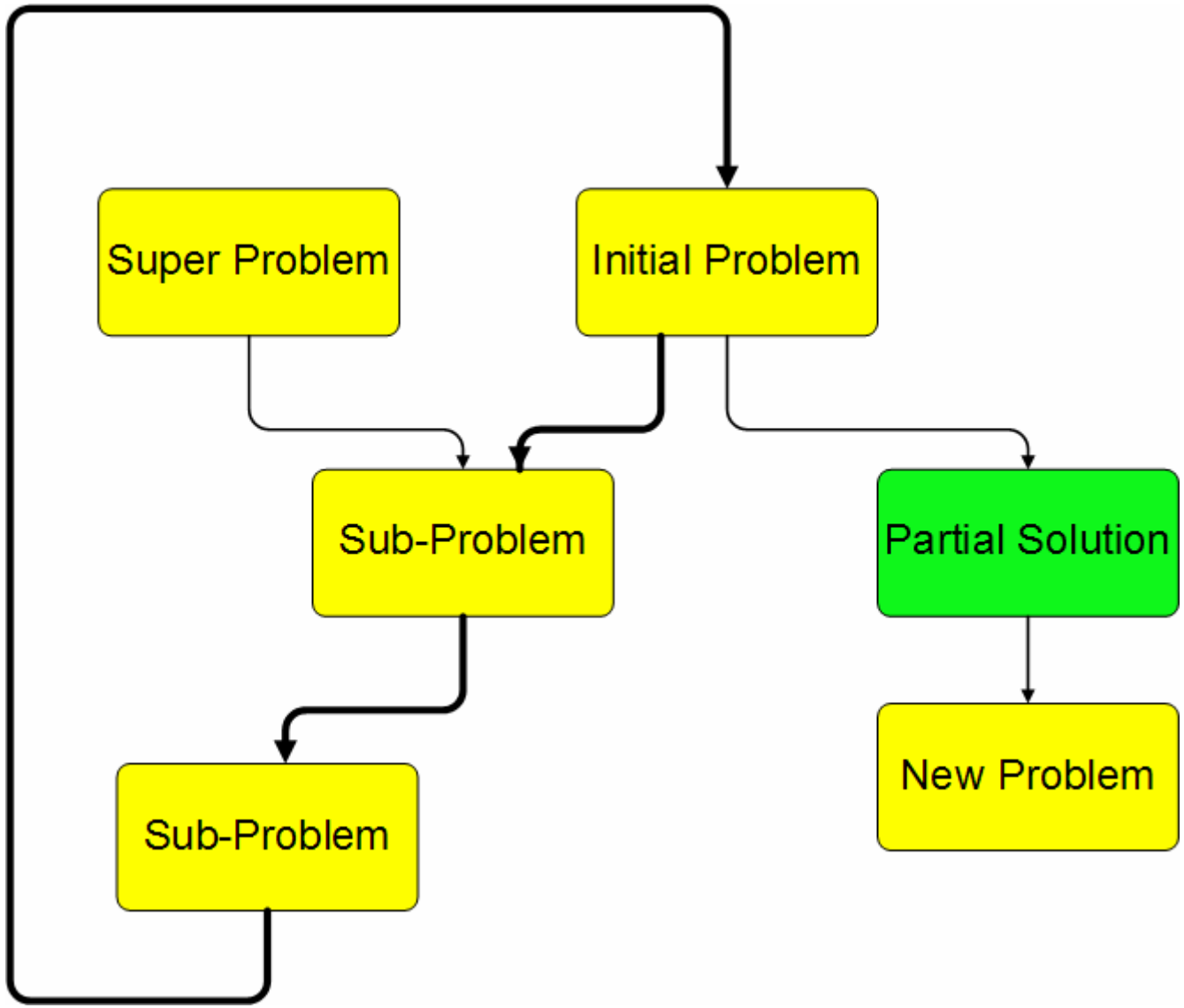
To solve a problem
a partial solution could be used
but this generate another problem.

Special attention topology: Short cut

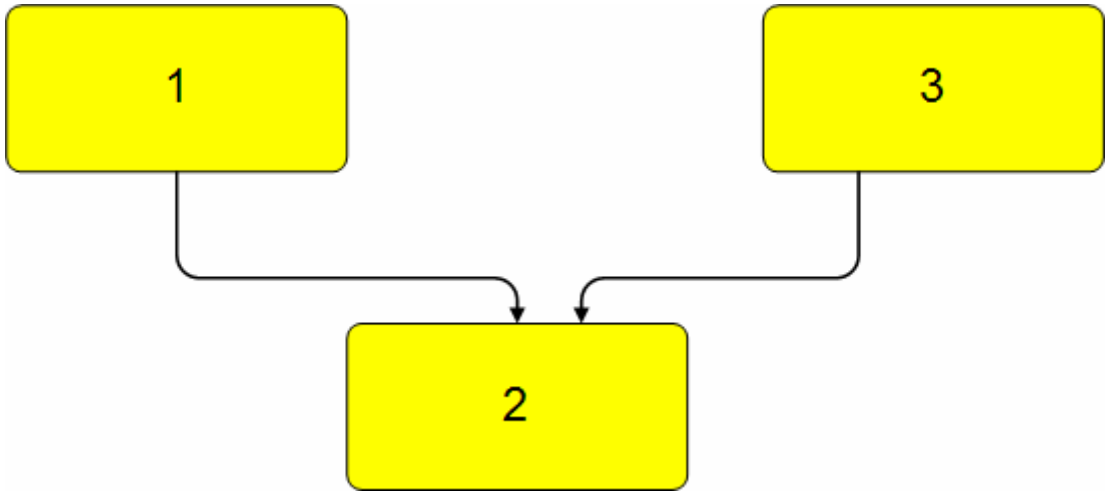


Short cut arrow are not allowed mostly.
However special analysis is required.

Special attention topology: Closed loop



Special attention topology: Bottle Neck



How the Network can be developed?

- Visio Process of creating OTSM Network of problems/solutions

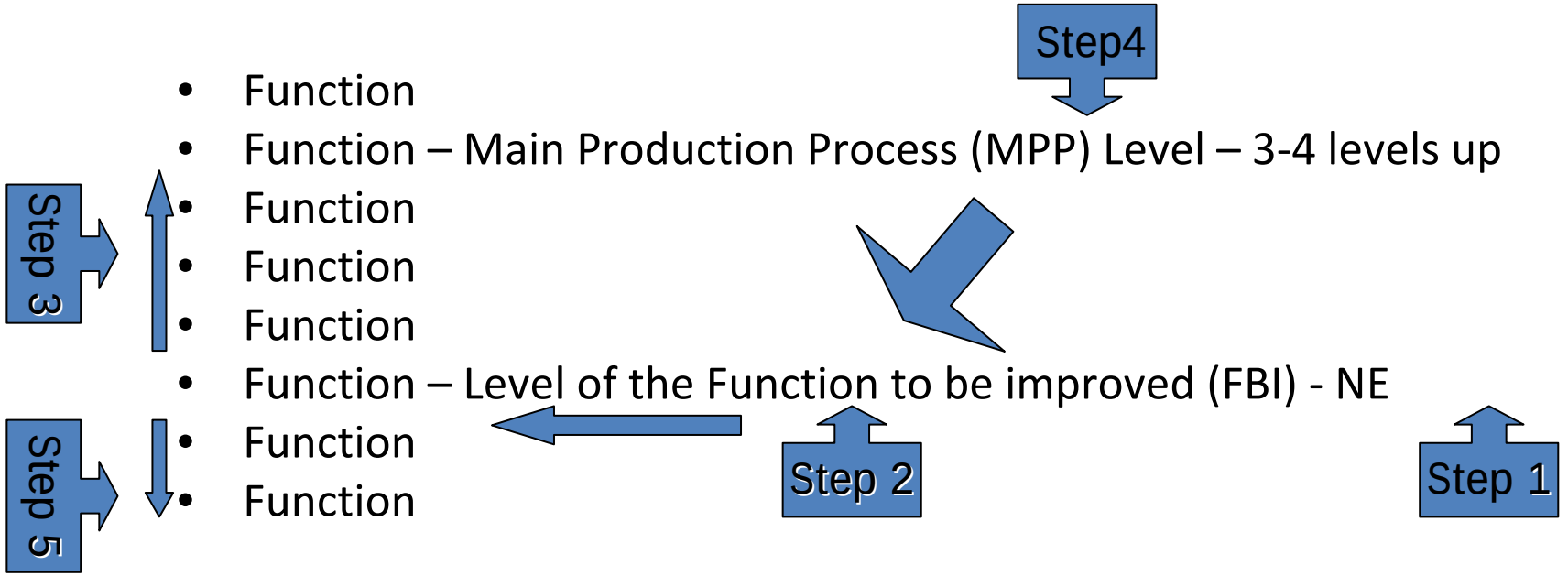
Some other OTSM based supplementary tools:

- OTSM ENV Model of the first step of ARIZ.
- OTSM Express analysis of an initial situation for developing first step of ARIZ.
- OTSM model of a minimal Engineering system.
- OTSM ENV algorithm for a Function reveailing.
- Elementary “Tongs” model for preliminary problem description and analysis.

How fulfill Step 1.1. of ARIZ in the best way?

SUPER SHORT INTRODUCTION TO OTSM EXPRESS ANALYSIS OF AN INITIAL SITUATION

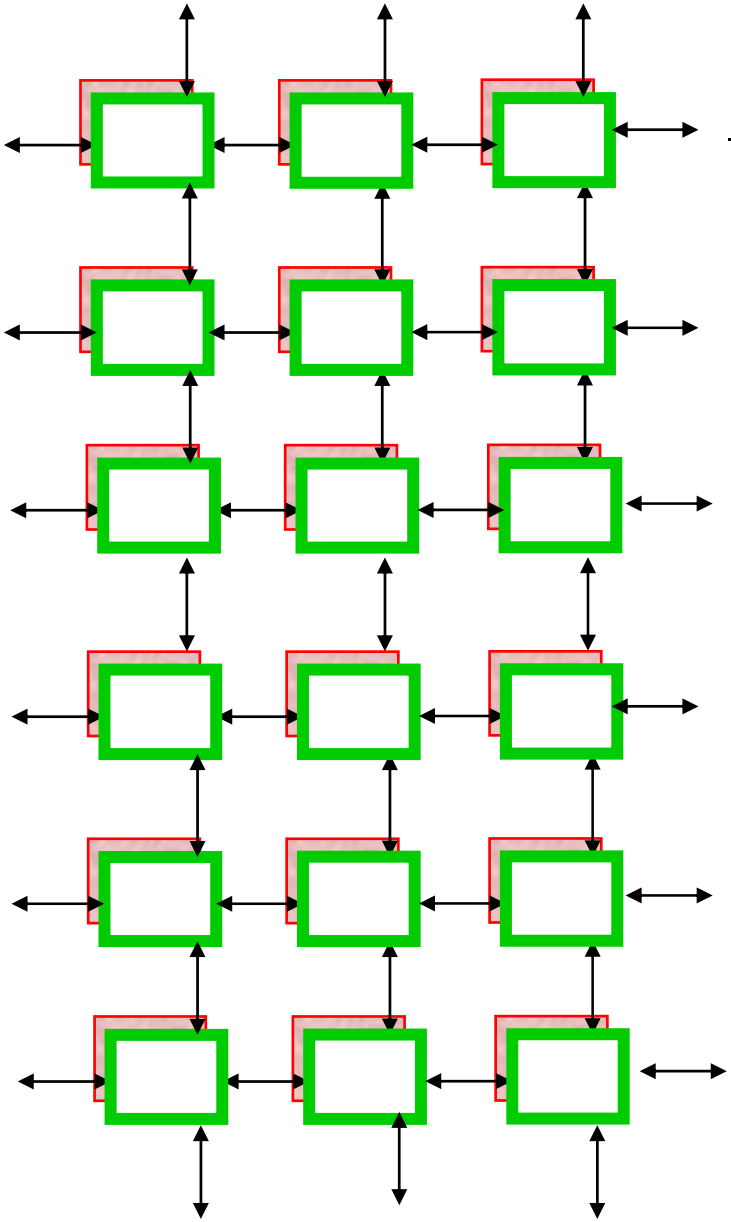
Function (Goals) Hierarchy



Comments:

Undesirable (Negative) Effect (NE) – Certain Evaluation Parameter has unsatisfactory Value

Step 5: analysis of deep roots of NE in sub-systems



Main Production Process System Level

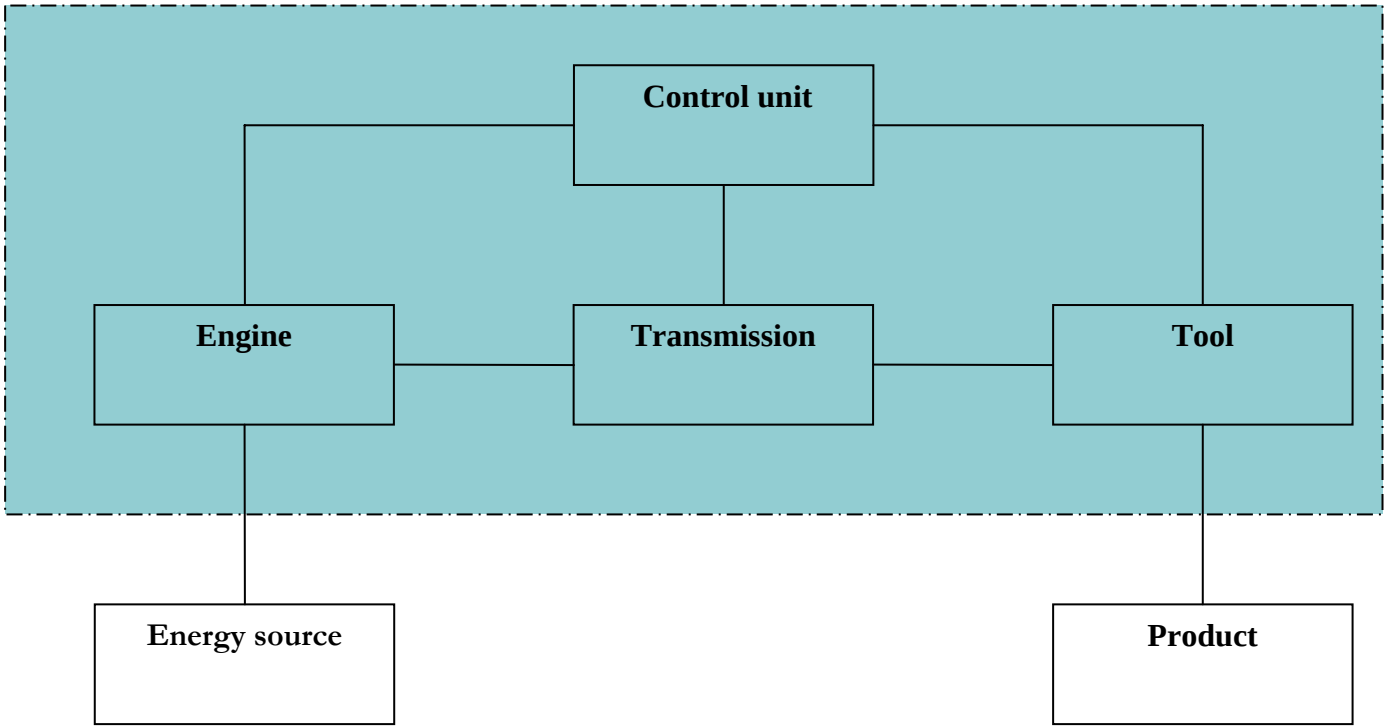
What for
we have to fulfil
the Main Function?

Main Function System Level

OTSM Function Definition: 3 steps algorithm

1. Common language model of Function
2. Verb – Noun model (Value Analysis model)
3. Four verbs ENV Model – OTSM ENV model for Function Description.

1. The law of the completeness of parts of the system



Law of Completes: OTSM interpretation

1. Identify OTSM ENV Function Definition
2. Identify Product – What should be changed?
3. Identify Tool – What DIRECTLY interact with the Product in order to make the change?
4. Identify what kind of energy we must supply the Tool in order to make possible the Change of the Product
5. Law of energy conductivity: Analysis of the Energy Source and the Energy Flow through the system from the Source to the Tool.
6. Engine – The last transformation of Energy.
7. Transmission – Chanel for energy between Engine and Tool

OTSM Negative System Technique

- In order to implement OTSM Negative system Technique we must reframe Negative effect as a Function of the system to be developed by using resources of the existing positive system and environment only.
- Then apply OTSM interpretation of the Law of Completeness and identify which role play Environment and the Positive System for making negative system functioning. Nothing new should be introduced.

Comment:

Negative system appear by it self as a parasite.

Positive (Desirable) System versus Negative (UnDesirable) System

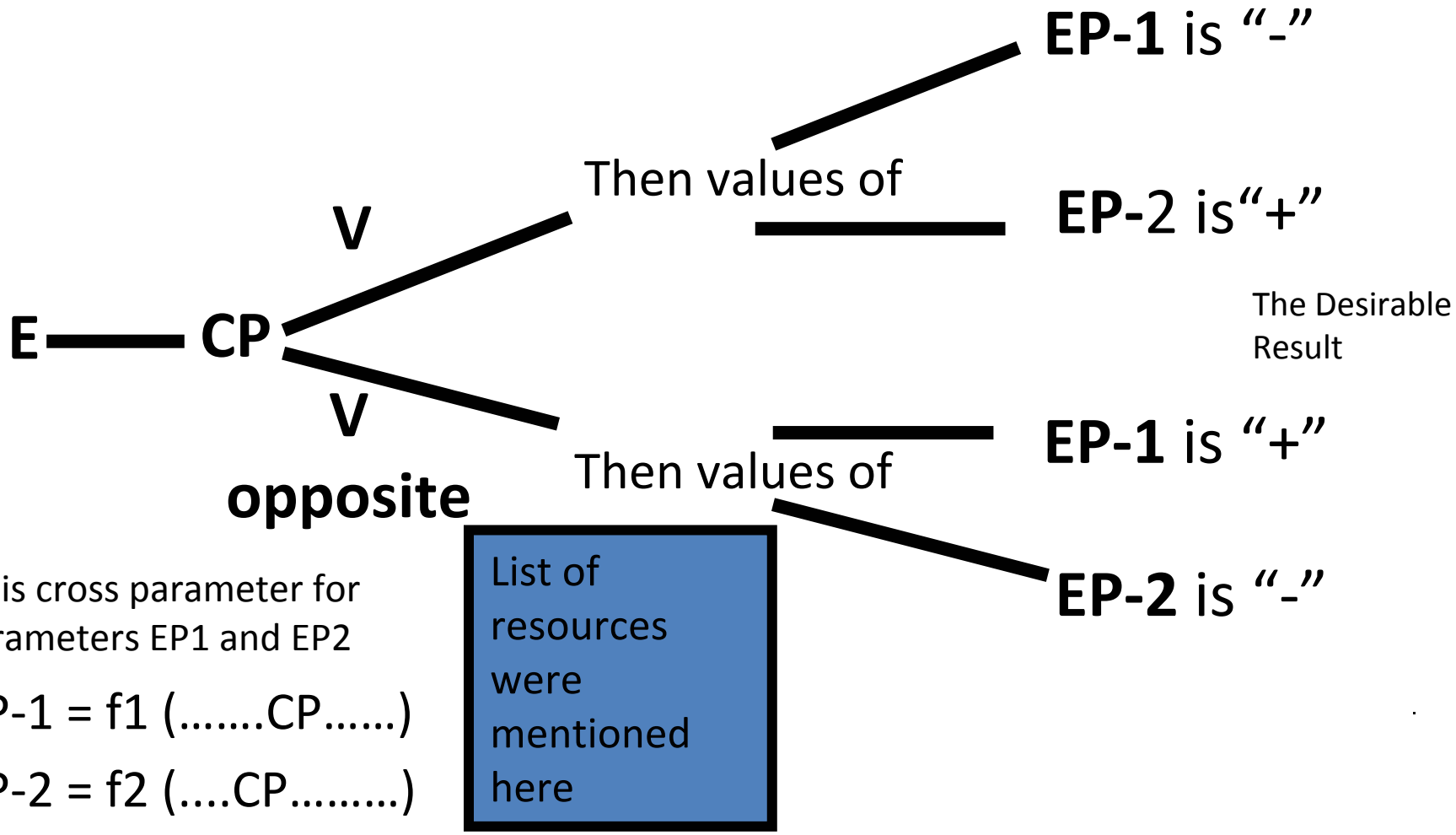
1. Use OTSM ENV model of function description and OTSM Minimal Complete Engineering System in order to develop models of positive and negative systems.

2. Compare structure of Positive and Negative systems in order to discover common components between them.

3. Identify which component of Negative system and what its property should be changed to stop its functioning without damage for MPP? What typical solution we could apply to make this changes. What new NE provoke this typical solution?

4. Develop for the choosen Element an OTSM ENV diagram for the Step 1.1. of ARIZ-85-C.

OTSM ENV Diagram for problem description – Step1.1



CP is cross parameter for parameters EP1 and EP2

EP-1 = f1 (…….CP……)

EP-2 = f2 (….CP……)

Independent observer Stage : Summary about previous steps (analog ARIZ 1.1.)

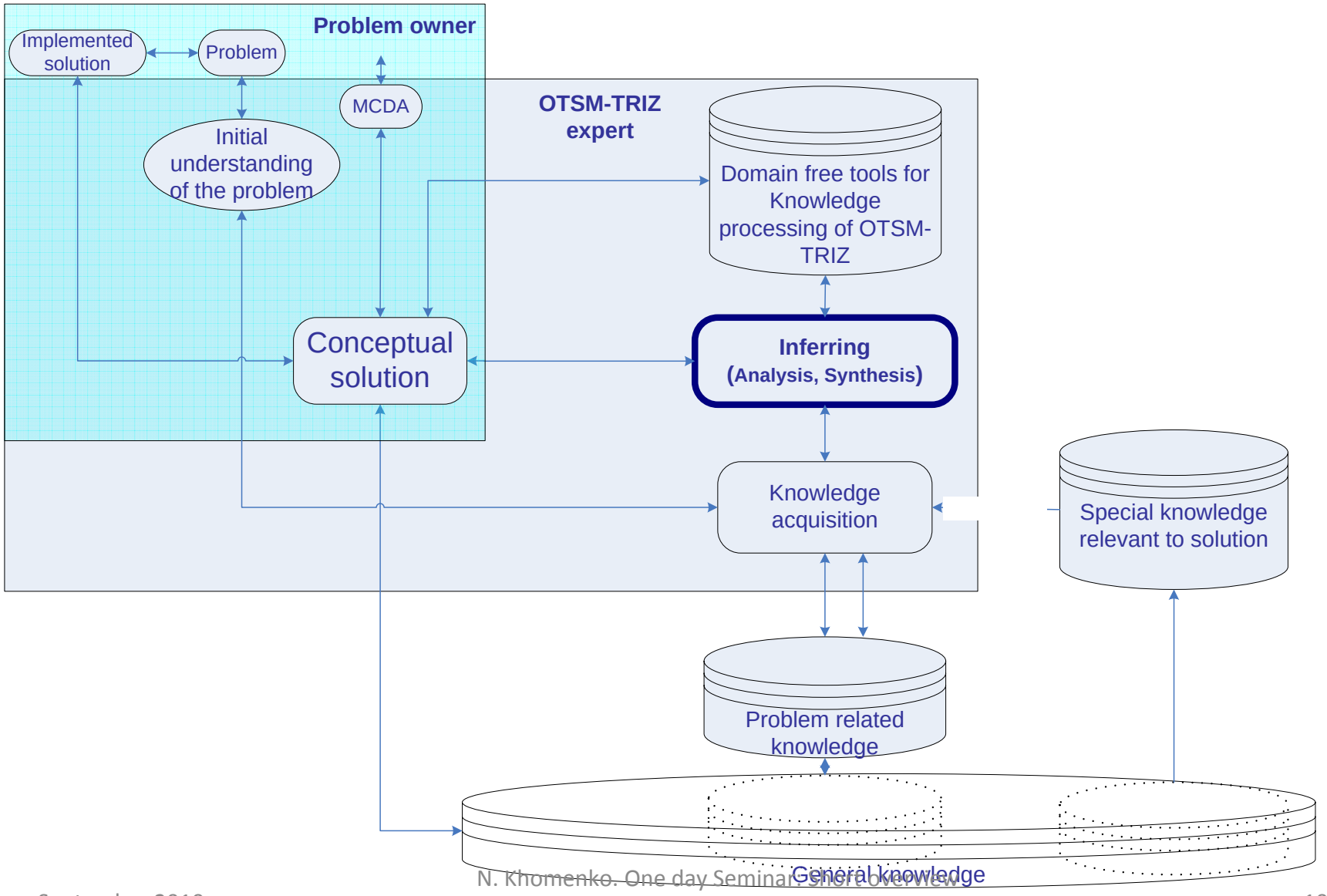
1. To fulfill <MPP> <Function> should be performed.
2. List of Elements to perform the Function:
3. C of SS-1 (Analog TC-1)
4. C of SS-2 (analog TC-2)
5. It is necessary with minimum changes to achieve: <MDR= EP-1(+) & EP-2(+)>
6. Check Twice eliminating professional terminology.

Comment:

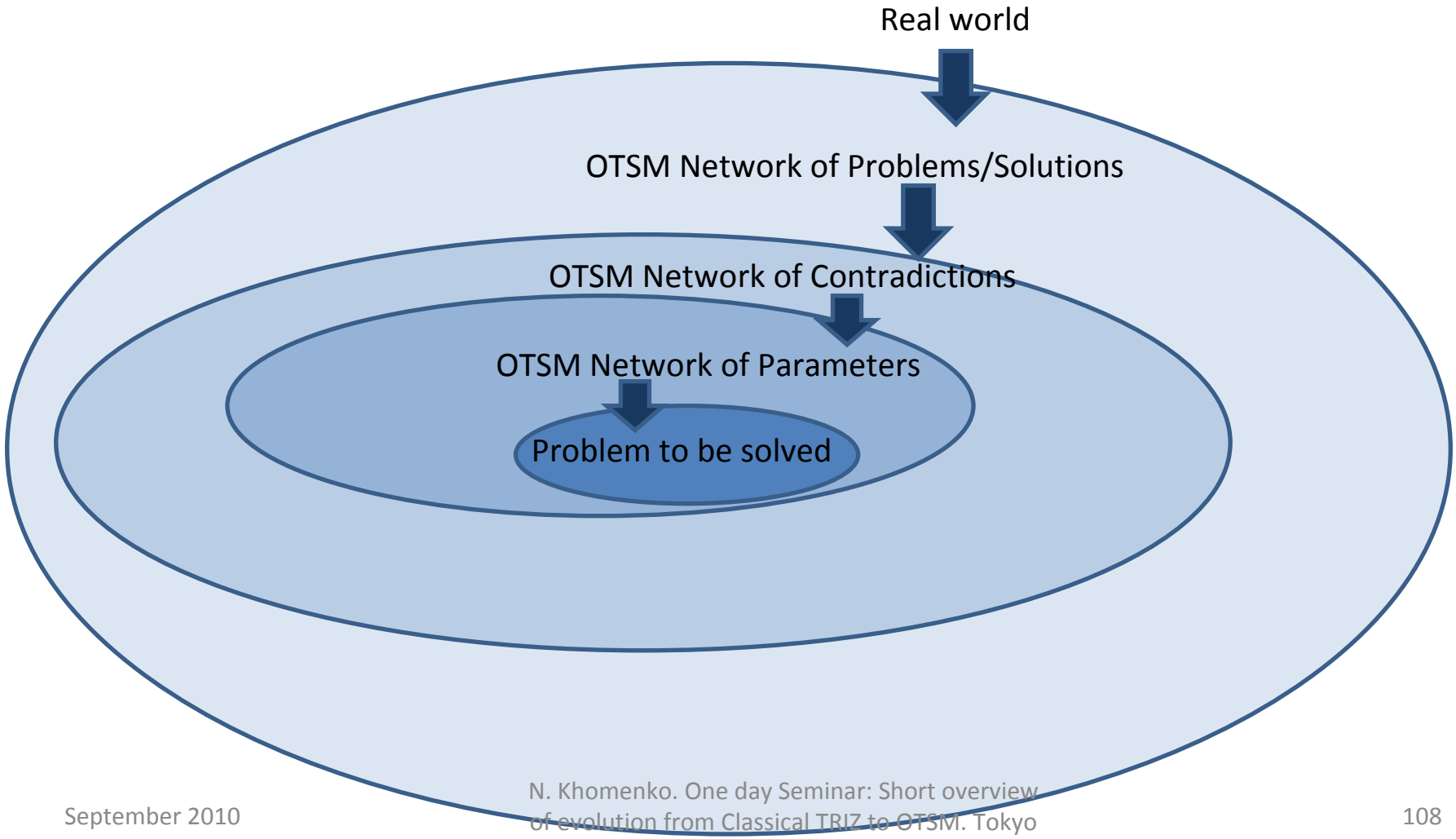
In ARIZ we have to define here just Main function. As a result when we have to apply MPP users do lot of mistakes because of they mix Main Function and MPP

GENERAL SCHEMA OF OTSM PROBLEM SOLVING PROCESS

OTSM-TRIZ model of knowledge processing



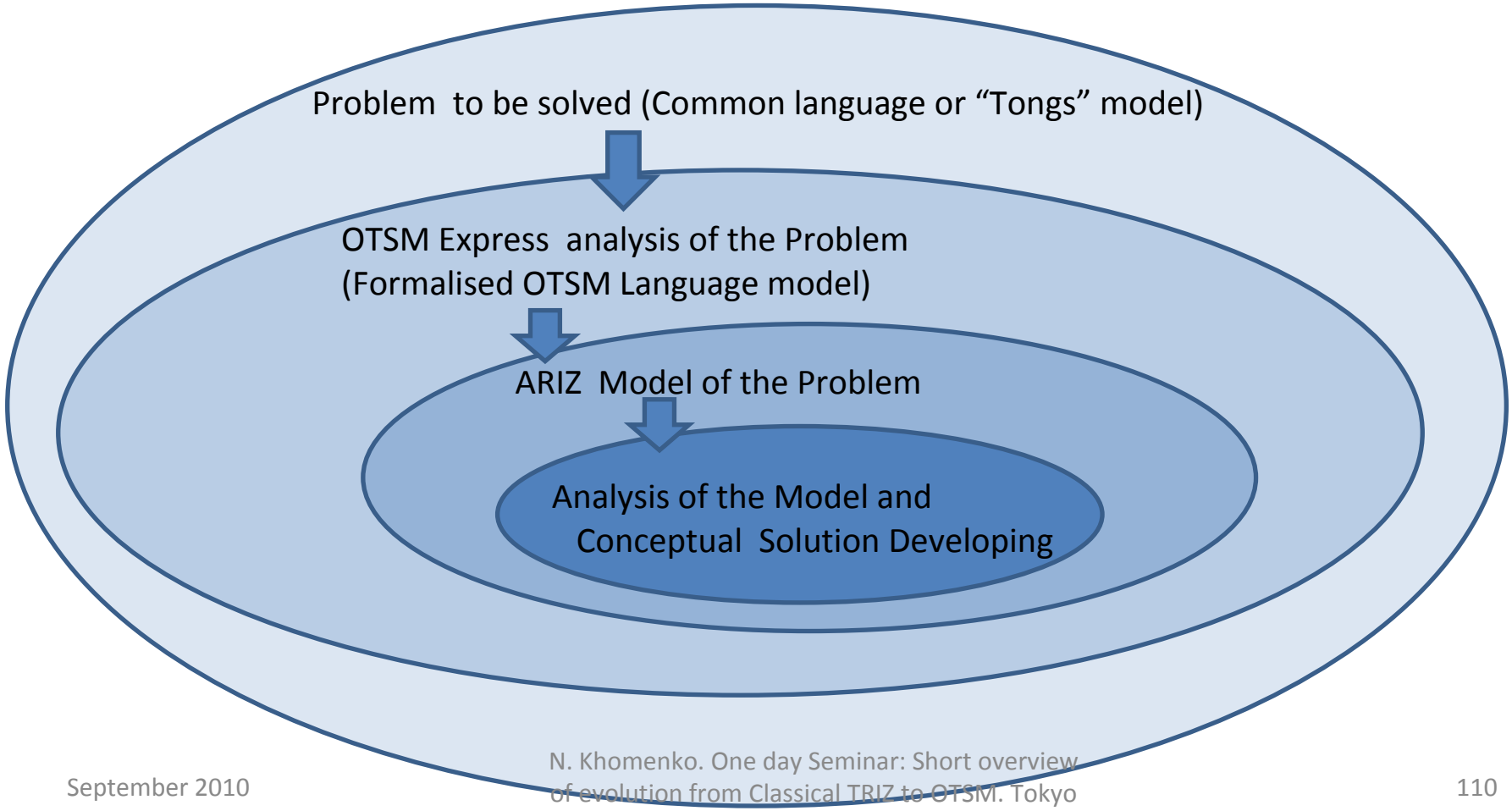
General Model of OTSM problem modeling process : selecting a problem to be solved



OTSM PFN approach

- OTSM Problem Flow Networks approach is working similar to Classical ARIZ and OTSM Contradiction technology. It helps us to narrow research area without useless trials and errors.
- OTSM PFN approach is kind of ARIZ problematic situations that consists of Complex NETWORK of problems while ARIZ is a tool for managing problem solving process for Single problem presented according Step 1.1.
- Visio

General Model of OTSM problem modeling process: stage of the problem analysis and concept solution development

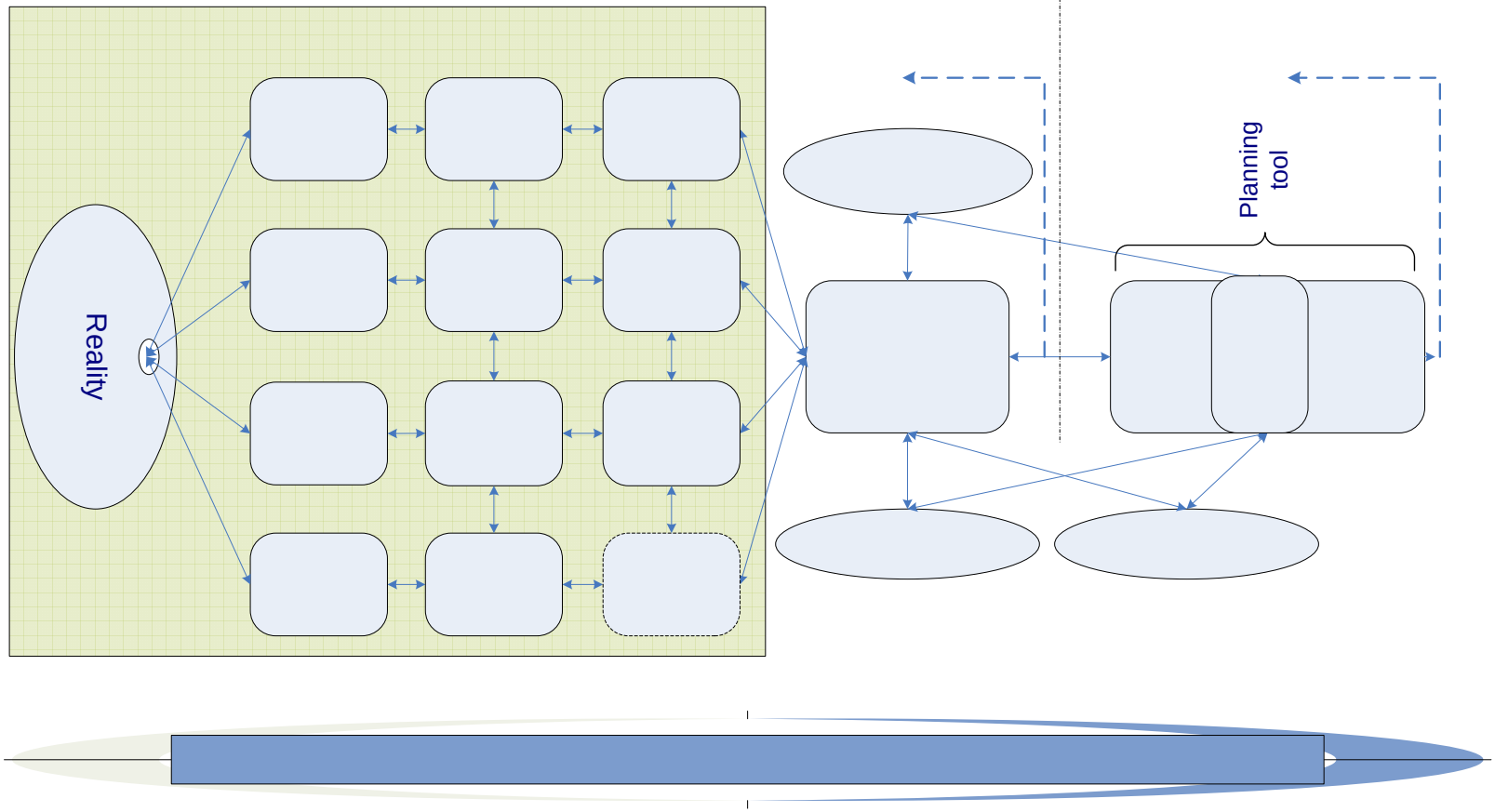


Third generation of the OTSM toolbox in the process of development

APPLICATION OTSM PFN APPROACH FOR COMPLEX SYSTEM MODELING. INTEGRATION QUALITATIVE METHODS WITH QUANTITATIVES METHODS.

Model building steps in

the integrated, interactive energy planning



- The quality of future planning depends strongly on the quality of master model.
- If the master model was not done properly by using above all qualitative methods then using any analytical approaches in the formal model, in the planning instruments will lead to the results, which will be neither relevant nor helpful

Mental model

A

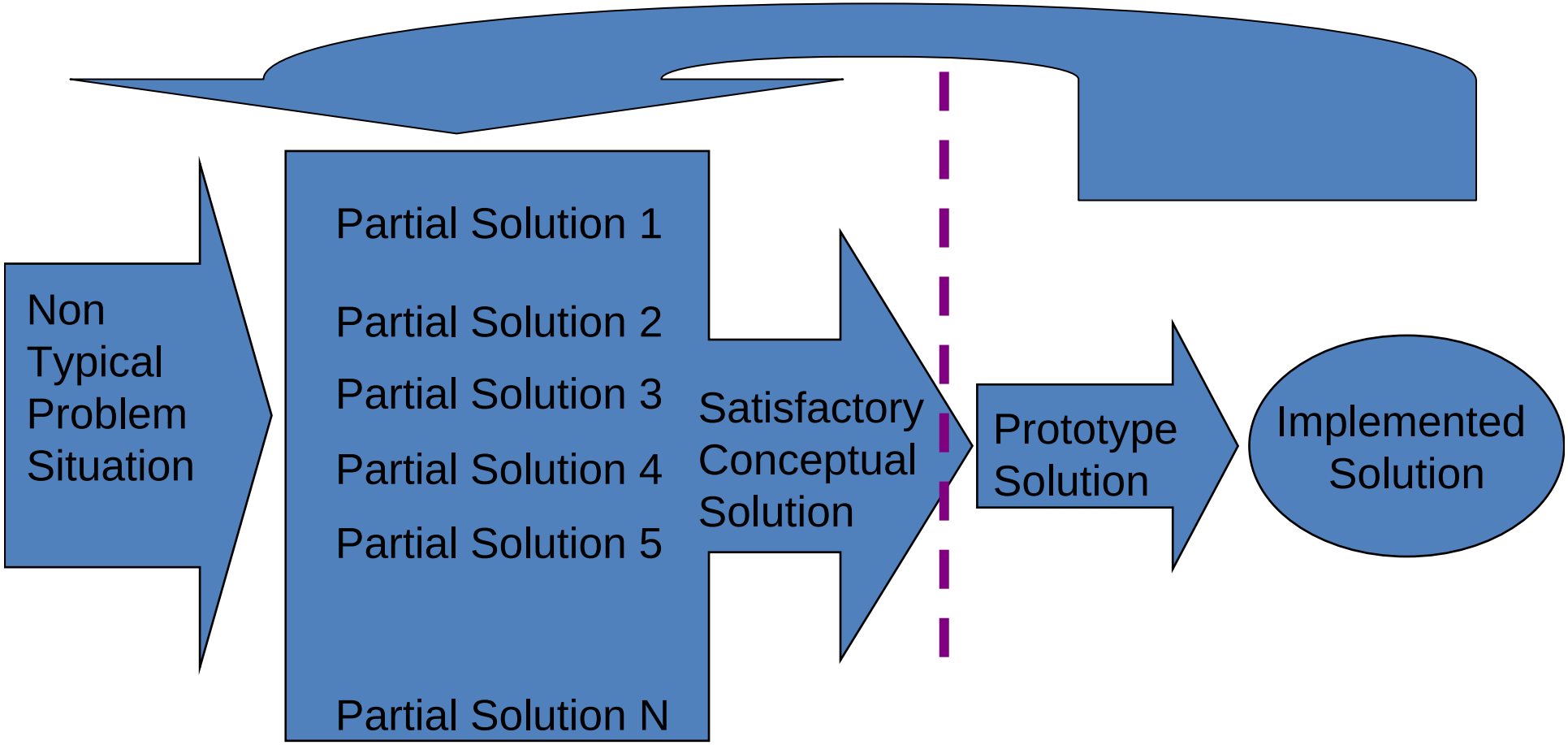
How can we know what tools of OTSM-TRIZ should be implemented for certain particular moment of a problem solving process?

BLACK BOXES OF OTSM

Instrument of OTSM-TRIZ as black boxes

- Each Instrument of Classical TRIZ and OTSM can be viewed as a Black Box that has input, output, and procedure inside the black box is an instrument itself.
- As soon as During problem solving process appear situation that we have enough Inputs for certain particular Black Box we can start the typical procedure to transform inputs into outputs.
- These outputs can be inputs for some other Black Boxes (Instruments).
- We consider Human mind as a super computer that consists of millions of independent processors each of them work independently and Classical TRIZ and OTSM based tools provoke and harmonize work of this knowledge processors with the aim of the problematic situation analysis, developing partial solutions and converge them into satisfactory solution, evaluation of obtained solutions and their further development. Each Black box can be viewed as a Knowledge processor in the framework of the proposed model of Human mind.
- Each output connected to inputs of all other processors.

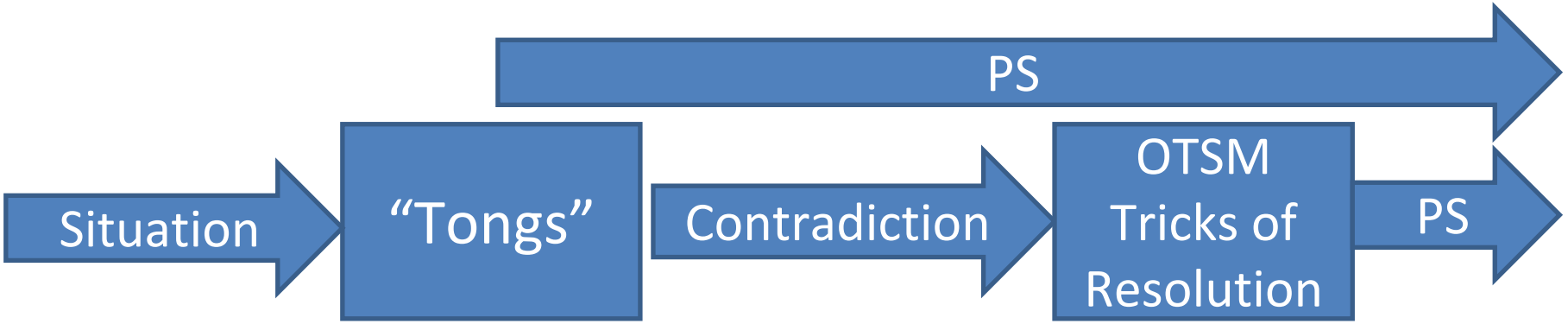
Black boxes stimulate our mind to generate PCS and converge them into SCS



OTSM-TRIZ provides us with instruments (black boxes) to generate effective partial solutions (PS); converge those PS into a Satisfactory Conceptual Solution and evaluate those solutions objectively.

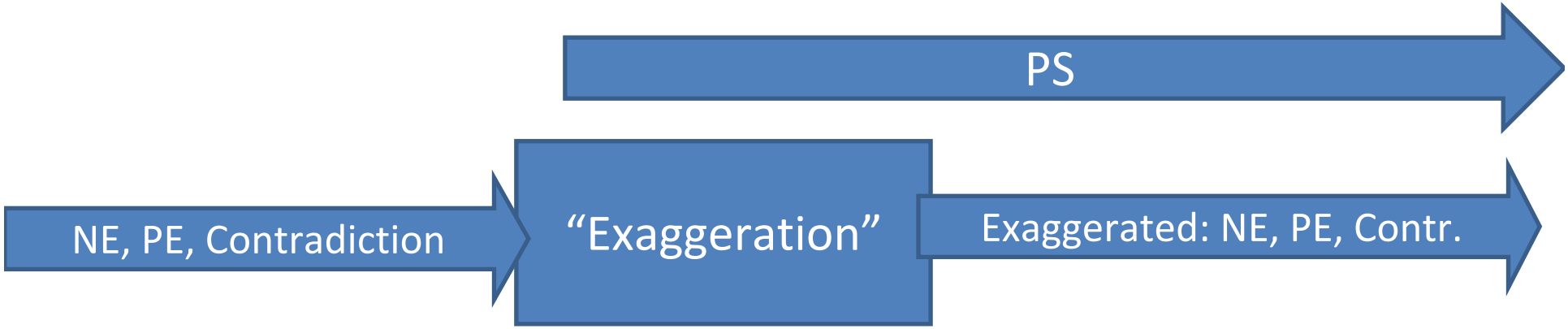
How does it works?

- When we have initial Fuzzy situation we can use “Tongs” model to clarify it and re-frame problematic situation from situation to be improved described in common language into shape of Contradiction.
- Tongs Could be used in many ways for: Solving problem directly, for “network of problems”, to understand and fulfil each particular step of “ARIZ” or any other algorithms of OTSM-TRIZ.



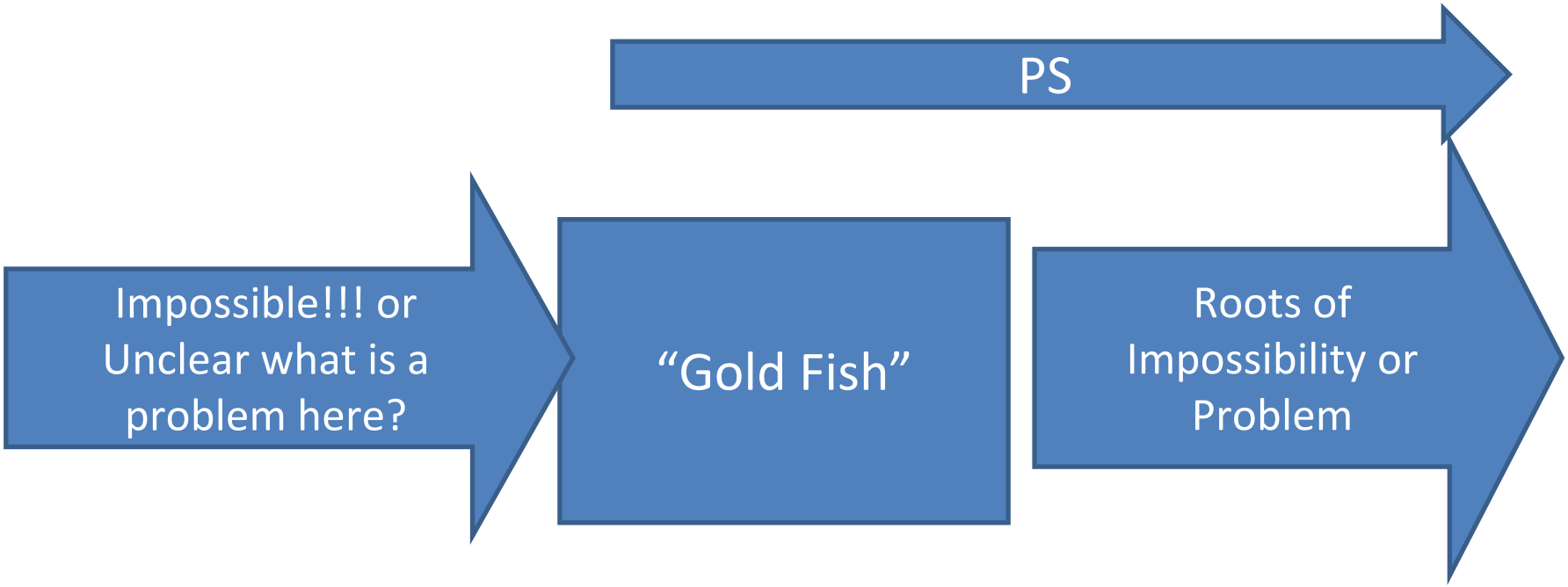
How does it works?

- When we have Negative Effect, Positive Effect or Contradiction we can apply Black Box “Exaggeration” and obtain clear understanding on the situation. Remember that exagerration should be done step by step.
- “Exaggeration” could be used for many black boxes: “Tongs”, “ARIZ”, “Network of problems”, “Gold Fish” etc.



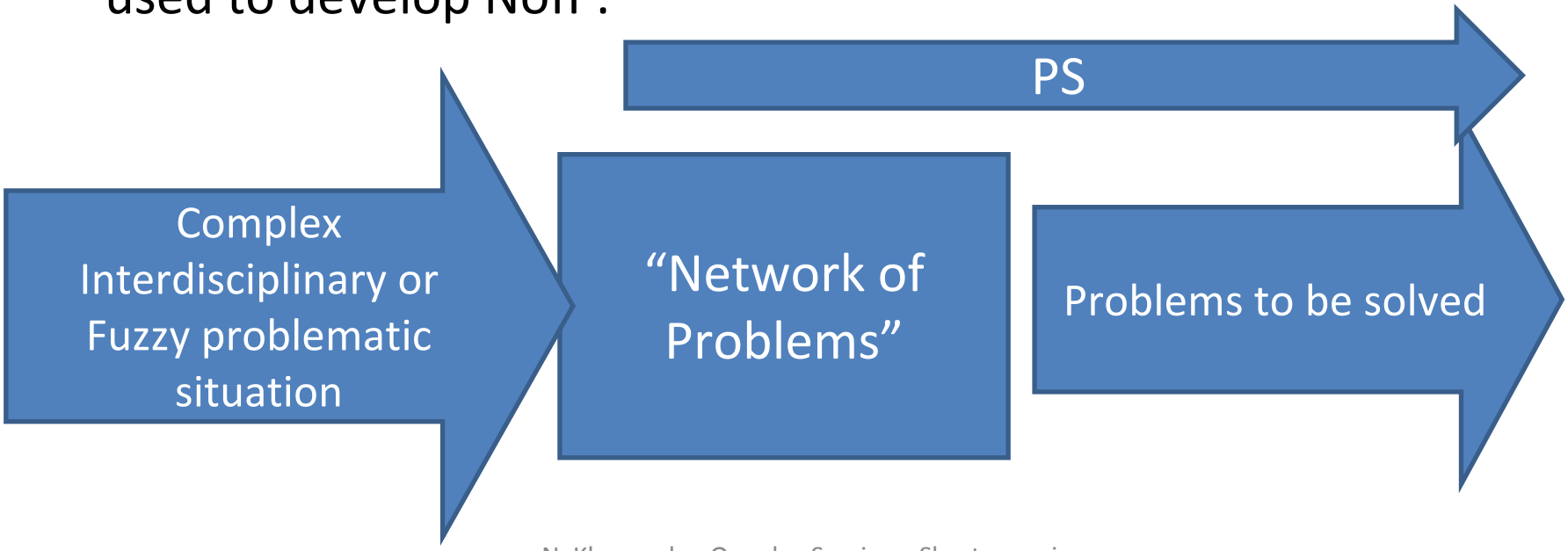
How does it works?

- When something seems impossible or difficult identify the core of problem we can use “Gold Fish”.
- “Exaggeration” could be used for many black boxes: “Tongs”, “ARIZ”, “Network of problems”, “Gold Fish” etc.



How does it works?

- When we confront with complex interdisciplinary problematic situation, or just unclear problematic situation, some solution leads us to new fuzzy situation we can use Network of problems (NofP).
- “NofP” could be used for “New Problem”, “Forecasting”, “Problem flow Networks” etc. In turn all Instruments could be used to develop NofP.



For beginners it seems like a chaos.
But it is just hard intellectual work.

MANAGING CREATIVE CHAOS

Creative chaos in Classical TRIZ

- ARIZ-85-C started new S-curve of ARIZ evolution and new generation of TRIZ based instruments.
- It sufficiently improved a model of a problem solving process by better stimulating unconscious creative processes in our mind.
- At first look it seems as a Chaos.

OTSM Chaos and self-organization of a problem solving process

- OTSM follows this direction of Classical TRIZ evolution and develops instruments to manage the Creative Chaos better :
  - OTSM Fractal Model of a problem solving process.
  - To apply the model for practice “OTSM Network of Problems” method was developed.
  - For most complex problematic situation was developed “OTSM Problem Flow Networks” approach.
  - OTSM Contradiction Technology based on ARIZ-85-C.
- Conclusion: OTSM is an “Intellectual Lego” for managing our “Creative Chaos” and stimulate our creativity skills.

Model of the Human Mind we used in our research.

- We consider Human mind as a super computer that consists of millions of independent processors each of them work independently and Classical TRIZ and OTSM based tools provoke and harmonize work of this knowledge processors with the aim of the problematic situation analysis, developing partial solutions and converge them into satisfactory solution, evaluation of obtained solutions and their further development. Each Black box can be viewed as a Knowledge processor in the framework of the proposed model of Human mind.
- Each output connected to inputs of all other processors.
- As a result each time as a particular black box has enough in its input it start to work (perform application of certain OTSM Tool) and produce output. This output is going right away to the all other inputs etc.
- As a result we have self organized knowledge processing driven by the knowledge processing itself until satisfactory solution can be obtained.

Domain Free Thinking tools do possible and have been already tested.

WHERE OTSM TOOLS WERE TESTED?

Where OTSM tools were tested?

- **By Companies:**
  worldwide European and Asian companies like: LG-Electronics, Samsung, Posco, Hundai, Puegeot-Citroen, EADS (Airbus), Bombardier, Bosh-Siemens, Renaut, EIFER (EDF), Salomon, Visa, etc.
- **By Domains:**
  Various Engineering domains; Material science; Software developing; Complex system modeling methodology development; European regions and city development planning (Economics, Architects, Energy); Advertising & Public Relations; Scientific research and Investment planning; Business organization, business models and schemas developing; Art; Decision making; Banking; Computer aided Thinking; Knowledge Management.

Education to solving non typical problems can not be the same as education to solving typical problems!

CLASSICAL TRIZ AND OTSM EDUCATION SHOULD BE DIFFERENT FROM TRADITIONAL.
WHY?

Brakethrough in OTSM-TRIZ Education: Narrow focus mind Expertize versus Open mind

- Narrow focus skills and dispositions for narrow professional typical solution mind development.
  - Businessmen education uses examples from business domain.
  - Engineering education – examples from engineering.
  - Biological education – example from biology.
- Open mind skills and dispositions for non typical problem solvers.
  - Engineering and business people learn OTSM-TRIZ by biological or any other non engineering and non business examples. Play Yes-No joke game and developing story line of fairy tales.
  - **This helps them understand how network of tools can be used for solving network of problems and develop appropriate skills**

OTSM-TRIZ Education:
Linear education versus Non-Linear education

By Using these educational technique we develop network of appropriate skills simultaneously but not step by step as in the linear technology.

This helps to resolve a problem “mass education versus individual education”. Individuals learn all topics in the sequence according the best way for their personality.

- Riddle Technology by A. Nesterenko
- Fairy Tale Technology by G. Altshuller
- Yes-No Game Technology by N. Khomenko
- System of creative assignments by T. Sidorchuk (Ph.D. thesis and book: T.Sidorchuk, N.Khomenko Thoughtivity for kids)

OTSM-TRIZ Education – **Problem Centered Education**

We teach people to solving Non-Typical problems and networks of problems and contradictions. We teach them how rearrange and evaluate their existing knowledge for the problem solving. If the knowledge are not in here now, then understand what kind of knowledge can be useful to solve the problem and how obtain the appropriate knowledge.

OTSM-TRIZ can not replace specific domain knowledge but helps a lot to rearrange the knowledge in the proper way useful for solving particular problem in the given context.

It is a solid base for Life Long Learning skills development.

Education Dilemma Which mind is better: well-filled in or well-organized?

- Modern education system produces professionals with the mind well filled in with typical solutions from the past.

- The current situation demands regular and quick innovation which cannot be provided by past typical solutions.
  Cross disciplinary problem solving instruments are needed to produce new typical solutions quicker and more effectively than Trials and Errors Method that was used in the past.

Well-organized mind.

- Well organized mind is a mind that could process available knowledge in order to obtain satisfactory solution of unknown (non typical) problems.
  It is not only well organized storage of knowledge but creative knowledge processing system as well.
  (See also - OTSM Advanced Schema for powerful thinking)

- Dynamic and well-organized mind is a new challenge for education, industry and research.
  This mind should be able to manage difficult non-typical problems that are often complex and cross-disciplinary.
- Collaborative negotiation between different professionals is more an more necessary now. This also requires efficient organization of the mind and appropriate tools like OTSM.

Creativity is a Horizon (Sky Line)

LAST BUT NOT LEAST:
WHAT IS CREATIVITY?
OTSM STANDING POINT.

What is Creativity?

OTSM standing point:

The core of Creativity is an productive activity of human mind that can not be completely formalized.

Examples: Linear Prospective, Square Equations.

Conclusions:

1. The higher level of formalization of the procedure we have the lower level of creativity we need. That is what modern professional education do with our mind – decrease our creativity.
2. Creativity is a kind of Sky-line – Horizon: the closer we arrive to it the far away it moves from us. By increasing level of formalization for Today Creativity we obtain new and better understanding on what will be Tomorrow Creativity.
3. TRIZ and OTSM based creativity kill Today understanding of Creativity and transform it to a routine activity but at the same time it opens our mind to a new level of creativity and provides us new opportunity.

You are welcome to a new opportunity world!

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