# HOW TRIZ WORKS

Global TRIZ Conference 2014 in Korea

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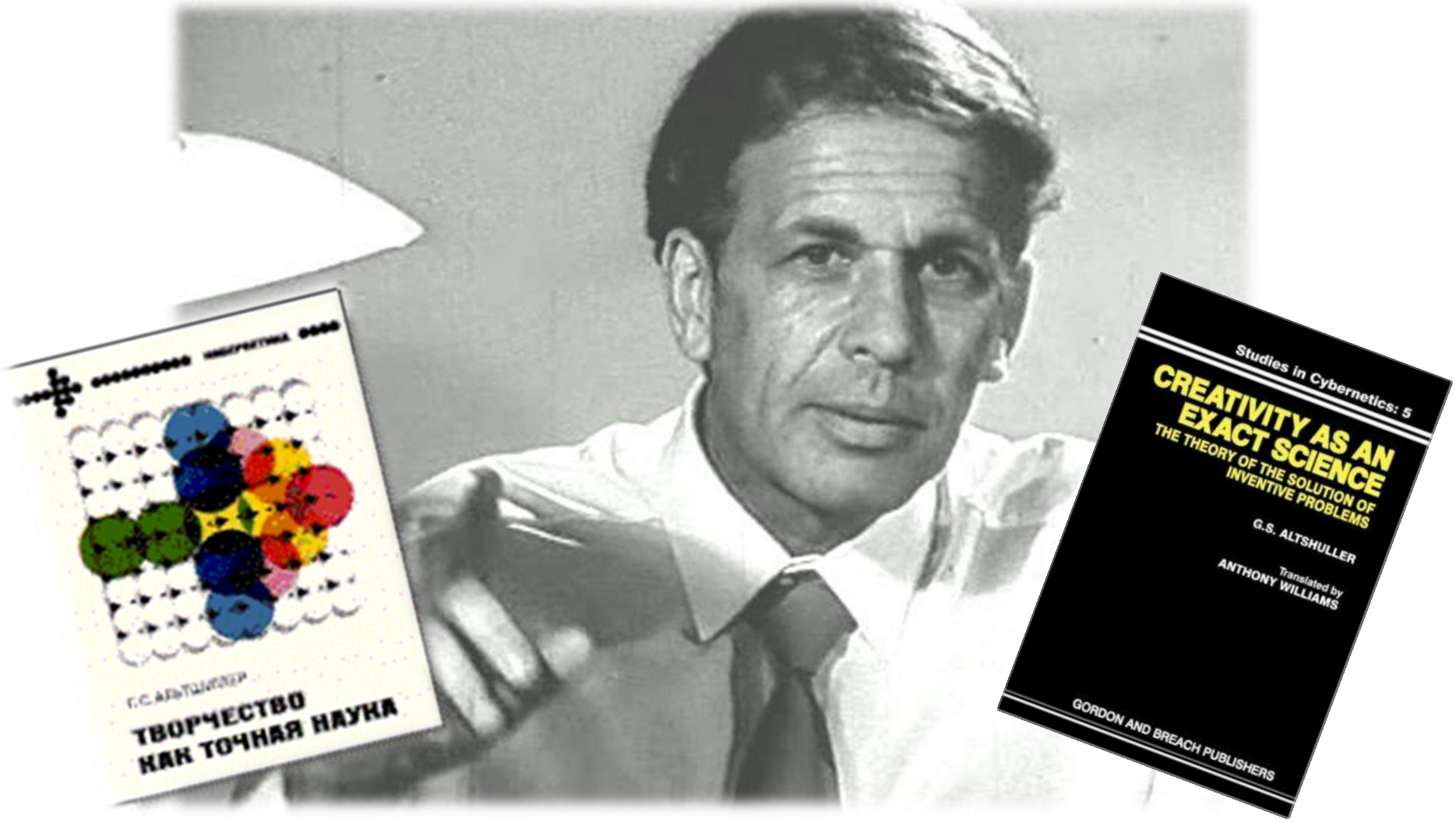
# 35 years ago…


Г.С. АЛЬТШУЛЛЕР
ТВОРЧЕСТВО
КАК ТОЧНАЯ НАУКА
Studies in Cybernetics: 5
CREATIVITY AS AN EXACT SCIENCE
THE THEORY OF THE SOLUTION OF INVENTIVE PROBLEMS
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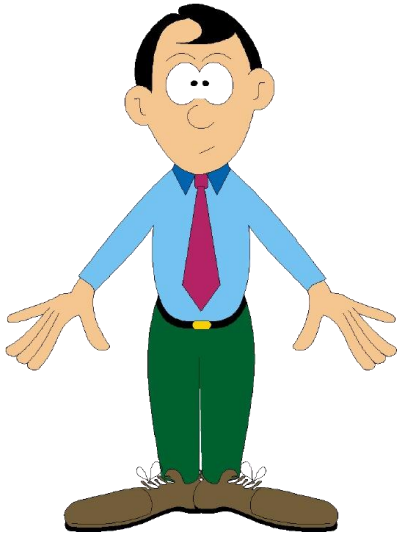
Translated by ANTHONY WILLIAMS
GORDON AND BREACH PUBLISHERS

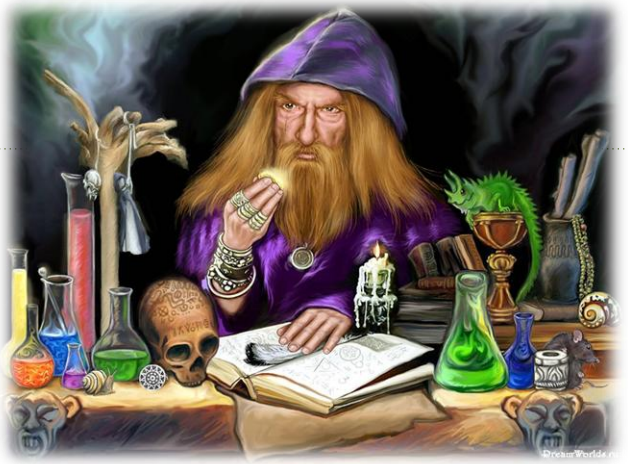
# Since then, nobody answered…

- …why and how does TRIZ work?
- …what TRIZ can and what TRIZ cannot do?
  - …what problems could and what problems could not be resolved with help of TRIZ?
  - …what can and what cannot be predicted with help of TRIZ?
- …does TRIZ really provide for better solution than any other creative method? If yes, then…
  - …how to prove it?
  - …how to distinguish a good solution from a mediocre one?
  - …how to prove that this particular solution was produced with TRIZ, not with any other creative method?



- …does TRIZ really produce more accurate forecast than any other creative method? If yes, then…
  - …how to prove it?
  - …how to distinguish a successful innovation from a failure?
  - …how to prove that this forecast was made with TRIZ, not with any other forecasting method?
- …are the TRIZ tools comprehensive? reliable? excessive? Usable?
  - …if yes, then how to prove it?
  - …if no, then how to improve TRIZ toolkit?

# How we understand TRIZ



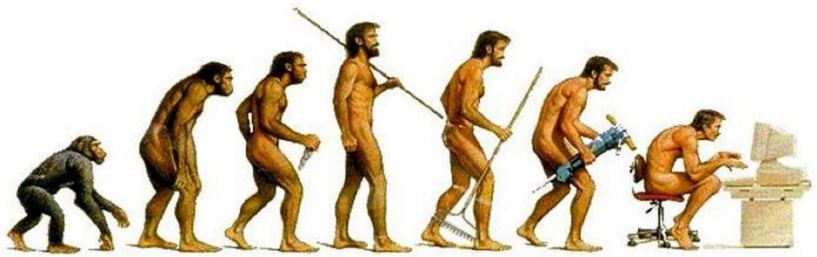
- TRIZ is a set of empiric rules
  - TRIZ works exactly as it is described
  - We need special TRIZ for chemistry, software, etc.

- In TRIZ we trust
  - TRIZ works everywhere
  - With TRIZ, I will solve any problem

- We know how TRIZ works
  - TRIZ has its specific purpose
  - There are handful of fundamental mechanisms that make TRIZ work
  - TRIZ has its boundaries of use

# TRIZ Is…

- …a science



  - …that describes, explains and predicts

    - …evolution of satisfaction of human needs


# TRIZ Space

**SatIsfactIon of human needs**

Thinking

Activity

Resources

Enabling & Disabling

Arming/disarming device

Underlying Process

Detection of situation

Sensors

Owners' identification

Key & lock

Decision-Making

Control unit

Action & Counteraction

Siren

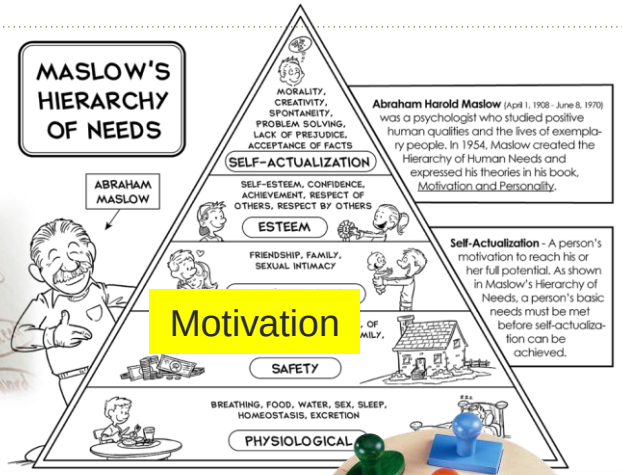
Excellence is a Habit

Consistency

Limitations

Balance

Associative Thinking


Motivation

Matching

Growth

Multiplicity

Availability

Variability

Selection

**EvolutIon**

# NEW PROBLEM-SOLVING PROCESS

Deduced from Axioms

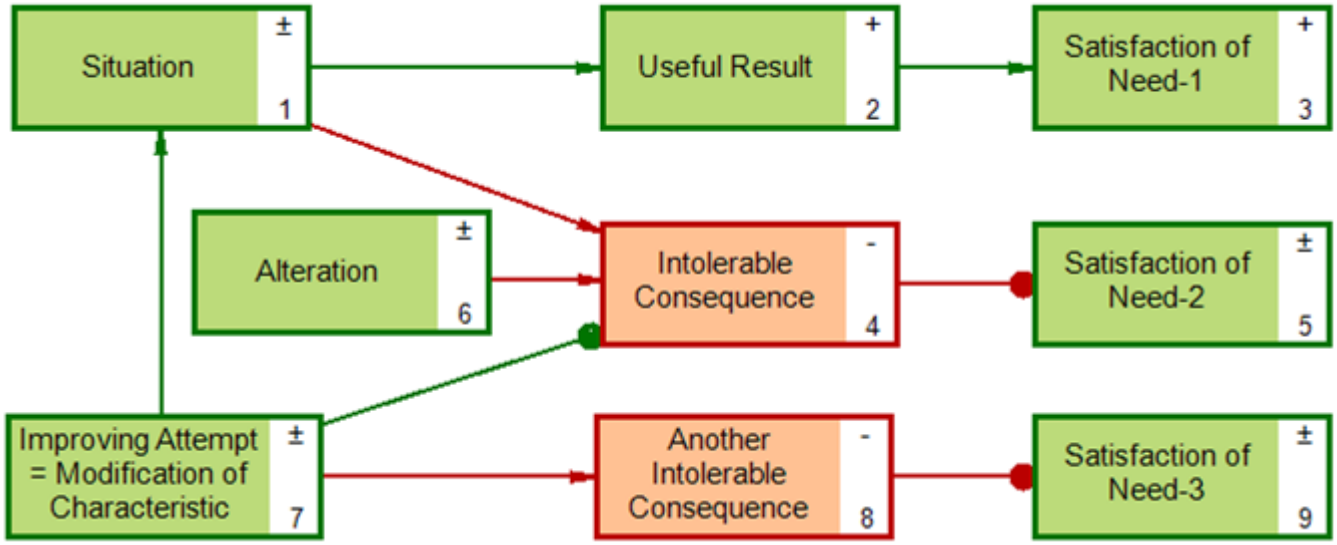
# What Problems Should TRIZ Solve?

- Solve problems in any area related to satisfaction of human needs
  - TRIZ uses principles of selection of the best solutions related to satisfaction of human needs
  - Hence, TRIZ outperforms any approach in solving the problems related to satisfaction of human needs


- Don't solve the problems that could be solved by other areas of science and knowledge
  - TRIZ is much younger in any area where problems occur
  - Hence, TRIZ cannot outperform any other knowledge
  - Solve the problems where other knowledge failed

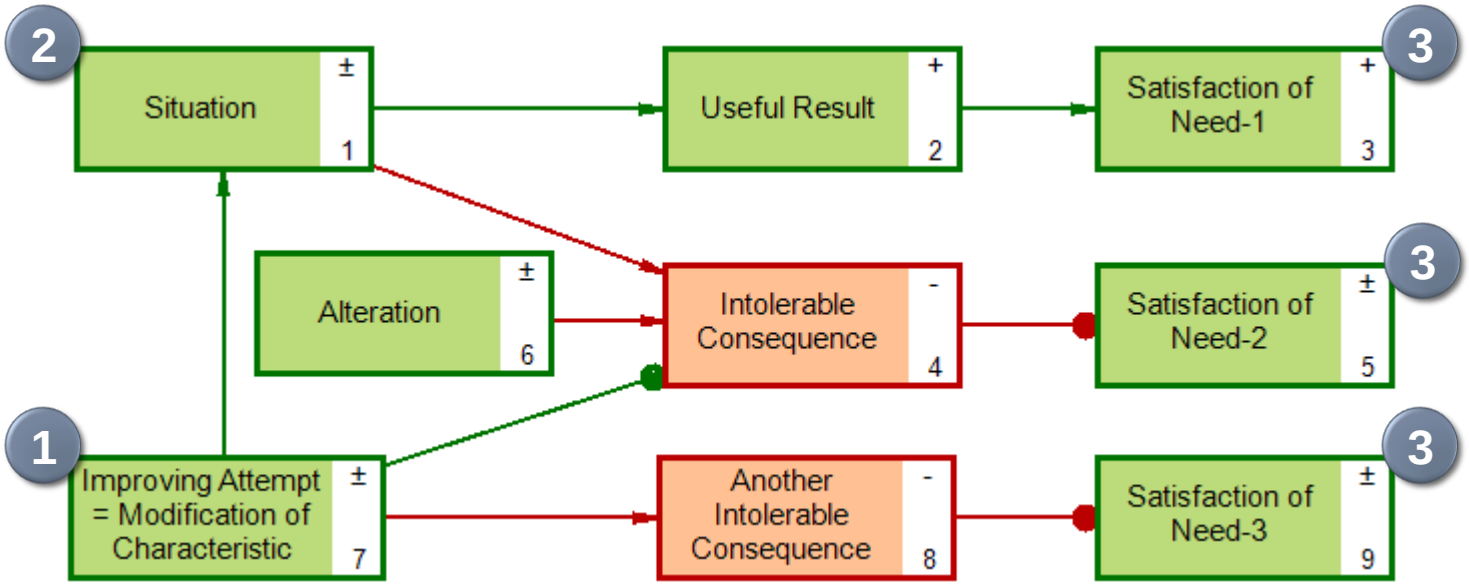
- Conclusion: TRIZ should solve the "unsolvable" problems
  - Problem is important for satisfaction of human needs
  - Experts tried to solve this problem, but failed
  - Hence, TRIZ job is helping the experts to overcome the failure of their expertise

# Typical Unsolvable Problem




- ***The initial situation was intended to produce useful result needed to satisfy some need.***
- ***Some alteration occurred in situation's environment and resulted in intolerable consequence of situation.***
- ***This consequence hinders satisfaction of some need.***
- ***Any known attempt to improve the situation produces another intolerable consequence.***
- ***What could be done?***

# Three Sub-Problems




1. Modify the known improving attempt so that it eliminates the intolerable consequence and does not produce another intolerable consequence

2. Modify the situation and its environment so that the intolerable consequence does not occur

3. Modify the ways to satisfy the needs so that their satisfaction does not depend on the obstacles that occur in the problem situation

# Evaluation Criteria

1. Achievement Criteria:
   - What is the goal of TRIZ project?
   - How do we know that this goal is achieved?

2. Threshold Criteria:
   - What efforts and expenses represent the reasonable cost of solution?
   - What is the threshold of reasonable cost?

3. Non-violation Criteria:
   - What consequences of solution would be intolerable?

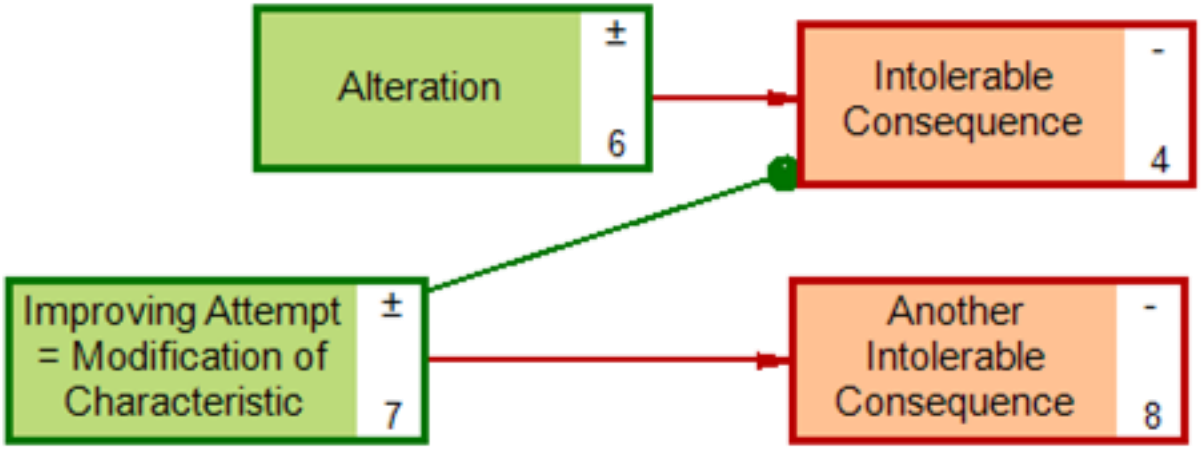
# SUB-PROBLEM # 1

Modify the known attempt to improve the situation

# Innovation Questionnaire # 1

1. How do you name the situation in which the problem occurred?
2. What useful result is produced by this situation? What is the purpose of this situation?
3. What alteration caused the problem?
4. Was this alteration intentional? If yes, was this alteration intended to improve useful result of situation?
5. What consequence of situation became intolerable due to this alteration?
6. Changes of which characteristics of situation could eliminate this consequence?
7. If we change these characteristics and eliminate this consequence, which another harmful consequence of situation would become intolerable?

# Three Typical Tasks

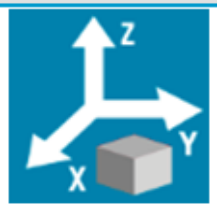
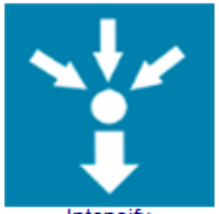
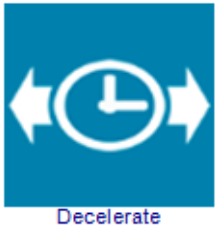



1. Prevent occurrence of the intolerable consequence, counteract to it or eliminate its aftermath

2. Prevent occurrence of another intolerable consequence, counteract to it or eliminate its aftermath

3. Resolve the contradiction: characteristic of situation should be modified to eliminate the intolerable consequence and should not be modified to avoid occurrence of another intolerable consequence

# System of Inventive Principles GB TRIZ

| | | | | | |
|---|---|---|---|---|---|
|  Use Resources |  Use Time |   Use Space |  Change Structure |  Change Conditions or Parameters | |
|  Power/Energy |  Preliminary action |   Another dimension |  Exclude |  Partial action |  Vaccination |
|  Elements |  Post process time |  Asymmetry |  Partitioning |  Excessive action |  Isolate |
|   Information |  Use pauses |  Nesting |  Integrate |  Matching |  Counteract |
|  Derived |  Accelerate |  Take out the part |  Mediator |  Dynamism |  Disposable |
|  Intensify |  Decelerate |  Localize |  Copy |  Controllability |  Inversion |

# SUB-PROBLEM # 2

Modify the problem situation and its environment

# Innovation Questionnaire # 2

1. Describe the Situation and its environment “as it was intended”
2. Describe the Situation and its environment “as it is”
3. Which events contribute to the intended result of situation (useful events)?
4. Which events contribute to the intolerable consequence (harmful events)?
5. Which events contribute to both intended result and intolerable consequence (contradictory events)?
6. Which events contribute neither to intended result nor to intolerable consequence (neutral events)?

# Situation as Intended

Purpose

Event

Condition

Medicine is protected +1

Opening is sealed +2

Glass melts +3

Flame is strong +4

Ampoule is exposed to flame +5

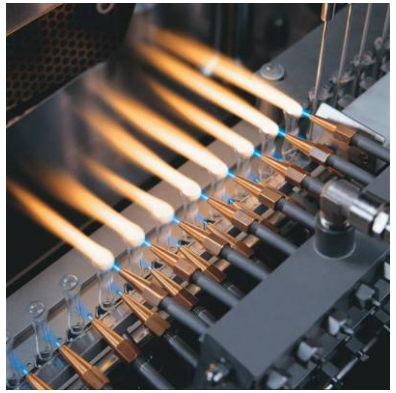
Torch works +6

Ampoule is in air environment +7

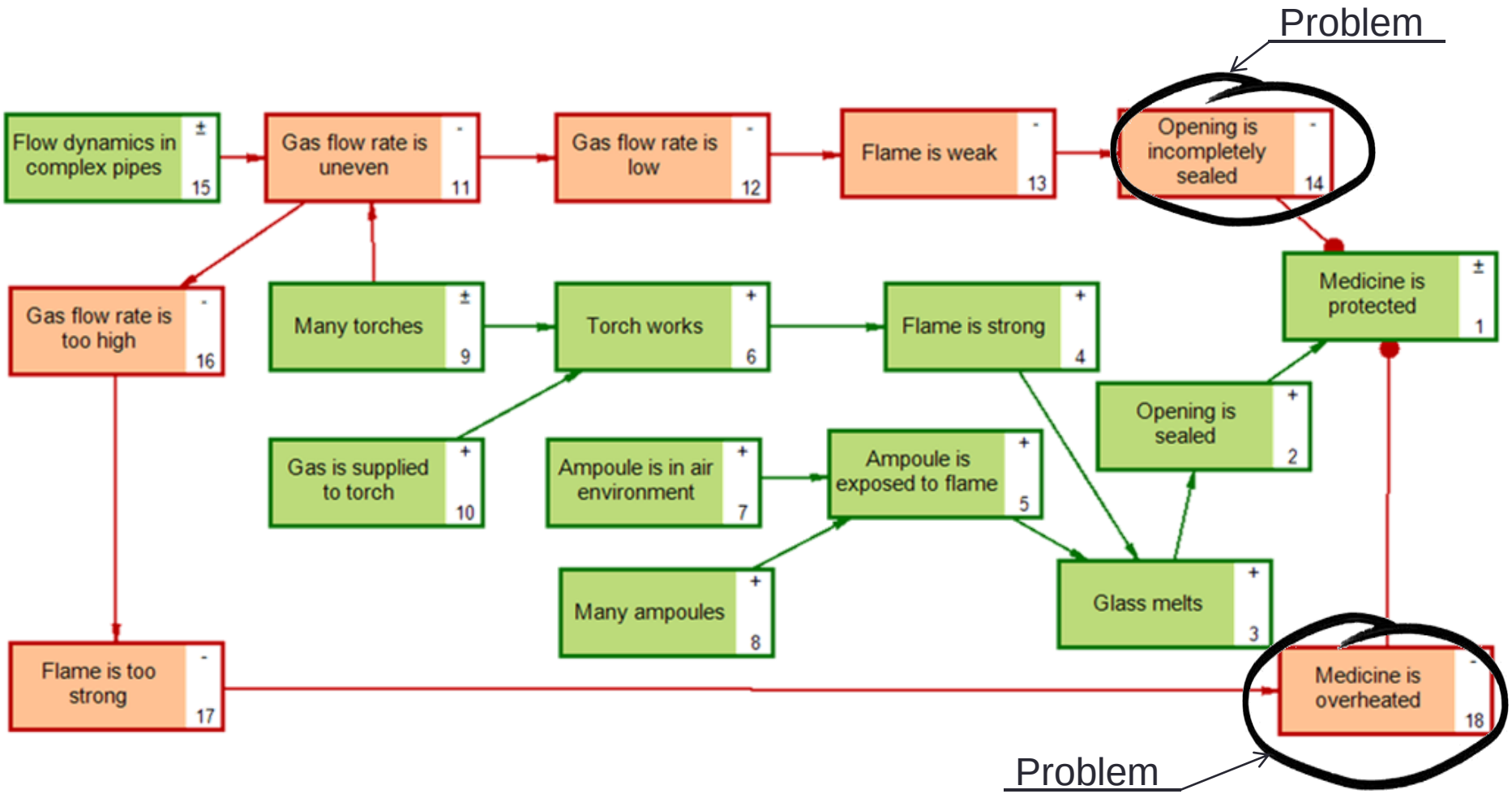
Many ampoules +8

Many torches +9

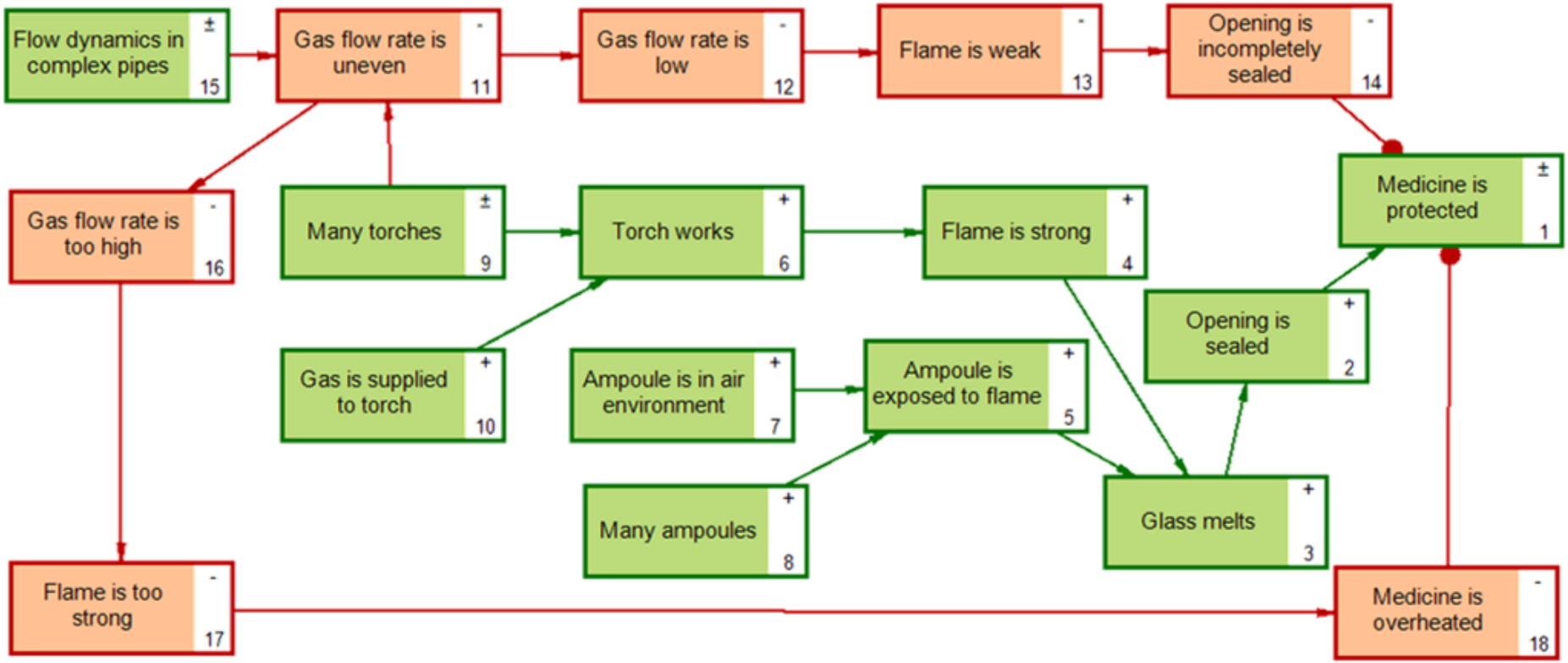
Gas is supplied to torch +10



# Situation as It Happened



# Three Typical Tasks




1. Improve the useful event
2. Eliminate the harmful event
3. Resolve the contradiction: the contradictory event should occur to produce the intended result, and should not occur to avoid the intolerable consequence

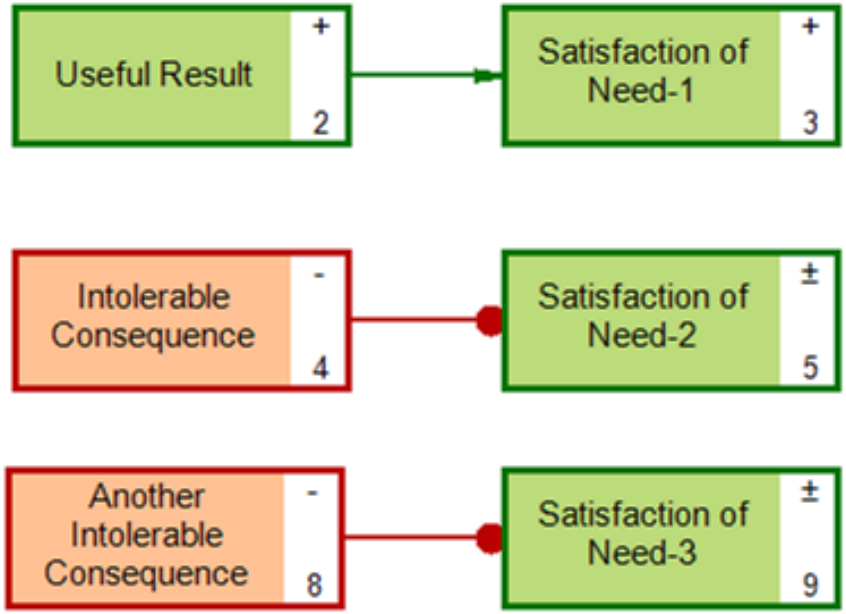
# SUB-PROBLEM # 3

Modify the ways to satisfy the needs

# Innovation Questionnaire # 3

1. Satisfaction of what need uses the useful result of problem situation?
2. What is the process of satisfaction of this need?
3. How would we know that this need is satisfied?
4. Satisfaction of what need is hindered by initial intolerable consequence?
5. What is the process of satisfaction of this need?
6. How would we know that this need is satisfied?
7. Satisfaction of what need is hindered by another intolerable consequence?
8. What is the process of satisfaction of this need?
9. How would we know that this need is satisfied?

# Sub-Problem # 3: Three Typical Tasks

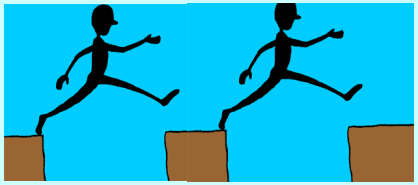
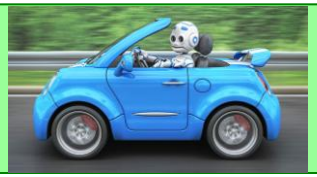
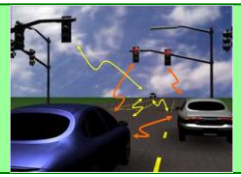
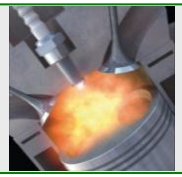
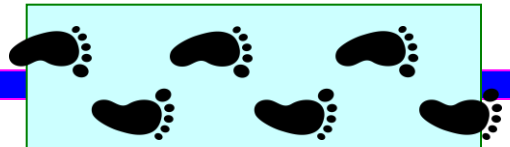



1. Forecast the next generation of satisfaction of the first need that does not require the useful result

2. Forecast the next generation of satisfaction of the second need that is not affected by the intolerable consequence

3. Forecast the next generation of satisfaction of the third need that is not affected by another intolerable consequence

# FutureMap

| | Current Paradigm | Emerging Trends ! | New Paradigm |
|---|---|---|---|
| Control |  |  |  |
| Decision |  |  |   |
| Participation |  |  |  |
| Safety |  |  |  |
| Energy |  |  |  |
| Path |  |  |  |

# SUBSEQUENT PROBLEMS

How to deal with objections and meet criteria

# Criteria, Objections and Subsequent Problems


## Criteria & Objections

1. Achievement Criteria:
   - What is the goal of TRIZ project?
   - How do we know that this goal is achieved?
2. Threshold Criteria:
   - What efforts and expenses represent the reasonable cost of solution?
   - What is the threshold of reasonable cost?
3. Non-violation Criteria:
   - What consequences of solution would be intolerable?
4. Feasibility Objection
   - It will not work because…

## Subsequent Problems

1. How to improve result?
2. How to reduce cost factors?
3. How to avoid intolerable consequence?
4. How to make concept working properly?

# CONCLUSION

- TRIZ is an exact science
- TRIZ is based on nine fundamental axioms
- TRIZ processes and tools can be deduced

감사합니다

Thank You