

# TRIZ SUMMIT 2022



INNOVATION MANAGEMENT  
AND TRIZ INSTITUTE



# TRIZ SUMMIT 2022



**Mikhail RUBIN**

- TRIZ Master, Moscow
- Started TRIZ since 1974
- President of TRIZ Developers Summit
- President of TRIZ Masters Union
- Co-author of G. Altshuller in research and publications in TRIZ
- Author of 12 patents,
- Author of 100+ publications n TRIZ



**Andrei KURYAN**

- TRIZ 4 specialist, Gdansk
- Started TRIZ since 1987
- Co-founder of EPAM TRIZ Club
- Presidium member of TRIZ Developers Summit



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# Source Problem Situation in TRIZ

Analysis & Ontology



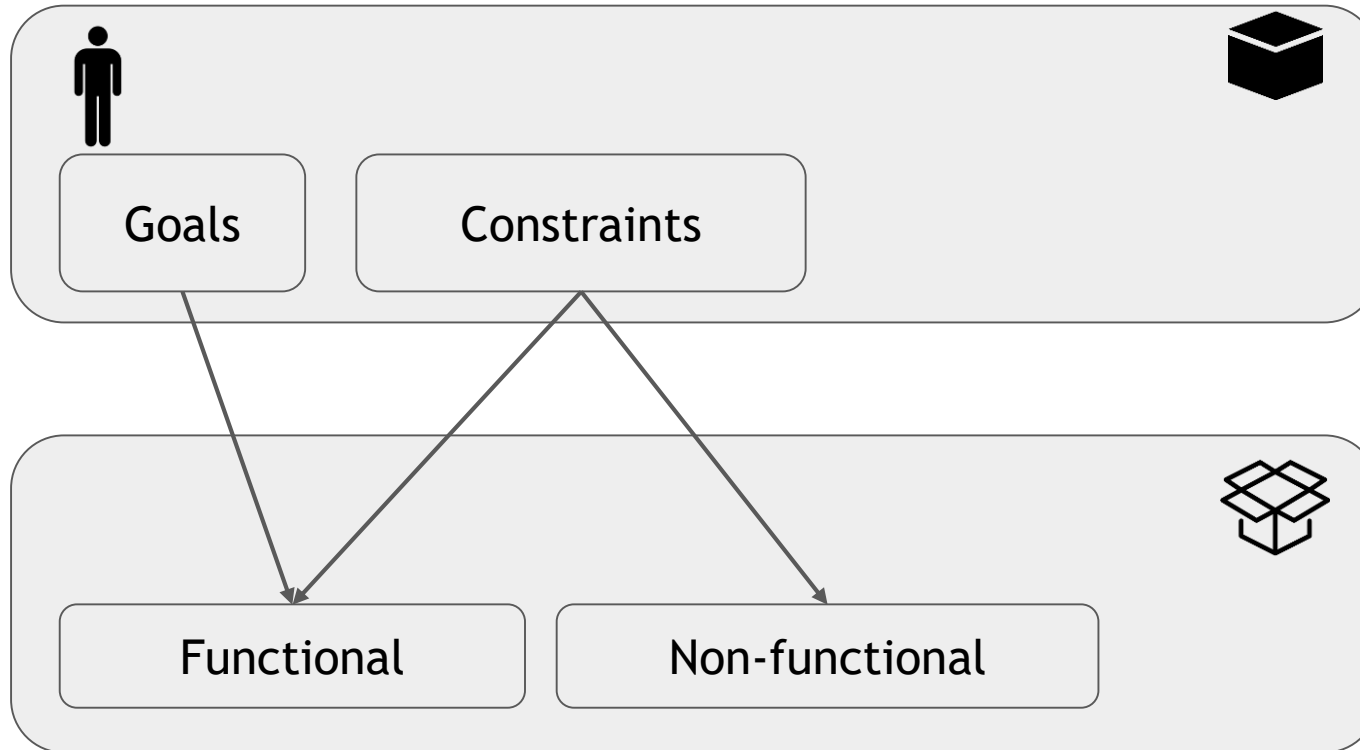
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# Requirements in engineering

Problems

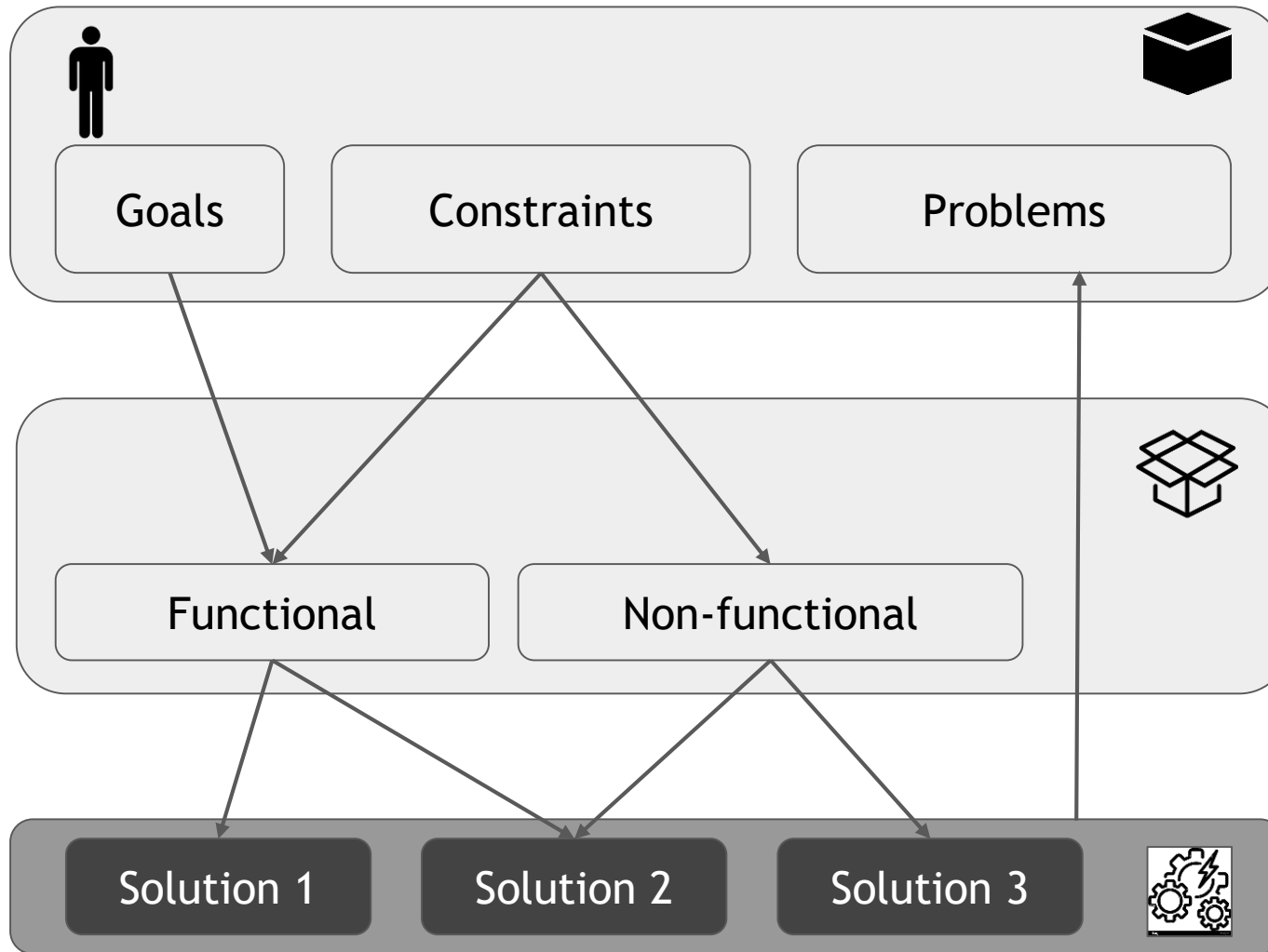
FMEA, ToC, ASQ 4-step model, Lean Six Sigma, Engineering Design Process, RCA



On the level of stakeholder`s requirements the subject considers the system as a “black box”

On the level of system requirements the subject considers the system as a “white box”

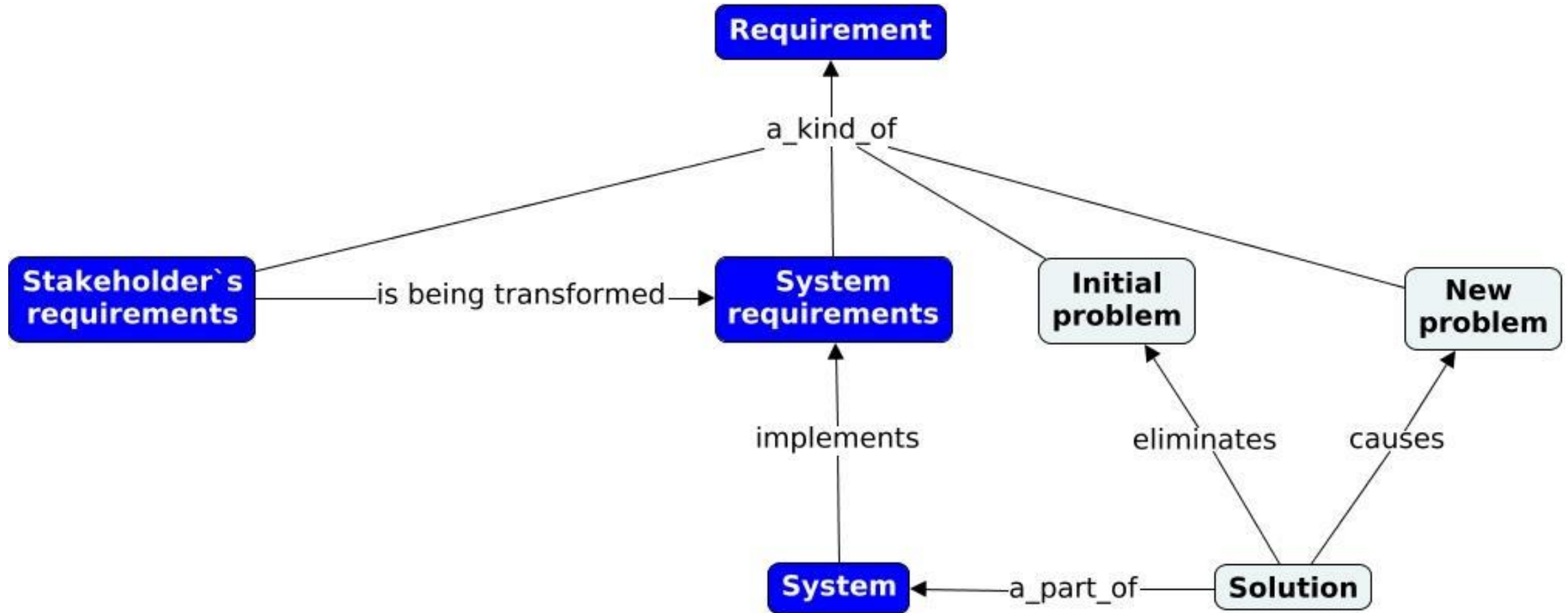
# Requirements in TRIZ



In TRIZ stakeholder's requirements consider as a requirements of super-system

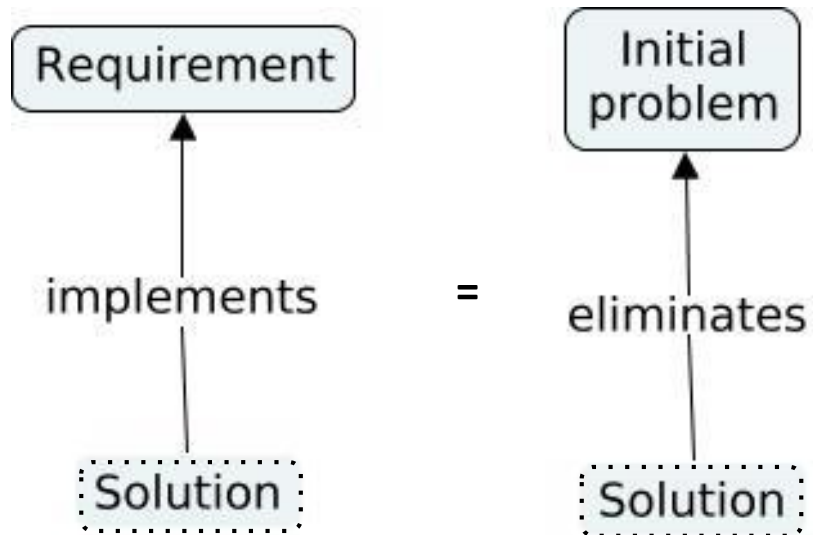
During inventive problem solving process the subject considers the system as a set of solutions where each solution implements the requirement or eliminates the problem

# Ontology of requirements in TRIZ



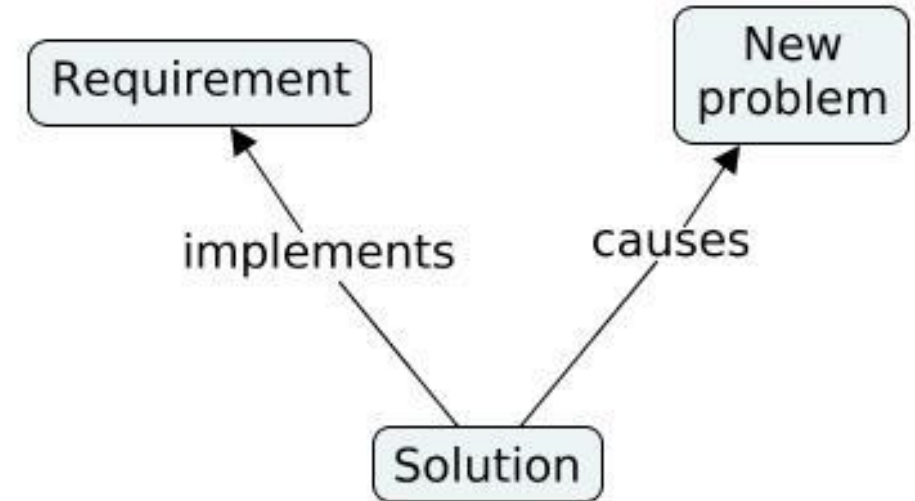
# Ontology of contradiction types

Administrative contradiction = Initial Problem situation



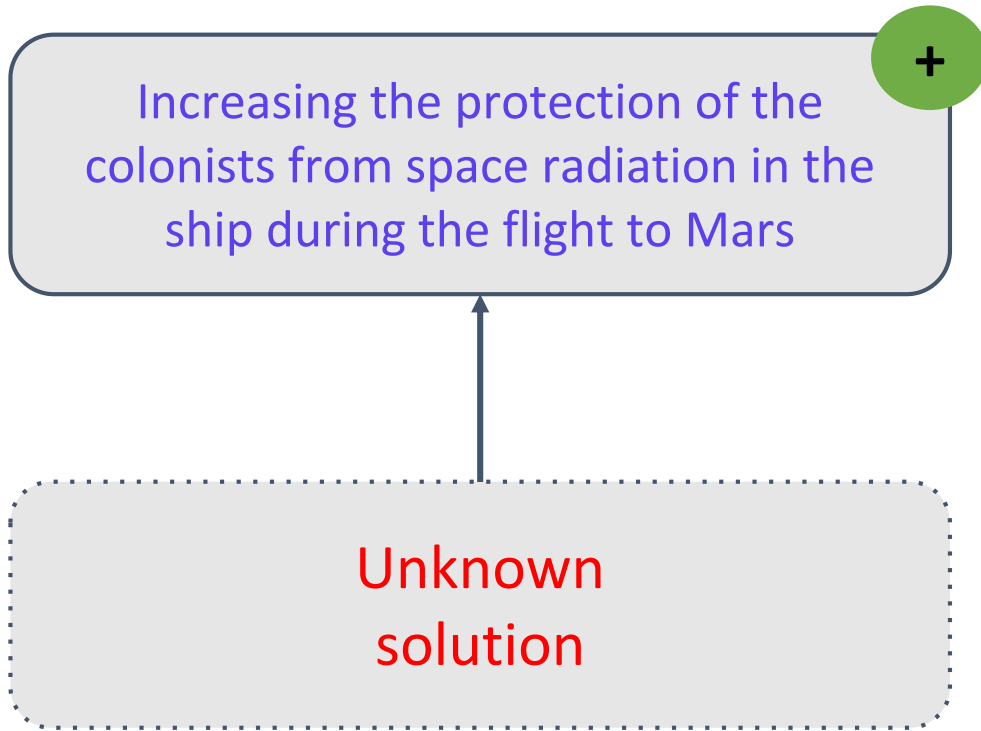
The solution  
Is unknown

Contradiction in requirements

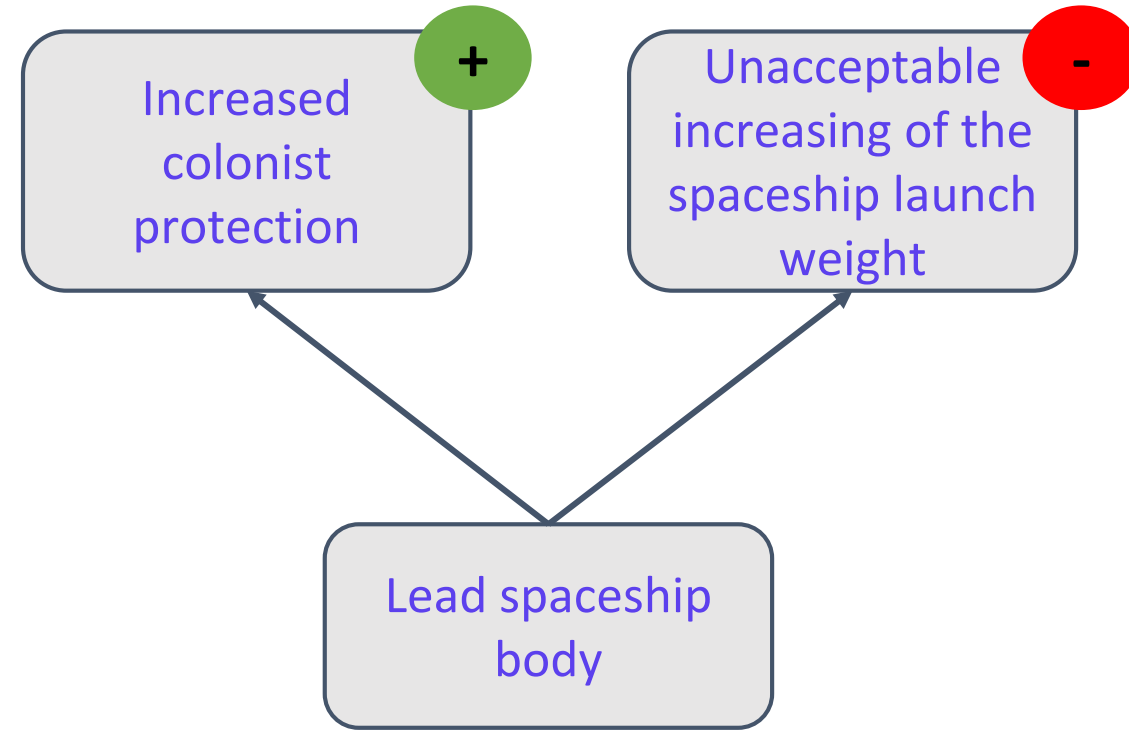


# Example

Initial  
problem  
situation

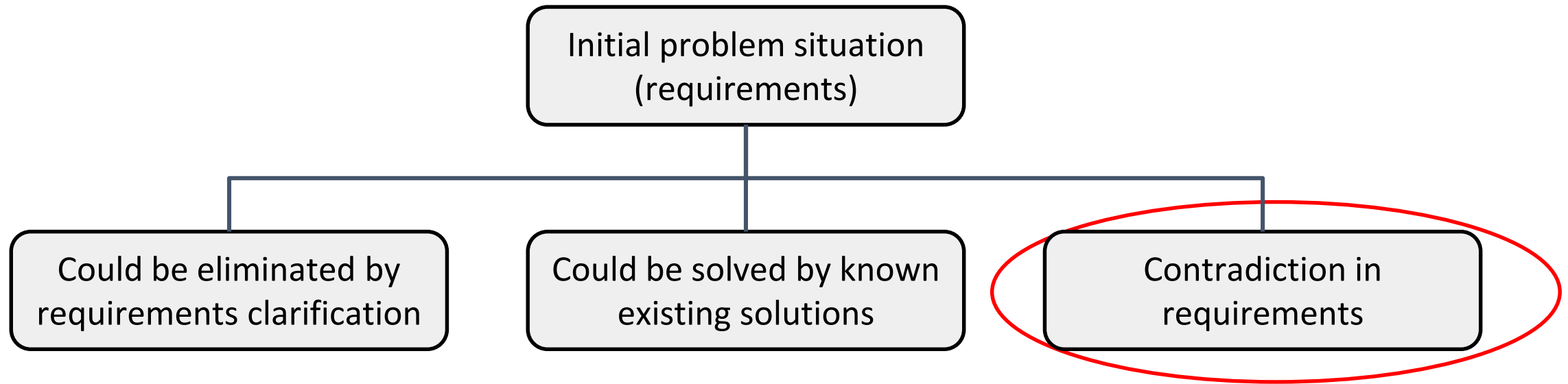


Contradiction in  
requirements



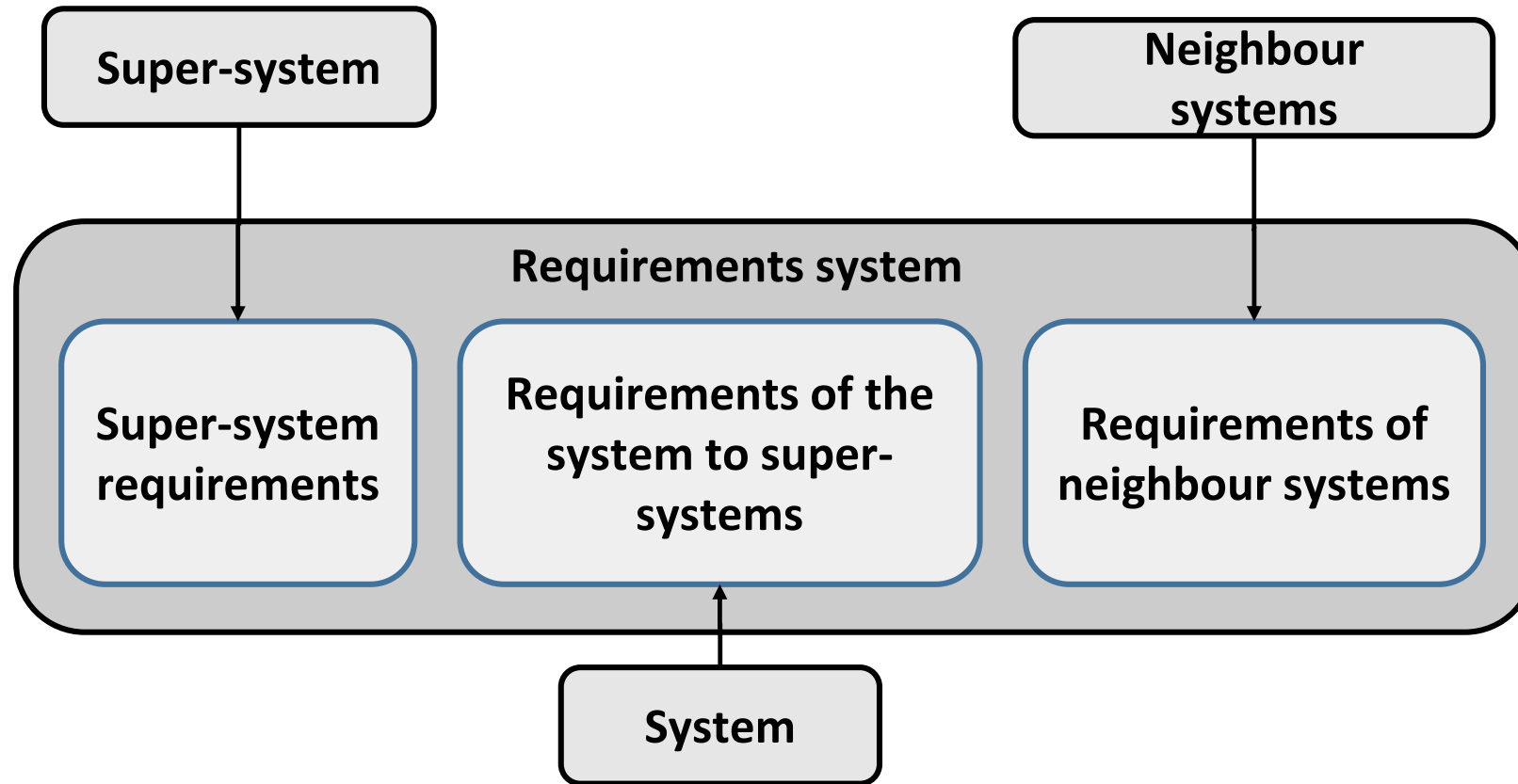


# Types of Initial Problem Situation



TRIZ focuses on this type of initial problem situation

# Requirements as a system



Contradiction in requirements appears when we combine requirements from different sources systematically

# Requirements system evolution

Super-system of  
requirements  
system in past

Super-system of  
requirements  
system

Super-system of  
requirements  
system in future

Requirements  
system in past

Requirements  
System AS IS

Requirements  
system in future

Subsystems of  
requirements  
system in past

Subsystems of  
requirements  
system

Subsystems of  
requirements  
system in future

Super-system includes:

- Legislation,
- Laws of nature
- etc.

Subsystems are:

- Depended requirements,
- Requirements of components
- etc.

The evolution occurs in  
accordance with evolution laws:

- dynamization of the system of requirements,
- folding,
- transitions to supersystems
- etc.

# Examples of Initial Problem Situation



## Example 1

The grinding wheel does not work well on complex shapes with depressions and bulges, such as spoons. Replacing grinding with another type of processing is unprofitable, difficult. The use of lapping ice grinding wheels is too expensive in this case. Elastic inflatable circles with an abrasive surface are also not suitable - they wear out quickly. How to be?



## Example 2

IT companies are trying to create more unique products to attract new customers and increase current sales. But a new product costs a lot of money, what to do?



## Example 3

Wounds are sealed with plaster, and the skin does not "breathe". How to be?

# Initial Problem Situation analysis

## ARIZ versions under analysis:

- ARIZ-62,
- ARIZ-63,
- ARIZ-64,
- ARIZ-65,
- ARIZ-68,
- ARIZ-71,
- ARIZ-77

## Components of Initial Problem Situation:

- Object of the problem
- Metric (goal, economic feasibility, numerical indicators)
- Object characteristic
- Permissible costs and complexity of the solution
- More general problem
- Comparison and selection of problems
- Supersystems and environment
- Industry trends
- Requirements
- Elements (properties, what can be changed and what cannot)
- Tool - product pair
- Undesirable effect (harmful interaction)
- Description of the cause-and-effect relationship of the elements and the undesirable effect

# Components of Initial Problem Situation

## Examples

Components of Initial Problem Situation	Interval	1	2	3
1. Object	p. 1 – 5	4	3	3
2. Objective metric	p. 1 – 5	2	2	1
3. Super-systems	<= p. 1	2	1	1
4. Requirement 1 (function)	<= p. 1	4	3	2
5. Solutions for implementation R1	<= p. 4	4	1	1
6. Requirement 2 (function, constraint)	<= p. 4	4	3	1
7. Solutions for implementation R2	<= p. 6	3	2	1
8. Object and its property that causes implementation of R1 & R2	<= p. 7	3	1	1
9. Root-cause model of requirements	<= p. 5&7	3	1	1
10. Root-cause model of requirements and properties	<= p. 8&9	2	1	1
11. Problem aspects	<= p. 9&10	2	1	1

## ASSESSMENTS

1	No
2	Not enough information
3	A lot of uncertain information
4	A lot of non-systematic information
5	Yes

# Initial Problem Situation visualisation

## Completeness:

- Example 1 – 54,4%
- Example 2 – 28,2%
- Example 3 – 16,9%



## Сравнение полноты формулировки исходной проблемной ситуации

— Задача 1. — Задача 2. - - Задача 3.



# Initial Problem Situation in Compinno-TRIZ

Сопинно-TRIZ : Рубин Михаил Семенович Шлифовальный круг Следить Примеры Физ.эффекты Справка Очет

ЭТАПЫ ПРОЕКТА

Списание

**Оценка**

Бенчмаркинг

Дорожная карта

Противоречия

Матрица

Призыв

Функция

Модель решения

Задачи

Матрица

Техни

Идея

Сообщения

Команда проекта

Начать

Далее

**Шлифовальный круг 1**

Цель: Списать описание

Шлифовальный круг плохо обрабатывает изделия сложной формы с изгибами и выпуклостями, например, ложки. Замена шлифования другим видом обработки нежелательно, сложно. Применение притирающих ледяных шлифовальных кругов в данном случае слишком дорого. Не годятся и эластичные надувные круги с обратной поверхностью — они быстро изнашиваются. Как быть?

Целевые метрики

2 - Мало, есть или нет

+

Объекты

4 - Много, но не по одной детали

Шлифовальный круг	<div></div> <div></div>
Ложки	<div></div> <div></div>
Изделия сложной формы	<div></div> <div></div>
Ледяные шлифовальные круги	<div></div> <div></div>
Надувные шлифовальные круги	<div></div> <div></div>
Цех или мастерская	<div></div> <div></div>
Абразив шлифовального круга	<div></div> <div></div>

Подсистемы

2 - Много, есть или нет

+

Цех или мастерская

Требование (Т-1)

4 - Много, но не по одной детали

Шлифовальный круг полирует Ложки	<div></div> <div></div>
Х-элемент сохраняет форму Ложки	<div></div> <div></div>
Х-элемент полирует Ложку	<div></div> <div></div>

Требование (Т-2)

4 - Много, но не по одной детали

+

Шлифовальный круг НЕ полирует Ложки

Эксперт

3 - Много, но нечетко сформулировано

+

Способы достижения Т-1

4 - Много, но не по одной детали

+

Способы достижения Т-2

1 - Много, но нечетко сформулировано

+

Шлифовальный круг НЕ полирует Ложки

График

5

Ориентир

Требование 1

Требование 2

Способы достижения Т-1

Эксперт

Подсистемы

Объекты

Целевые метрики

Сбор доп. информации, уточните целевую метрику

Добавить в Дорожную карту!

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# Resume

1. Differences between the concepts such as requirement, inventive problem, solution, and system in engineering disciplines and TRIZ make a barrier for integration between TRIZ and engineering approaches
1. The authors proposed a general ontology for the definition of the Initial Problem Situation that joins these concepts and applicable both in TRIZ and in engineering disciplines
1. The authors proposed a method for formal definition, numerical evaluation and verification of the Initial Problem Situation.

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# Q&A

## SESSION



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# THANK YOU!

