

General Theory on Powerful Thinking (OTSM):

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

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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.

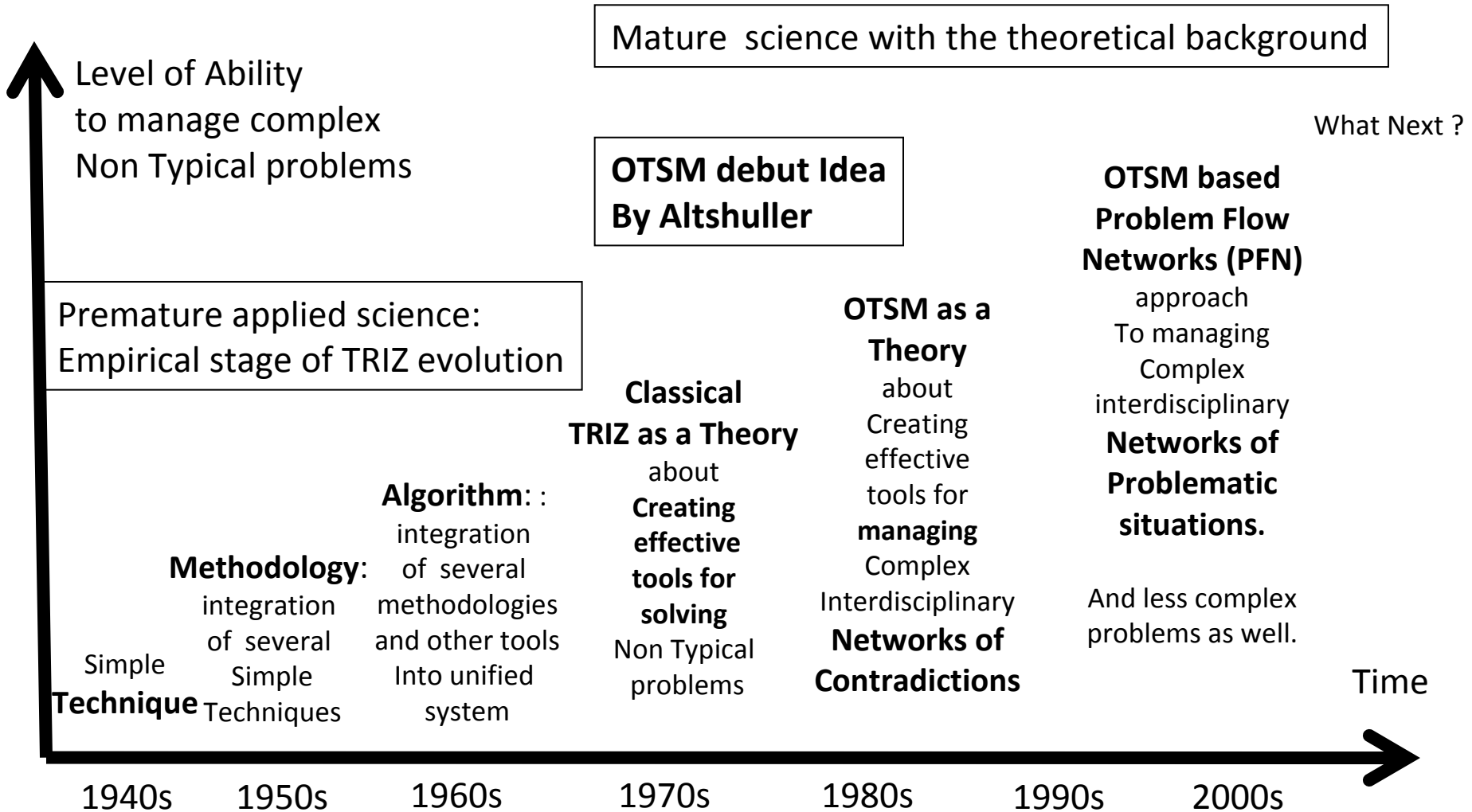
Content of the presentation

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.

What was before the journey....

OTSM DEBUT IDEA BY ALTSHULLER

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 propose the domain free tool for presenting various kind of non typical problems into canonical form and proposed routine procedure for solve the 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 of 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.

What should be a structure of the new applied science?
Analogy with Classical TRIZ.

STARTING POINT OF THE JOURNEY FROM TRIZ TO OTSM

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 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 toll as a system of the rules provide appropriate satisfactory solution for the specific case.

Second Conclusion for OTSM development:

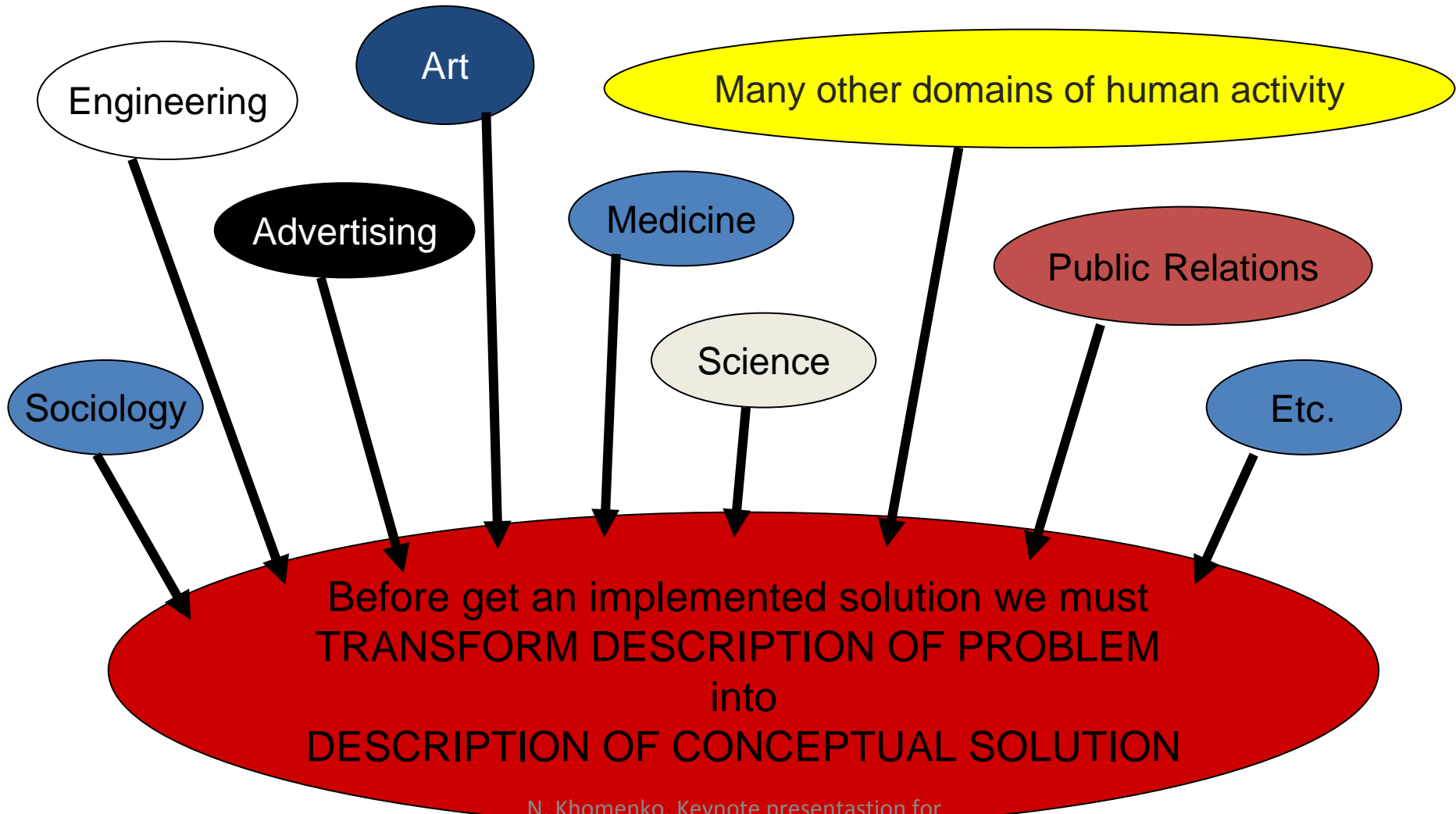
Image of the solution of the key problem.

To create a domain free tool we need 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 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 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.

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.

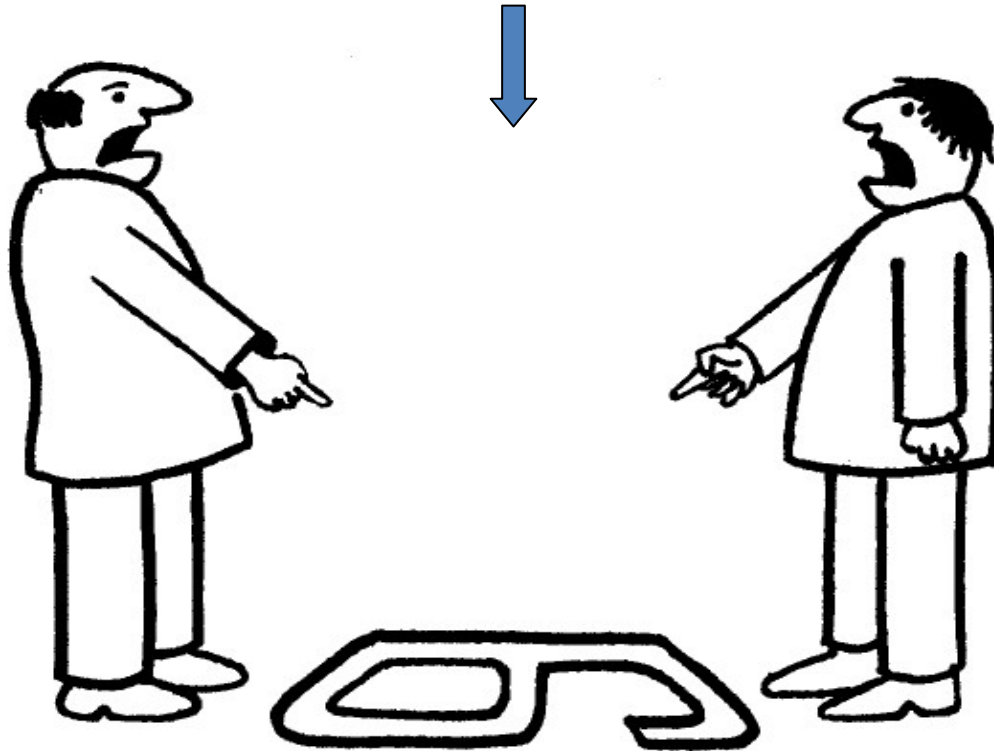
Comment:

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*

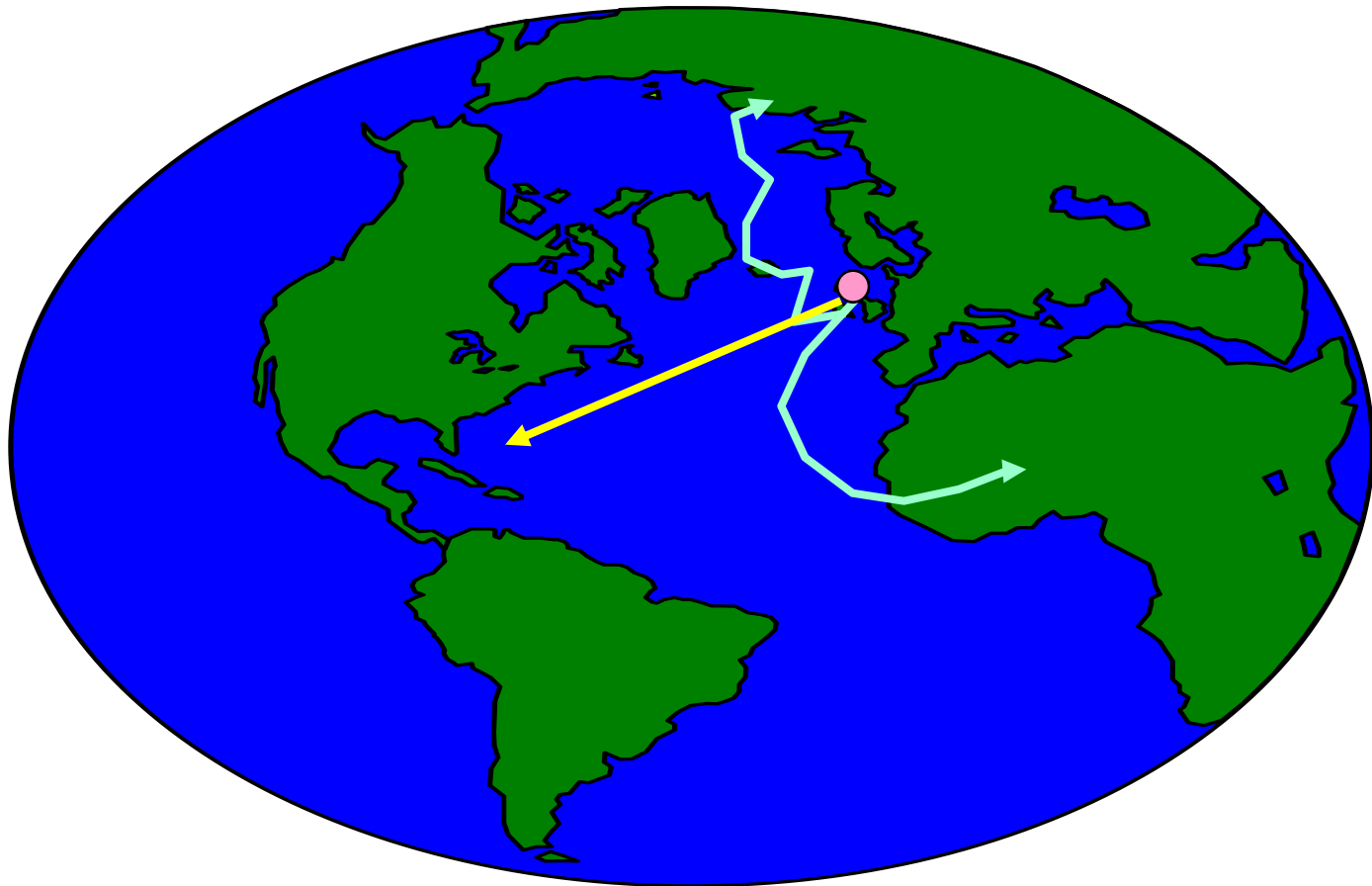
*"Making knowledge workers productive
requires changes in basic attitude "
Peter Drucker*

Management Challenges for the 21-st century.

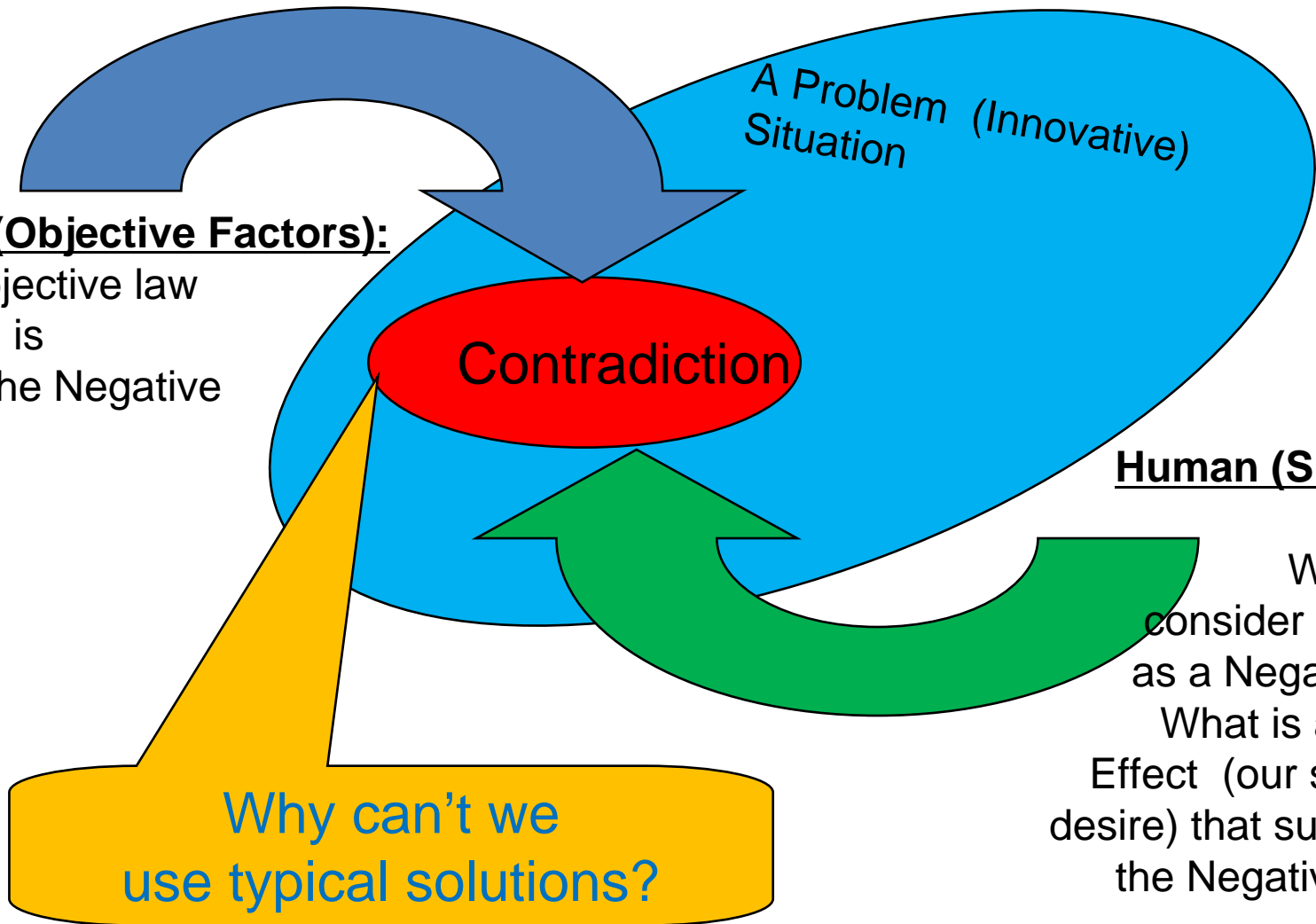
Conclusion:

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.

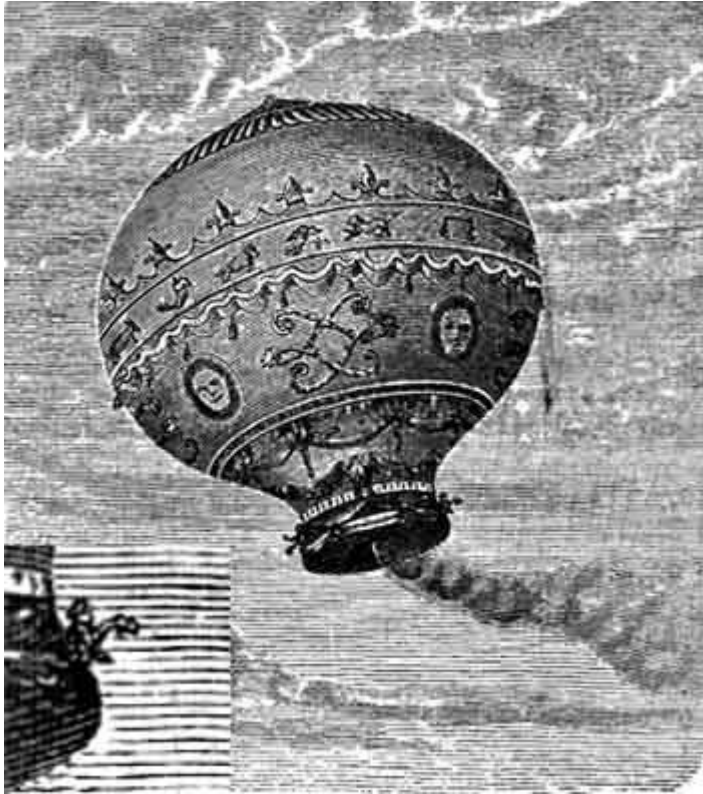
To solve a difficult problem
(to discover new continent of our thinking)
we **must** use unusual ways of thinking



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



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

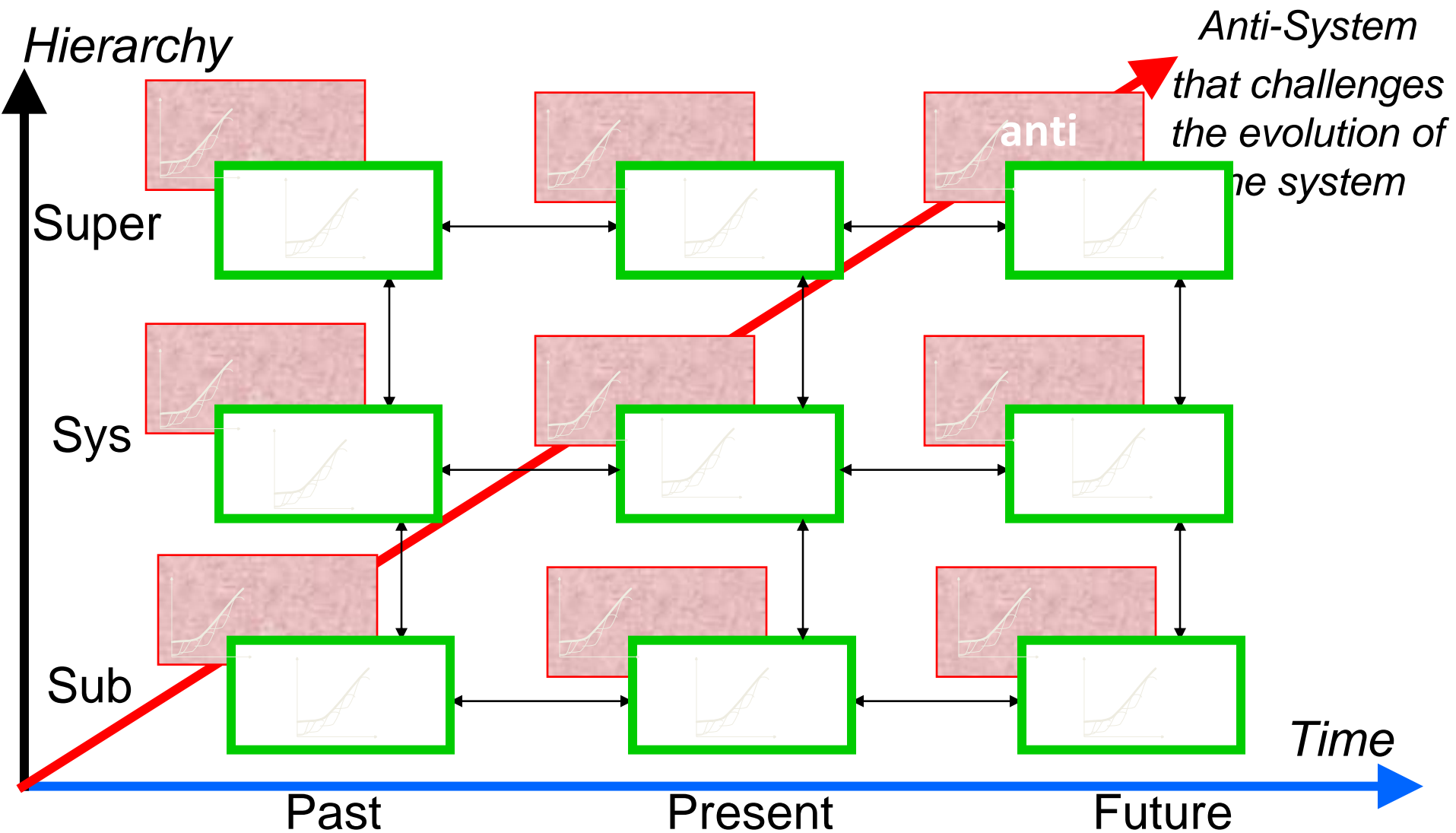
Next stop of our journey – Models of an applied theory

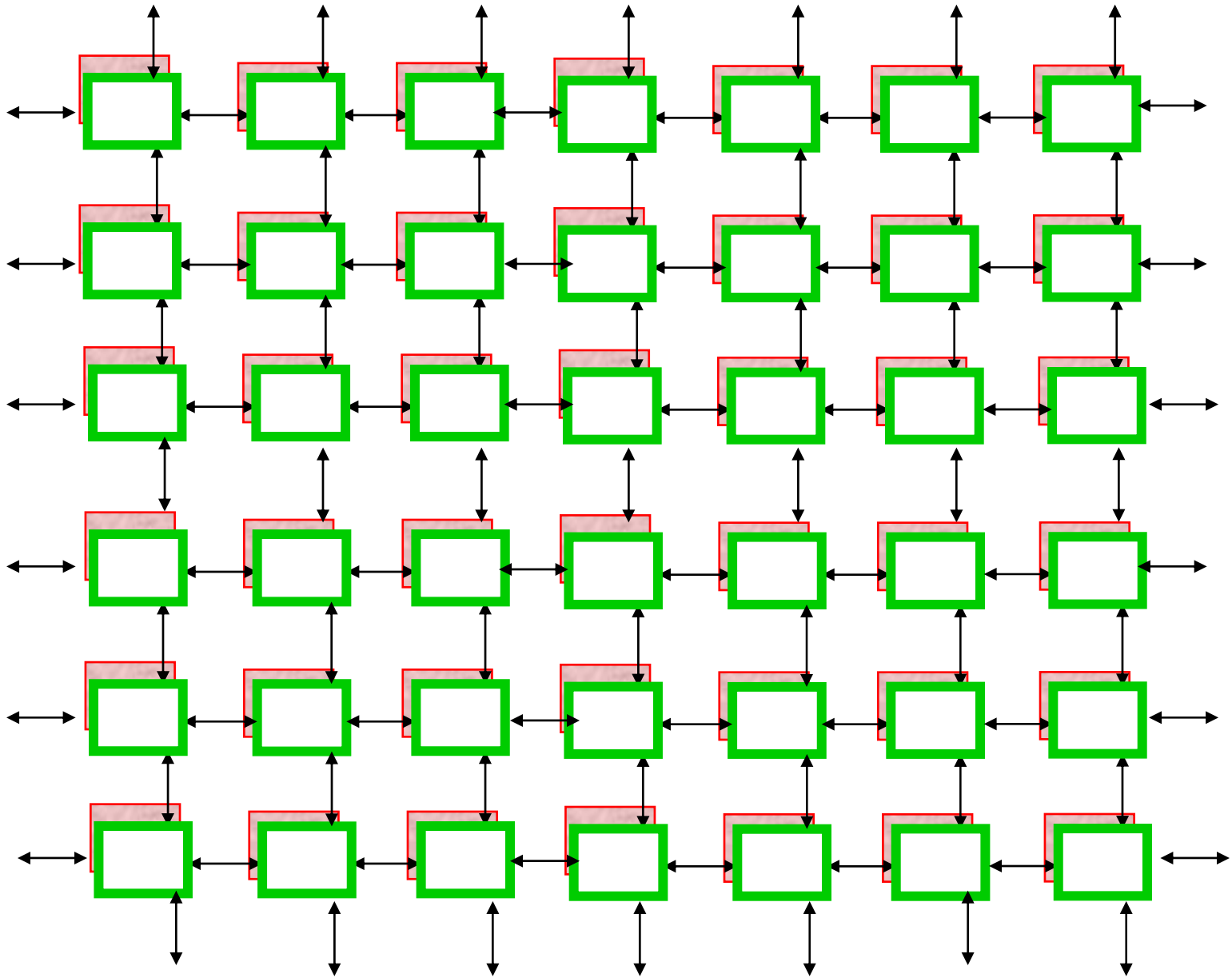
FUNDAMENTAL MODELS OF OTSM WE HAVE TO KEEP IN MIND WHEN WE USE OTSM TOOLBOX OR DERIVE NEW ONE FOR THE THEORY AND NEW TOOLS DEVELOPMENT

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 previous models of a problem solving process).

Classical TRIZ: Scheme of Powerful Thinking

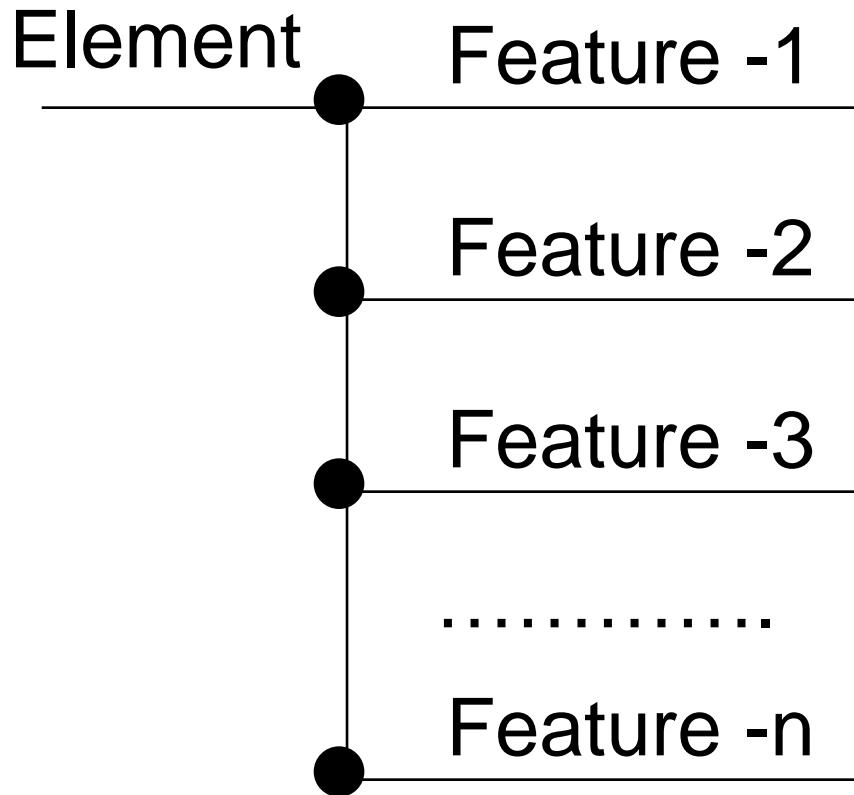




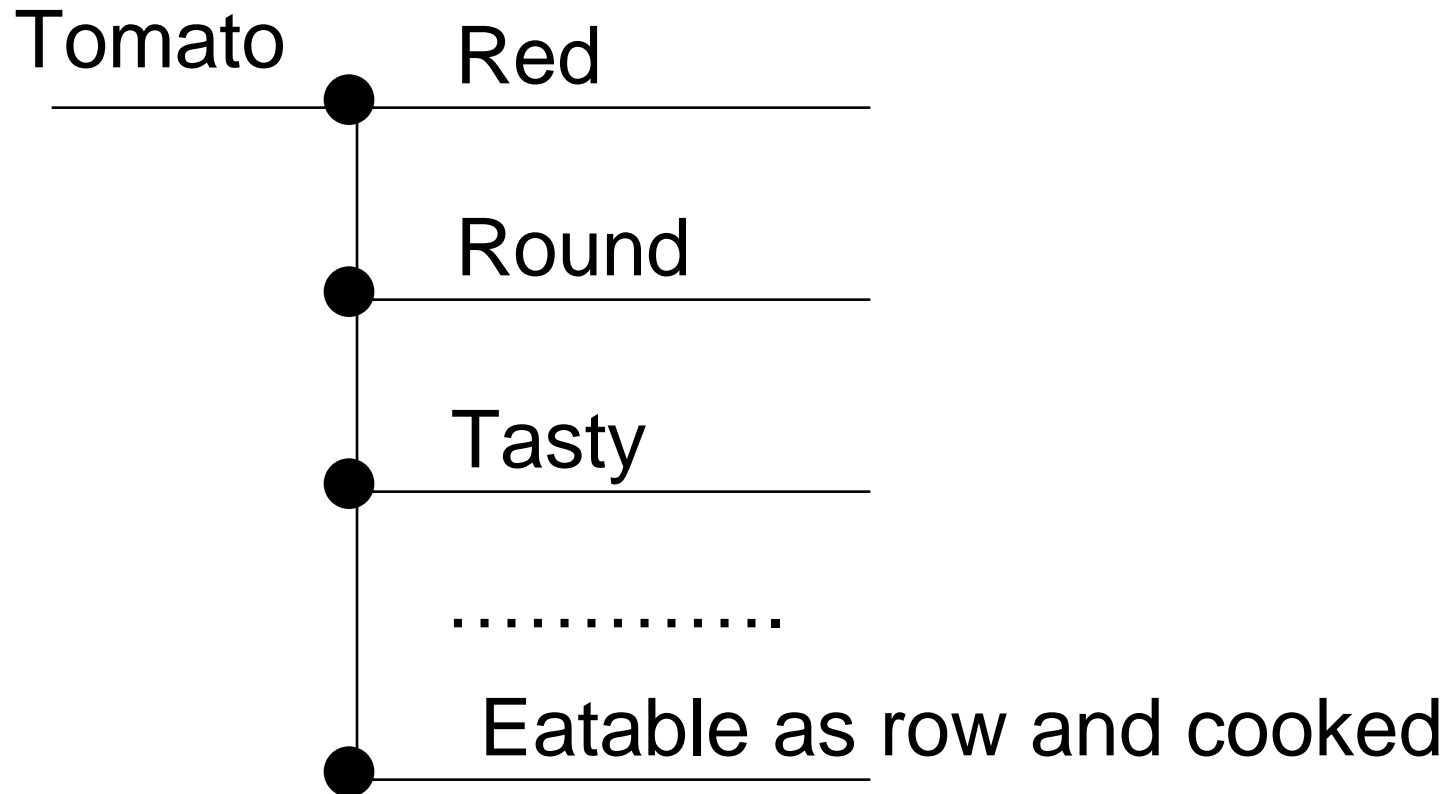
What model we can use to describe something?

OTSM ENV FRACTAL MODEL

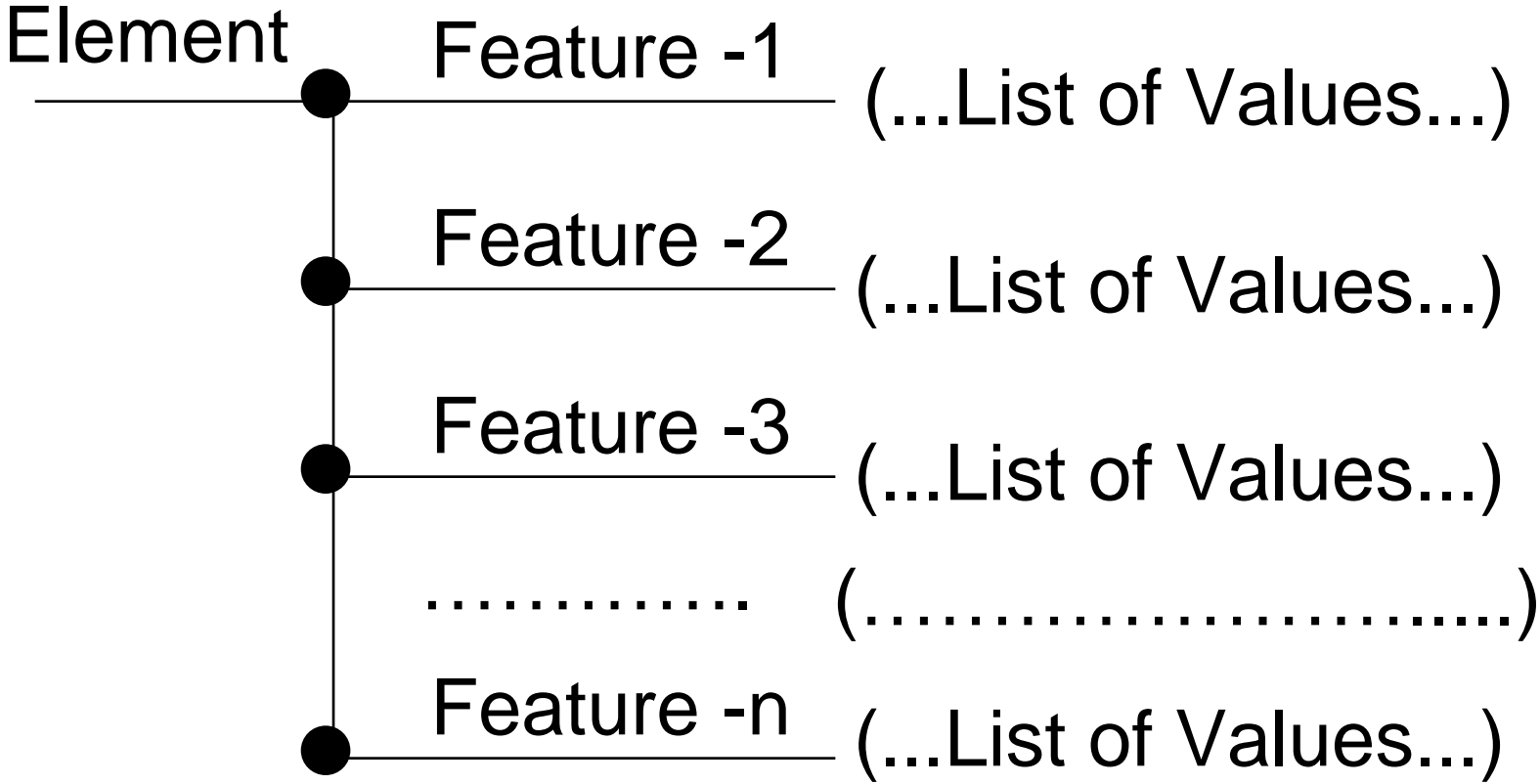
Common life usage: Name of Element and List of its Features



Example:



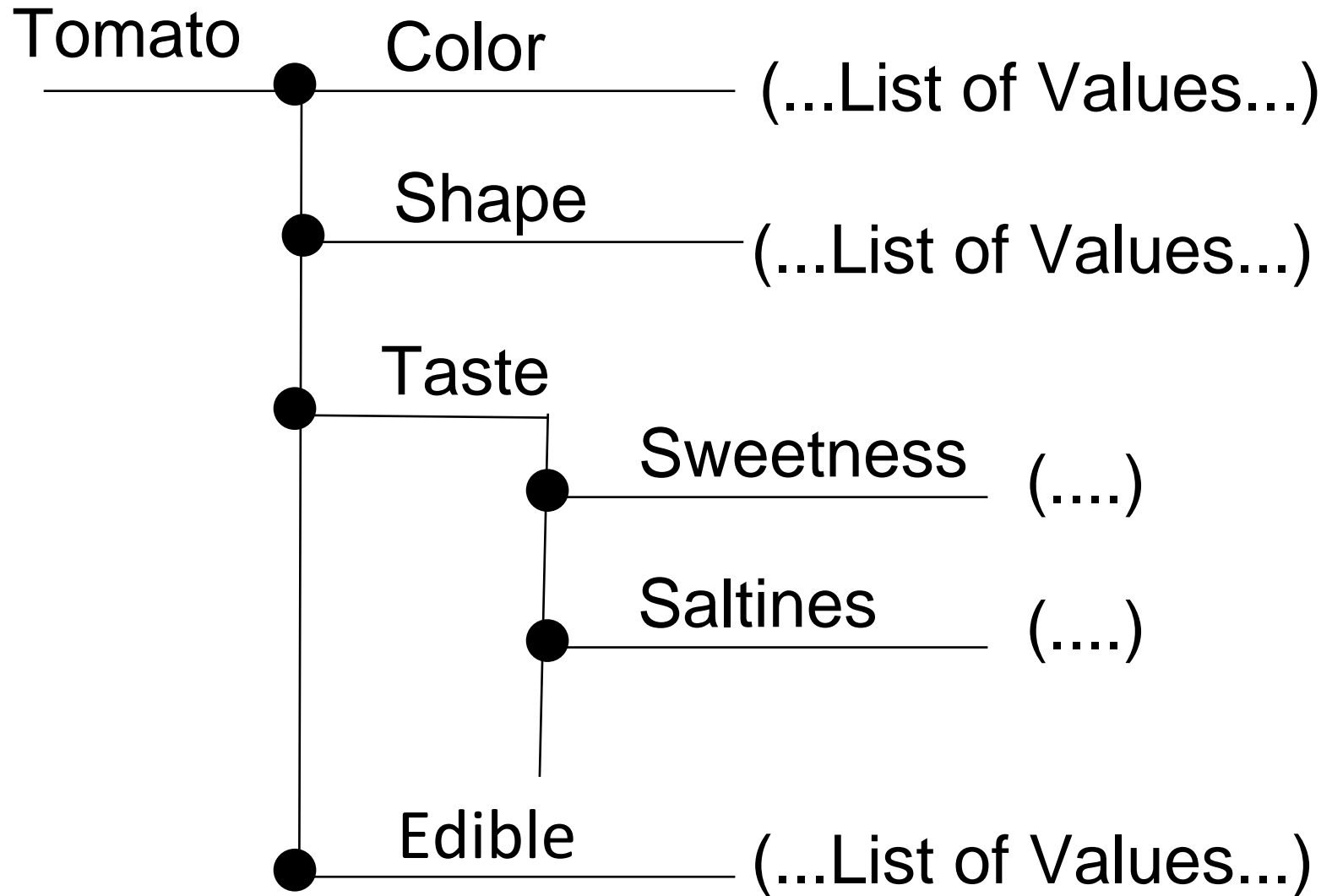
Model useful for problem solving: Element - Name – Value (ENV)



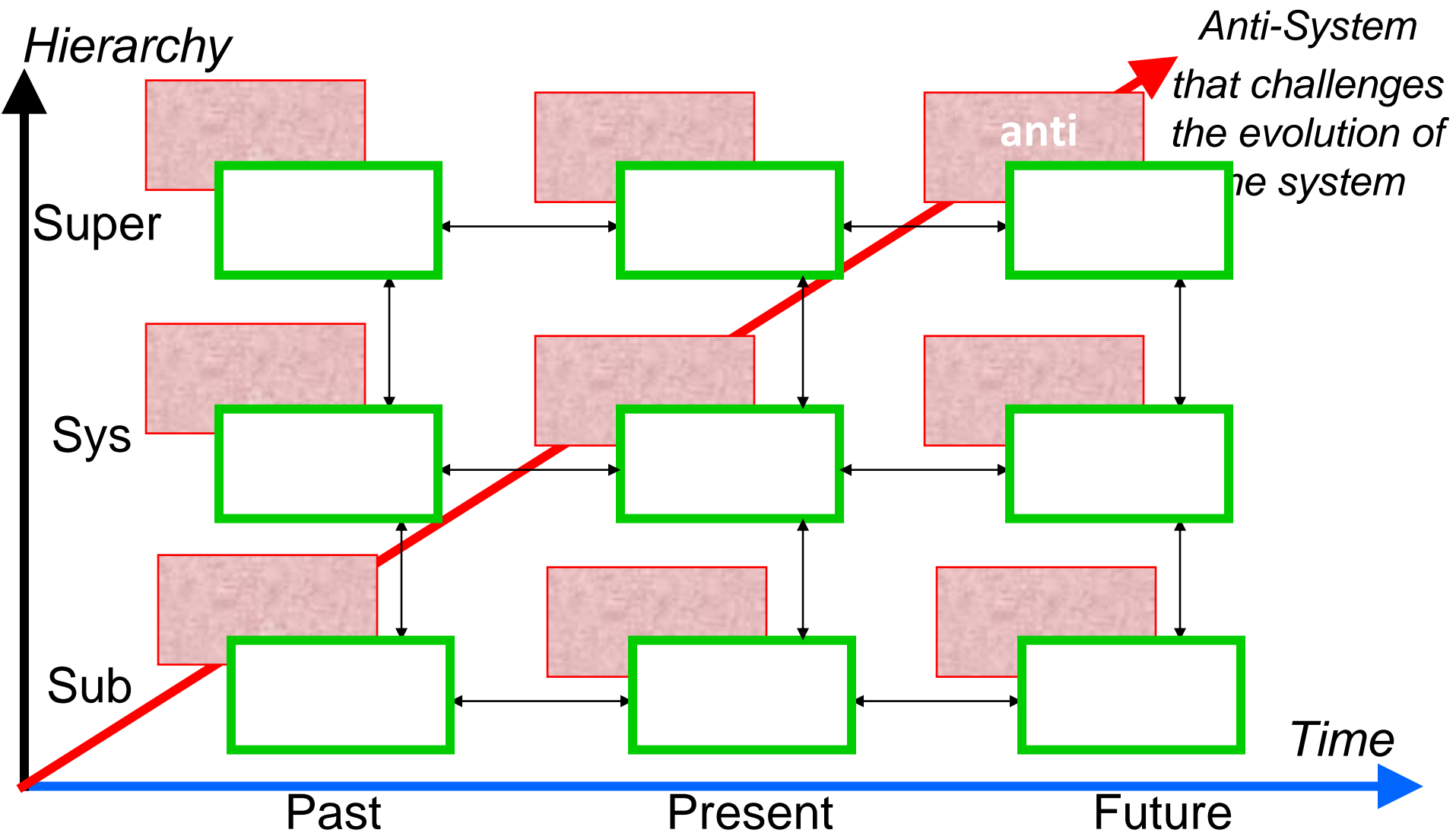
Example:



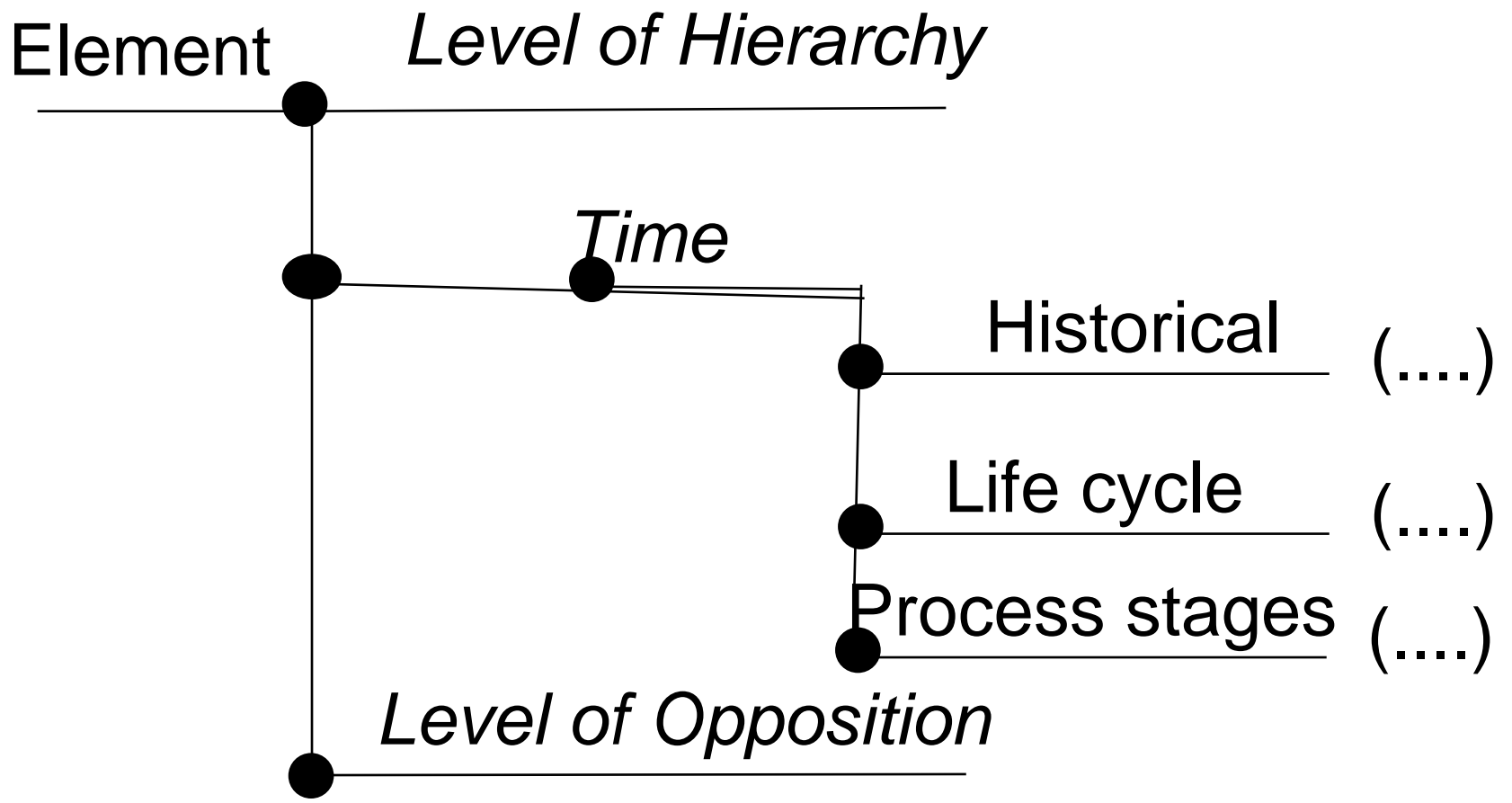
Fractal Example:



Altshuller's Scheme of Powerful Thinking



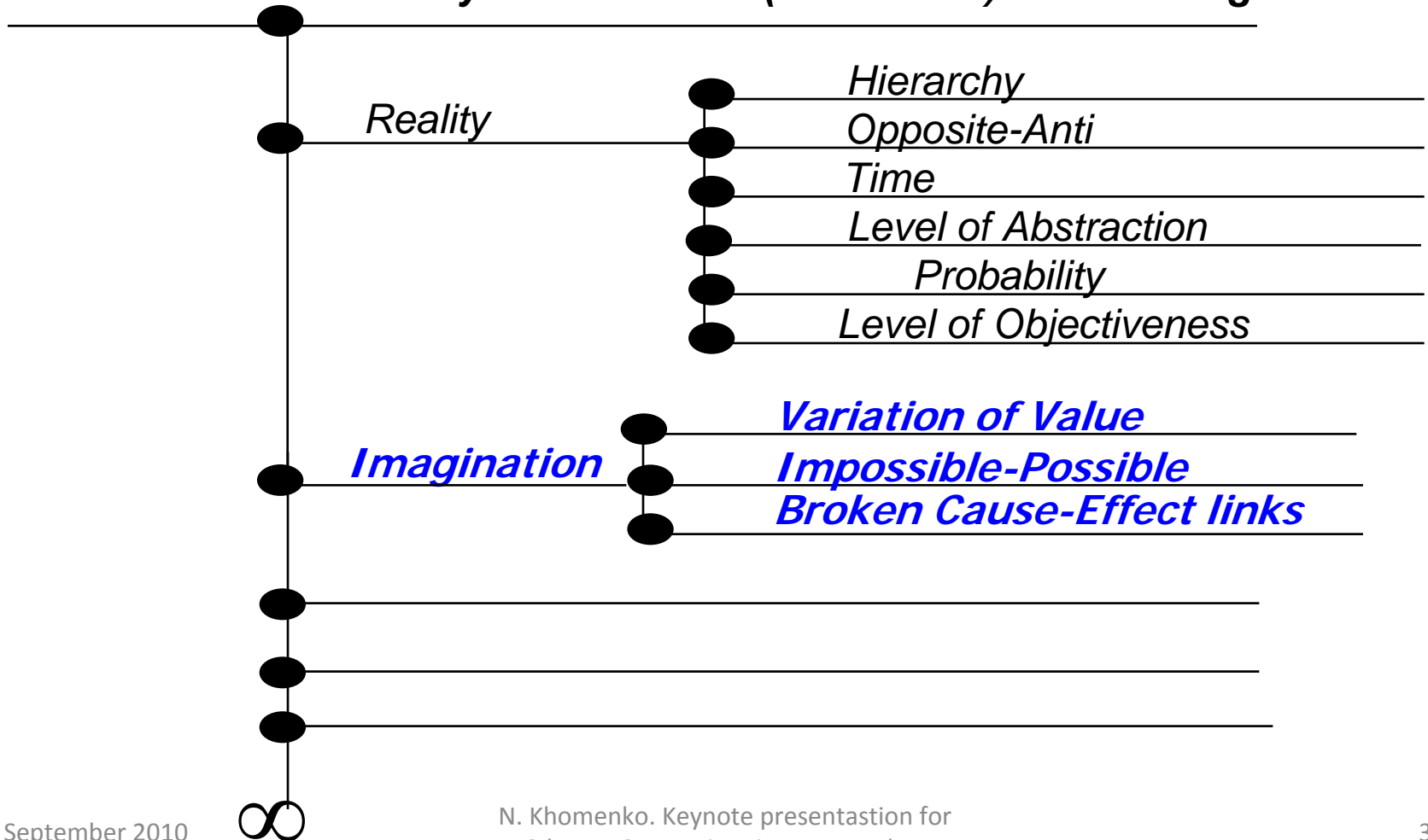
ENV Representation of Classical TRIZ System Operator



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

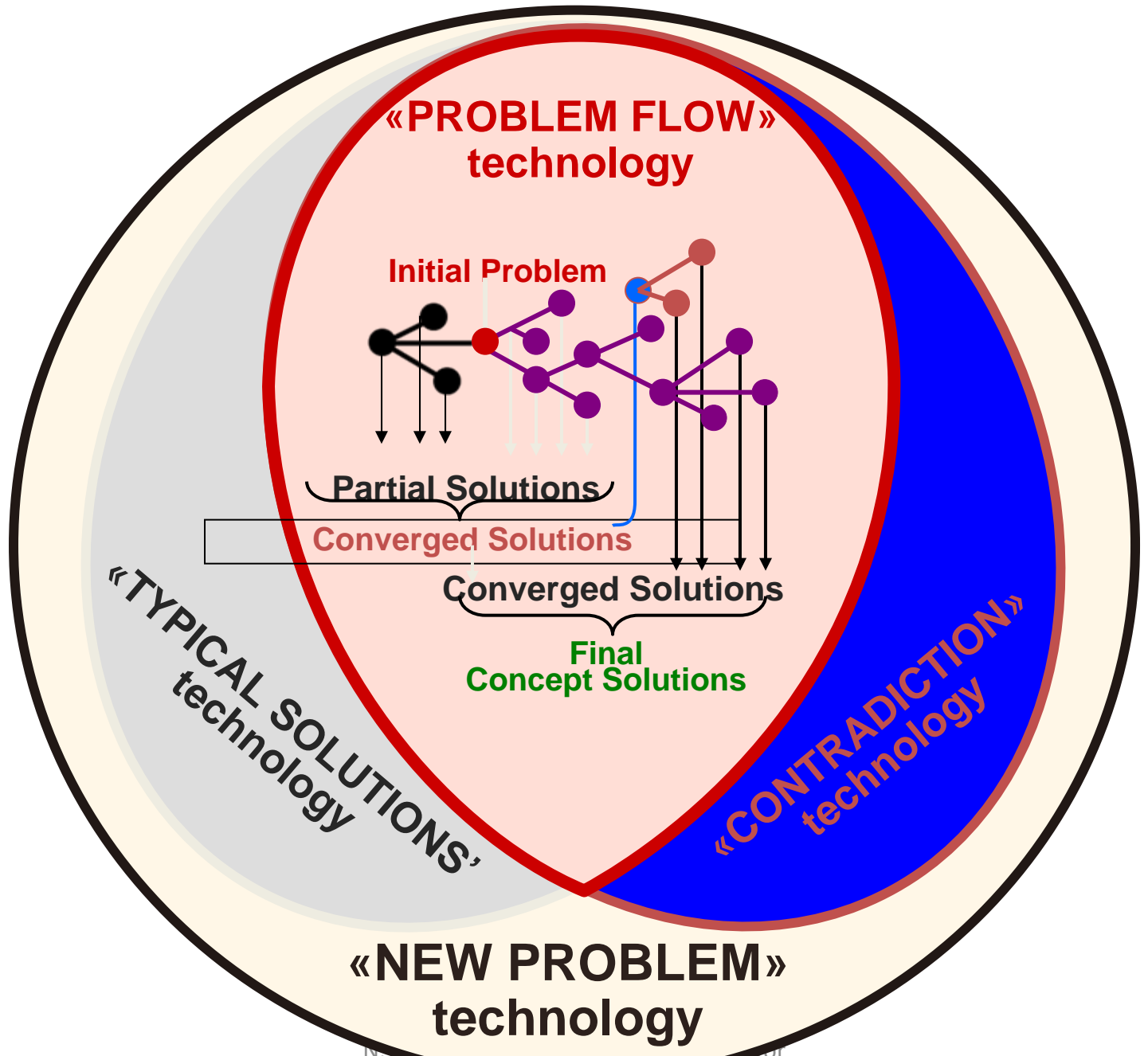
Element

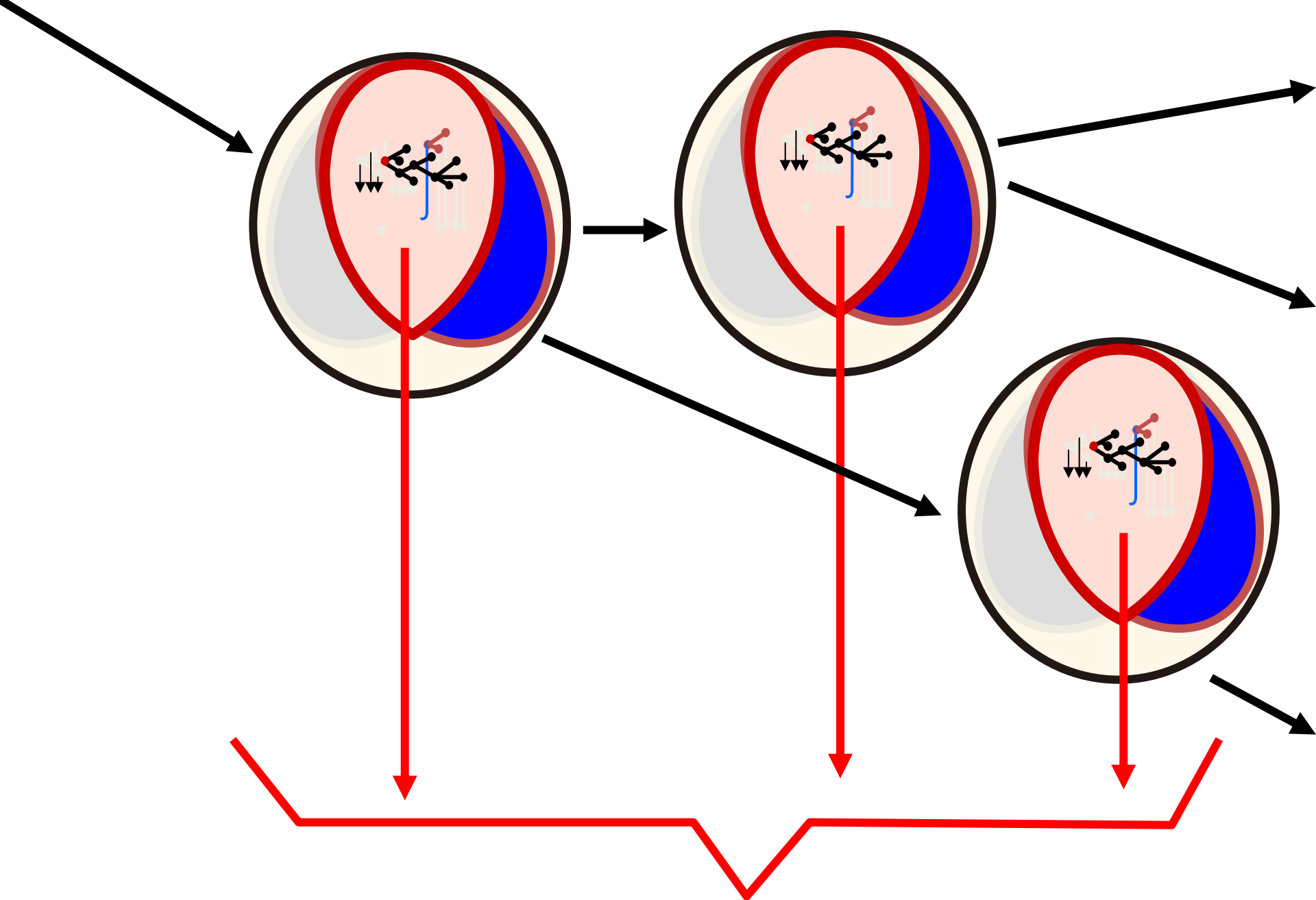
System of Goals (Value Tree) of modeling :



What make a problem difficult?

OTSM FRACTAL MODEL OF A PROBLEM SOLVING PROCESS





Next Stop – OTSM Toolbox.

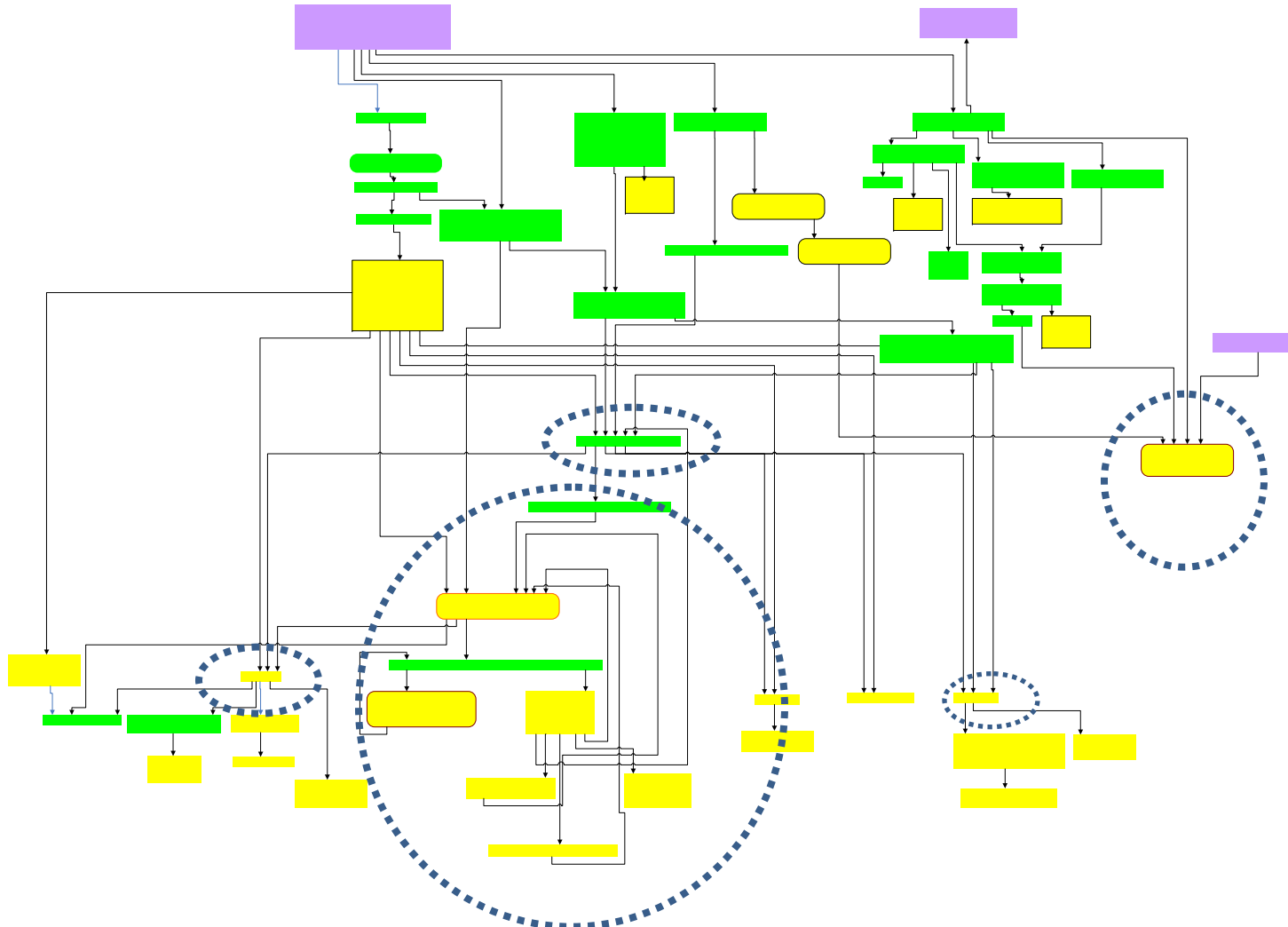
From problem solving to a problem flow managing

**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

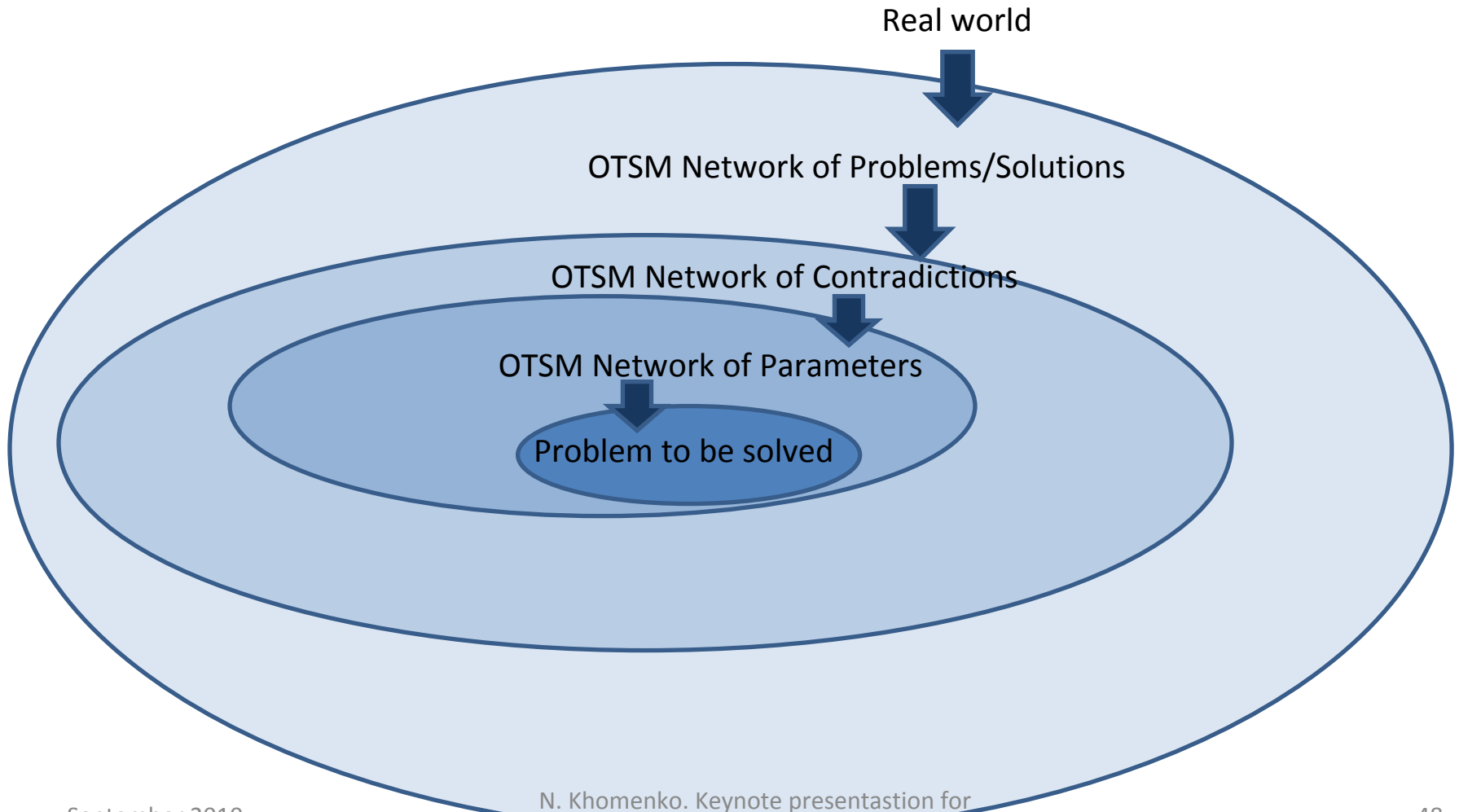


Some other OTSM based suplimentary tools:

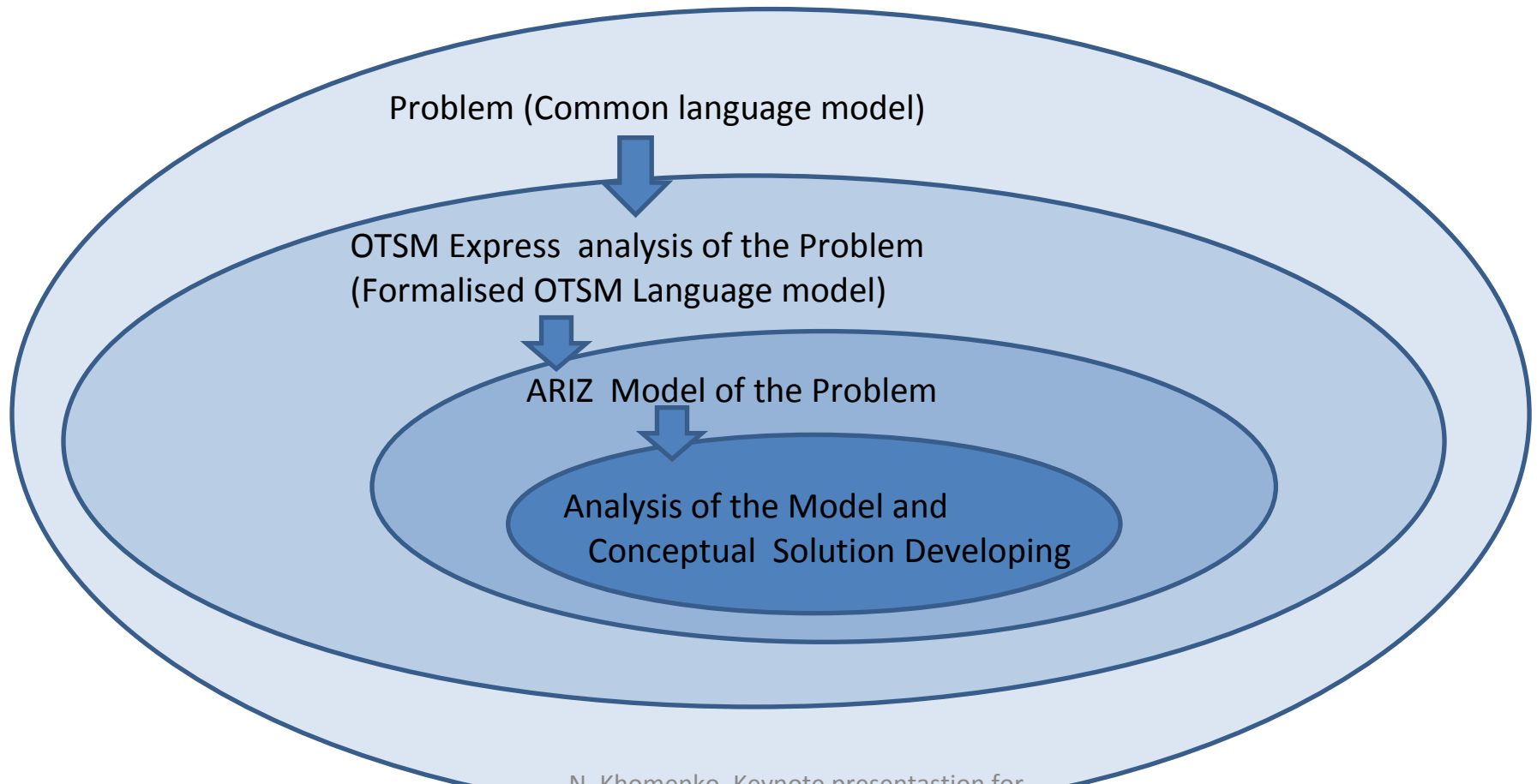
- OTSM ENV Model of the first step of ARIZ.
- OTSM Express analysis of an initial situation for developing first step of ARIZ.
- OTSM model of a minimal Engineering system.
- OTSM ENV algorithm for a Function reveailing.
- Elementary “Tongs” model for preliminary problem description and analysis.

GENERAL SCHEMA OF OTSM PROBLEM SOLVING]PROCESS

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



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



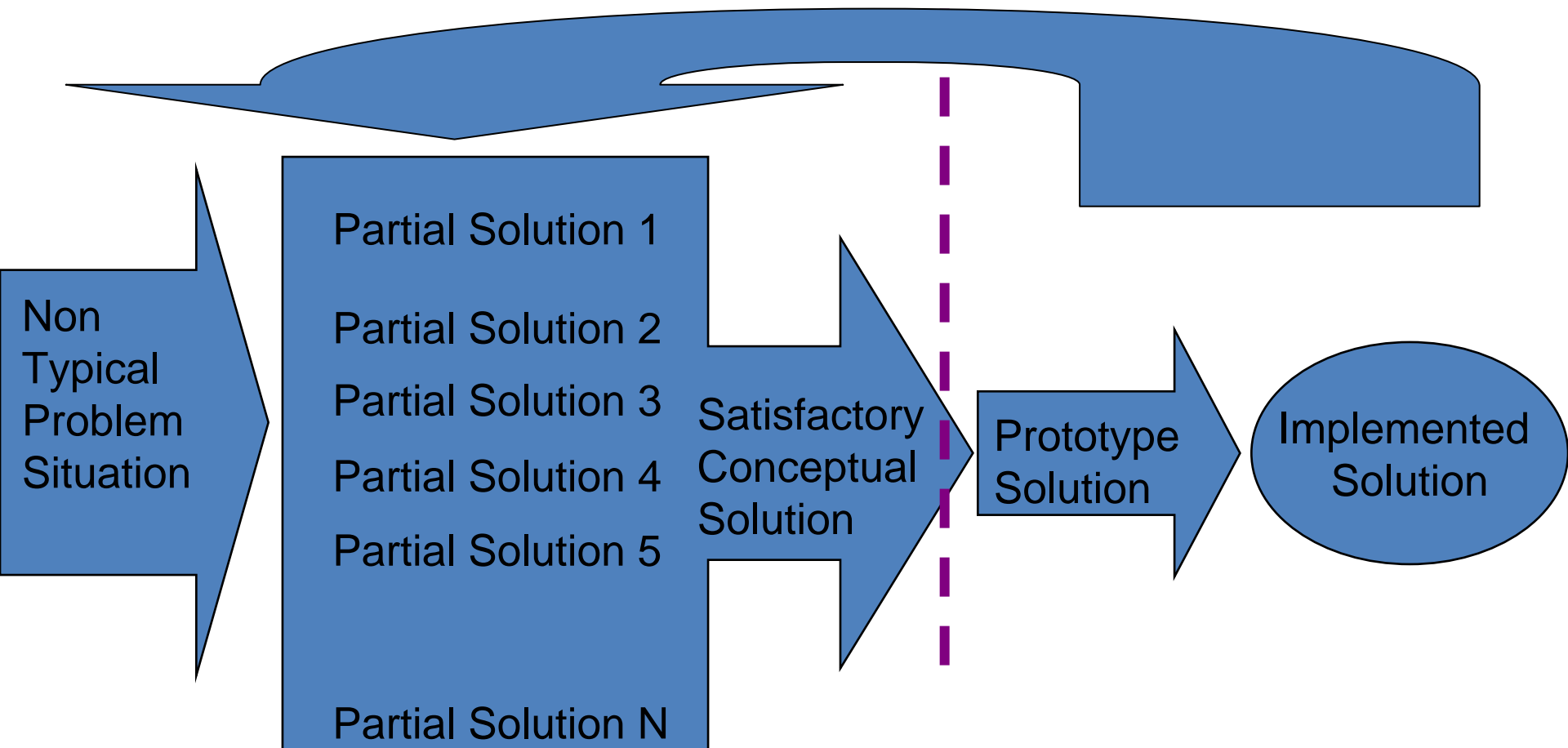
How can we know what tools of OTSM-TRIZ should be implemented for certain particular moment of a problem solving process?

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, and output, 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).

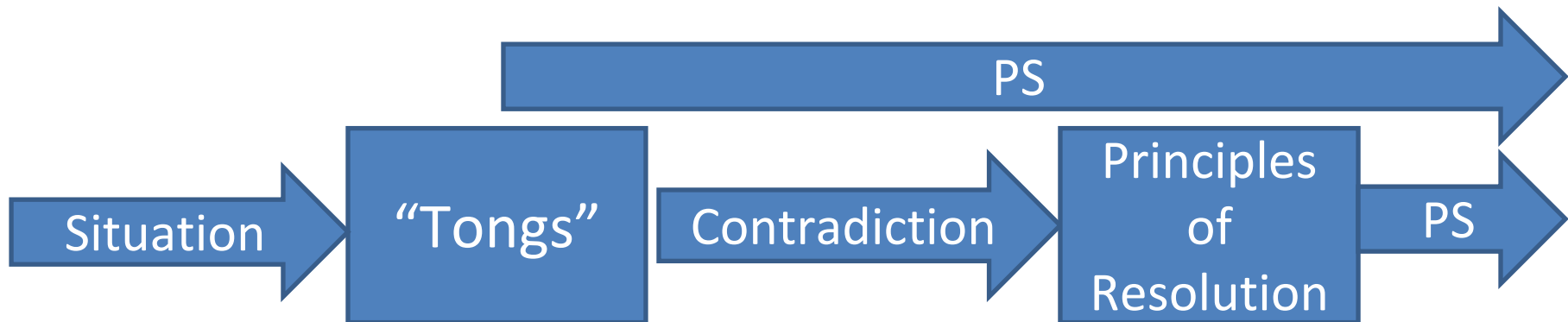
Black boxes stimulate our mind to generate PCS and converge them into SCS



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.

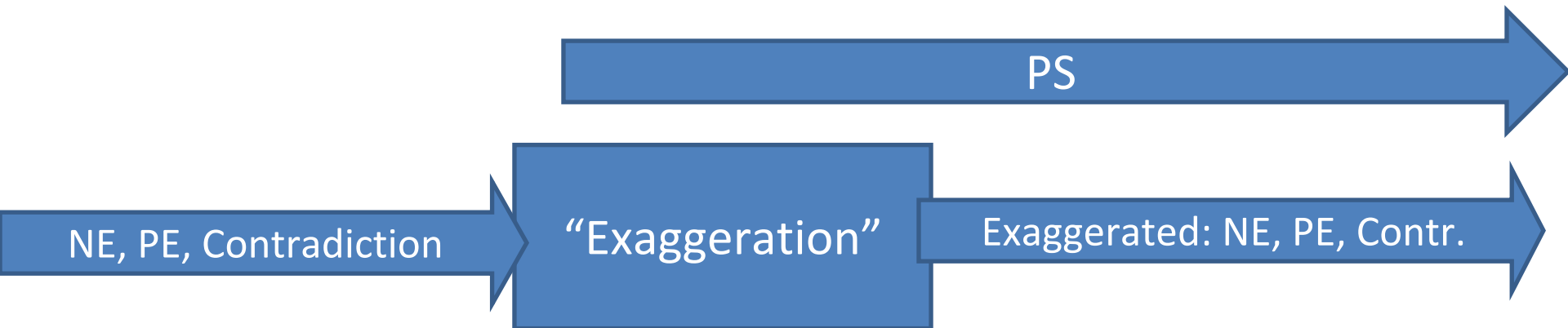
How does it works?

- 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.



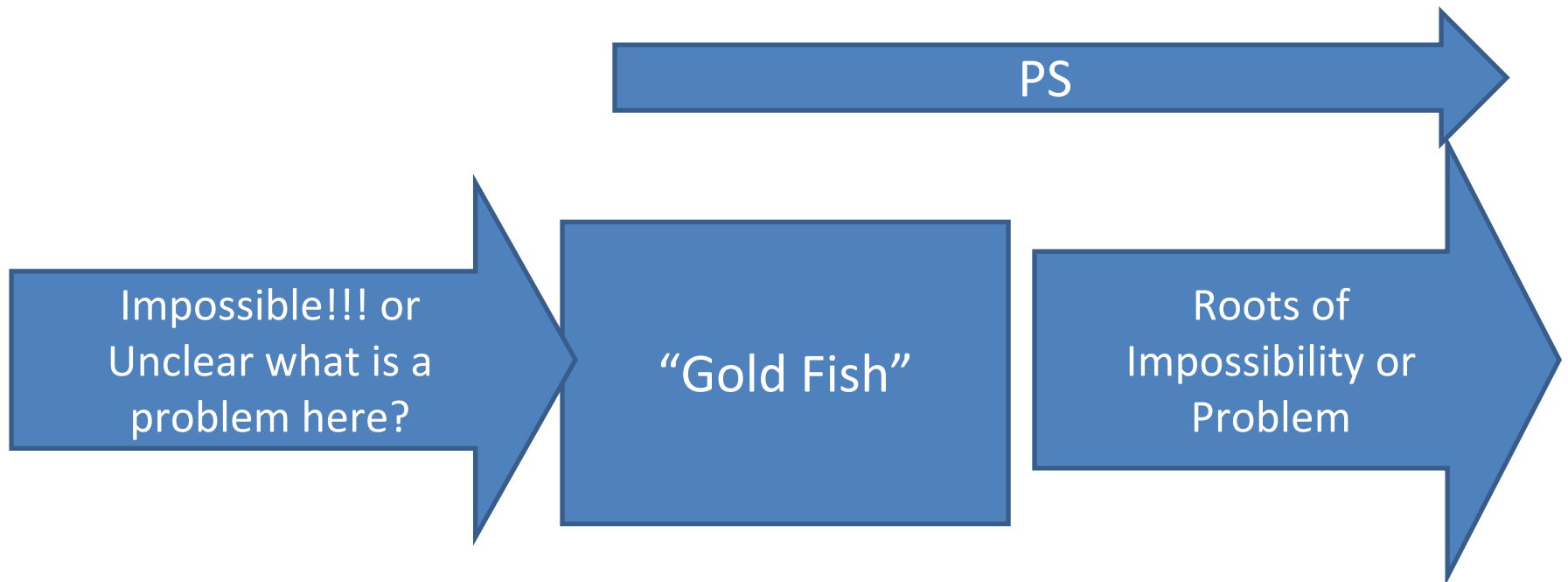
How does it works?

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



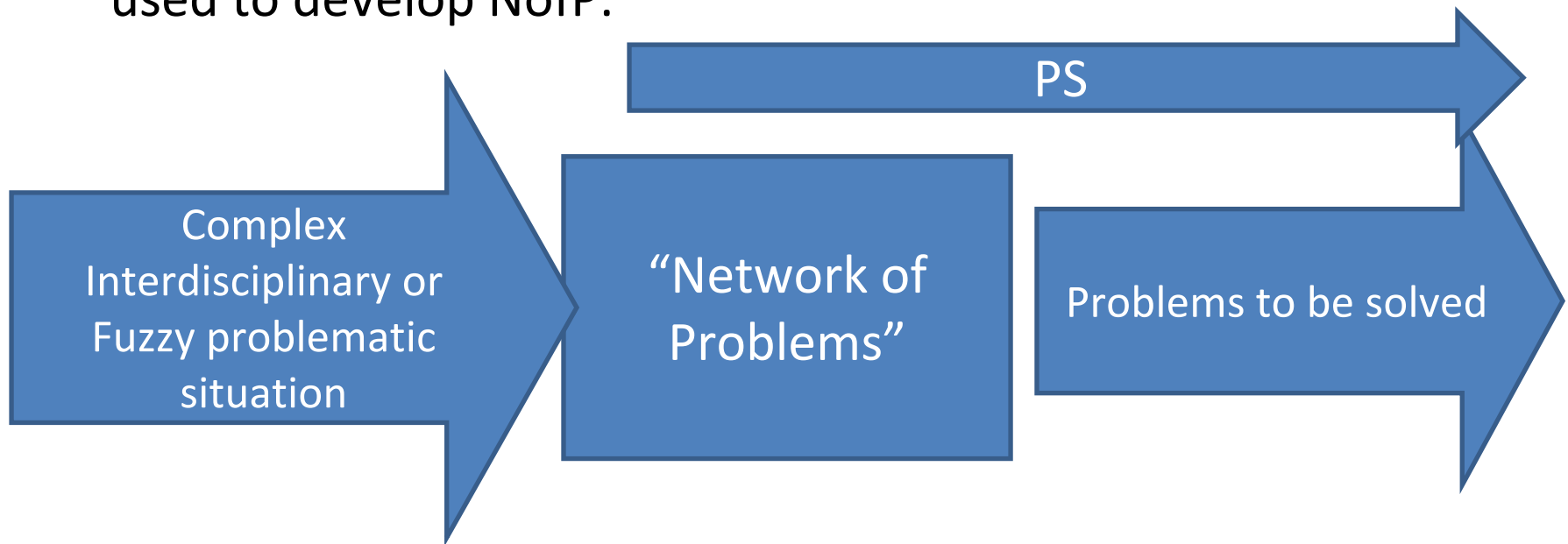
How does it works?

- 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 follow this direction of Classical TRIZ evolution and develop 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.

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?**

Breakthrough 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 thre problem solving. If the knowledge are not in here now, then undurstand what kind of knowlledge can be usefull 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 knoweldge 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 necessary more and more 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 A 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 formalised.

Examples: Llinear Prospective, Square Equations.

Conclusions:

1. The higher level of formaisation 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 formalisation for Today Creativity we obtain new and better understanding on whan will be Tomorrow Creativity.
3. TRIZ and OTSM based creativity kill Today understanding of Creativity and transform it to a routin activity but at the same time it open our mind to a new level of creativity and provide us new opportunity.

You are welcome to a new opportunity world!

Contact:

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You can connect me at social networks:

www.linkedin.com & www.facebook.com

Blog:

<http://otsm-triz-sustainable-innovation.blogspot.com/>

Download some of my papers and animations from my Website:

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