

The Ideal of TRIZ

TRIZ as the Way of Life? Part 2

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1. Preface

- **TRIZ is an assemblage of methods consisting of changing one attribute, solving physical contradiction and technical contradiction and segmenting and merging of attributes and Objects.** [TS4]
- **This seems to mean that TRIZ could be a unified thought and method applicable to every action in every area and become formal basic of operational science.**
- This is the starting point. Let us verify this and realize this dream. (I don't intend to touch any tools in TRIZ)

2. Life 2.1 Barter

- Invention of tool brings about labor and technology. Invention of language brings about communication.
- As same as tool and language “barter” was invented at some stage of the history of human. What brings about “barter”? What “barter” brings about? We must answer these two questions.

2. Life 2.1 Barter

Before the age of barter, human beings don't have the consciousness of individual, community nor possessing.

1. Recognition that my community has something and other community has another thing.
2. Image that we will give you something we have and you will give us something you have.
3. When, where and what quantity?

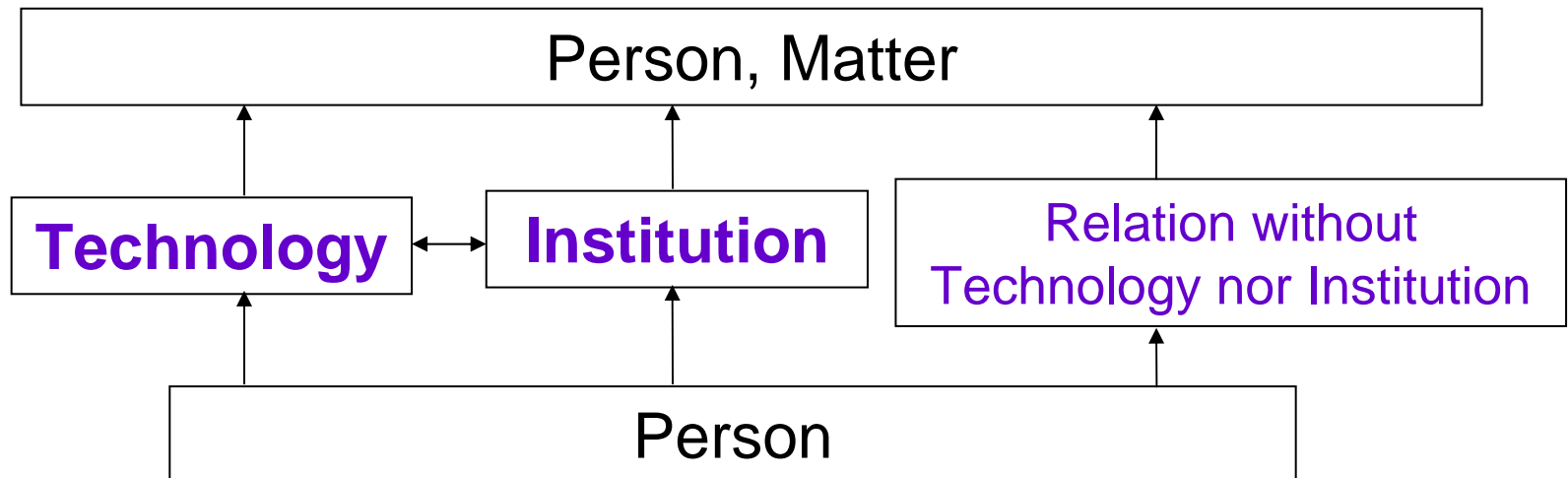
Common idea for you and us in representatives of each communities is the start of barter.

2. Life 2.2 Life

Matter and its movements
→ **Technology**

Mind and its movements (including religion, sense of value): Common Idea
→ **Institution**
e.g. Politics, Economy, Family, Company

- Intentional change (Resolving Differences) via **Technology and Institution**



3. The Ideal of TRIZ

- **Everyone can objectify everything one can recognize and**
- **one can change them by specifying one of possible types of change to fulfill proper purposes immediately.** [TS1][TS2]

3. The Ideal of TRIZ 3.1 Object

Something important such as object should be viewed or defined from several points of view.

1. To describe differences between something and other thing.
2. To enumerate kinds of something.
3. To describe inner structure of something.

These three views are indispensable to make us recognize something, define something, enumerate kind of something and change something.

3. The Ideal of TRIZ 3.1 Object

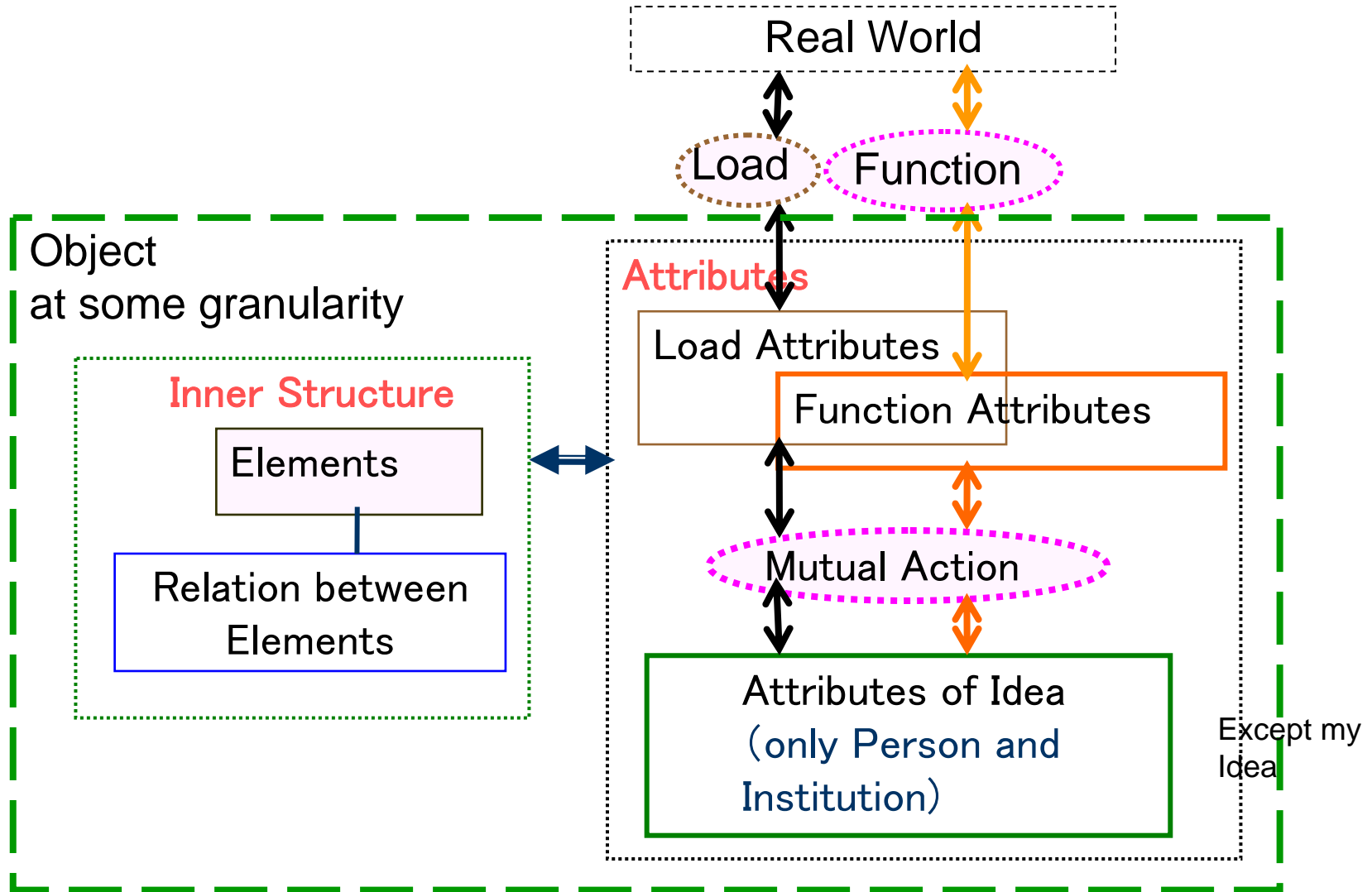
- Anything recognizable is called **Object**. I recognize three kinds of Objects. *99/100* cf. Definition by Fey [TJ]
 1. **Matter** : System Object
 2. **“Idea”** : System Object
 21. Information of individual or common notion which is taken by physical entity
 22. My idea
 3. **Movement** or Action : Process Object
- **Granularity**= Size, magnitude or scope in space and/ or time. Degree of abstraction
- **Function**= (primarily) Meaning of Process Object, (secondly) Meaning of attributes of Object
- **Structure**= Granularity and inner structure

3. The Ideal of TRIZ 3.1 Object: Fey' s Definition

- **Object - Article, Product** *60/100*
- A component of the system that is to be controlled, processed or modified (e.g, moved, machined, bent, turned, heated, expanded, charged, illuminated, measured, detected, etc.).

http://www.triz-journal.com/dictionary/Object_-_Article,_Product-253.htm

3. The Ideal of TRIZ 3.1 Structure of Object



3.The Ideal of TRIZ

3.2 Viewpoint of Purposes of Resolving Differences

- 1) Make new function : Make new system or add new function to existing system
- 2) Solve issues : Solve problems in existing system
- 3) Idealize : Improve functions in existing system or realize existing functions with less resources



3. The Ideal of TRIZ 3.3 Elements of Realization

- 1) Transform purpose **P** into type of Object change
- 2) Transform type of Object change to the other type of Object change
- 3) Transform type of Object change into solution **S**

3. The Ideal of TRIZ 3.3 Elements of Realization 1)-1

1) Transform purpose into type of Object change by each purpose

P- O1: Within one attributes of one Object. This is to change one attribute, delete or generate attribute or delete or generate Object.

a) Purpose can be reached directly by a change of one attribute using existing environment

b) Purpose can be reached by using causal relation

3. The Ideal of TRIZ 3.3 Elements of Realization 1)-2

P- O2(PC)- S: Handling Physical Contradiction

Transform purpose into Physical Contradiction with two values of one attribute of one Object

P- O2(TC)- S : Handling Technical Contradiction in advance

Transform purpose into Technical Contradiction with two attributes of one or two Objects
Expansion of usual Technical Contradiction

3. The Ideal of TRIZ 3.3 Elements of Realization 2)-1

2) Transform type of Object change to the other type of Object change

O1- O1: Transform by the law

Change of one attribute can autonomously cause deleting Object or attributes, generating Object or attributes according to the law of the mutual transformation of quantitative and qualitative changes or its expansion.

O1- O2: Transform by side-effect autonomously

3. The Ideal of TRIZ 3.3 Elements of Realization 2)-2

O2- O2(TC)- S: Handling Technical Contradiction to deal with side effects

Dealing with side effects under environment of usual technical contradiction

Even making new function or idealization can cause side effects.

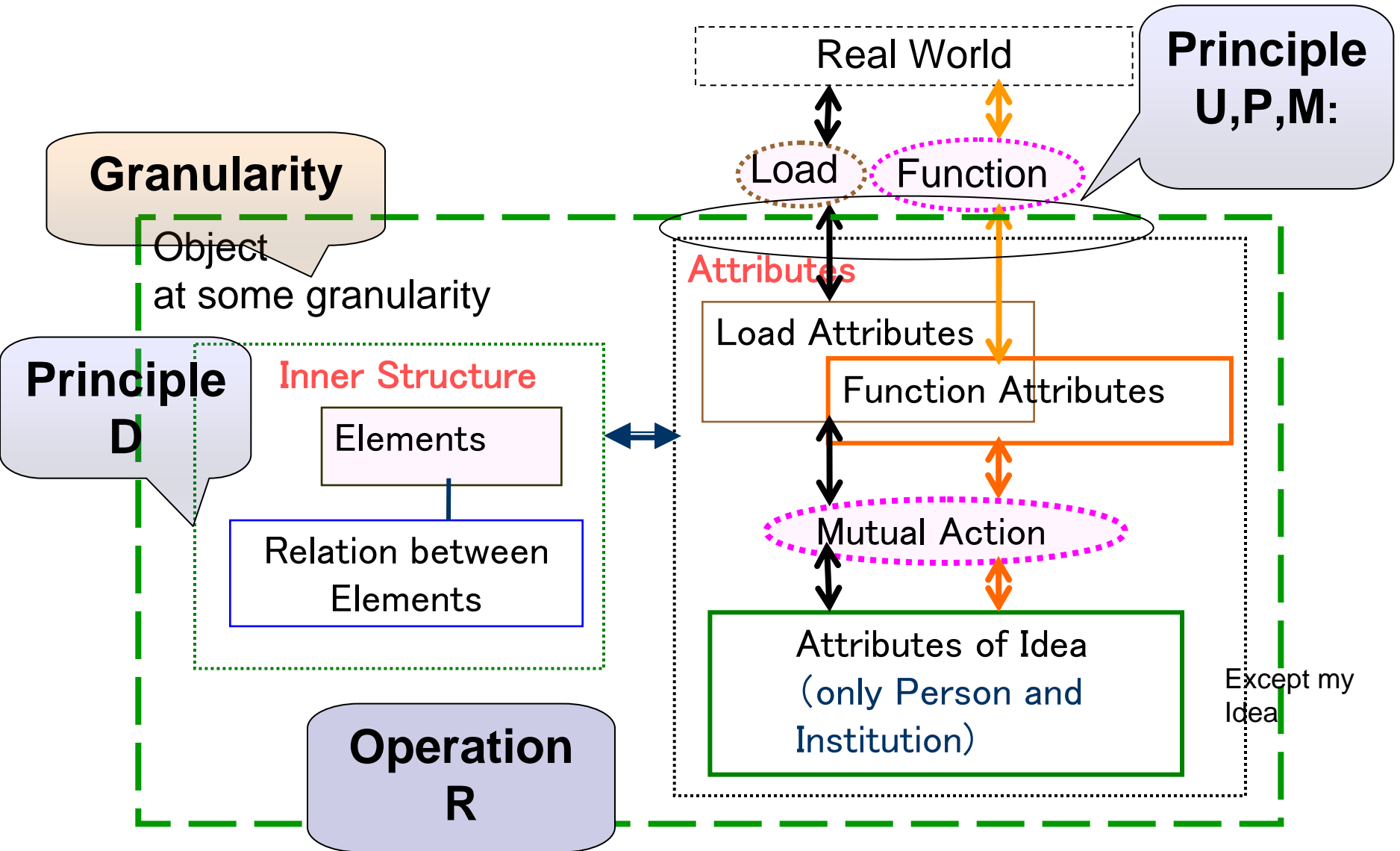
3. The Ideal of TRIZ 3.3 Elements of Realization 3)-1

3) Transform into solution

O1-S: Transform within one value of one attribute of one Object by next Principle [TS3][TS4][TS5]

1. Transformation Principles U, P, M from outside
2. Transformation Principles D from inside
3. Operation Principle R of replacing, adding or deleting Object

Transformation Principles U, P, M, D and Operation Principle R



Types of Object Operation and Transformation [TS4]

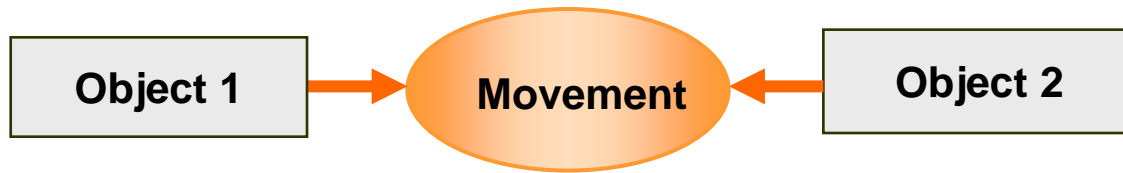
Object Transformation Principle D: Change of inner structure consisting of elements and the relation between them can change attributes of Object, generate new Object and delete Object itself from inside.

Object Operation R : We can bring in, bring out or replace Object or its element of existing single Object or Object in “Object 1- Process Object- Object 2 model” freely regardless they are existing or not.



Object Transformation Principle U [TS4]

Object 1 and movement can change attributes of Object 2 or Object 2 itself.



Object Transformation Principle P [TS4]

Object 1 and Object 2 can change attributes of movement or movement itself.



Object Transformation Principle M

Object 1, Object 2 and movement continue to act each other.

3. The Ideal of TRIZ 3.3 Elements of Realization 3)-2

O2-S : Transform type of Object change into solution within two attributes of two Objects

This is in the 40 Principles [TS4] at present.

3. The Ideal of TRIZ

3.4 Four Types of Realization

1) P- O1, (O1- O1), O1- S

Change one attribute or Object for all purposes.

2) P- O1, (O1- O1), O1- O2, O2- O2 (TC), O2- S

If case 1) would cause side effects we must solve Technical Contradiction afterwards.

3) P- O2 (PC), O2- S

Solve Physical Contradiction in advance.

4) P- O2 (TC), O2- S

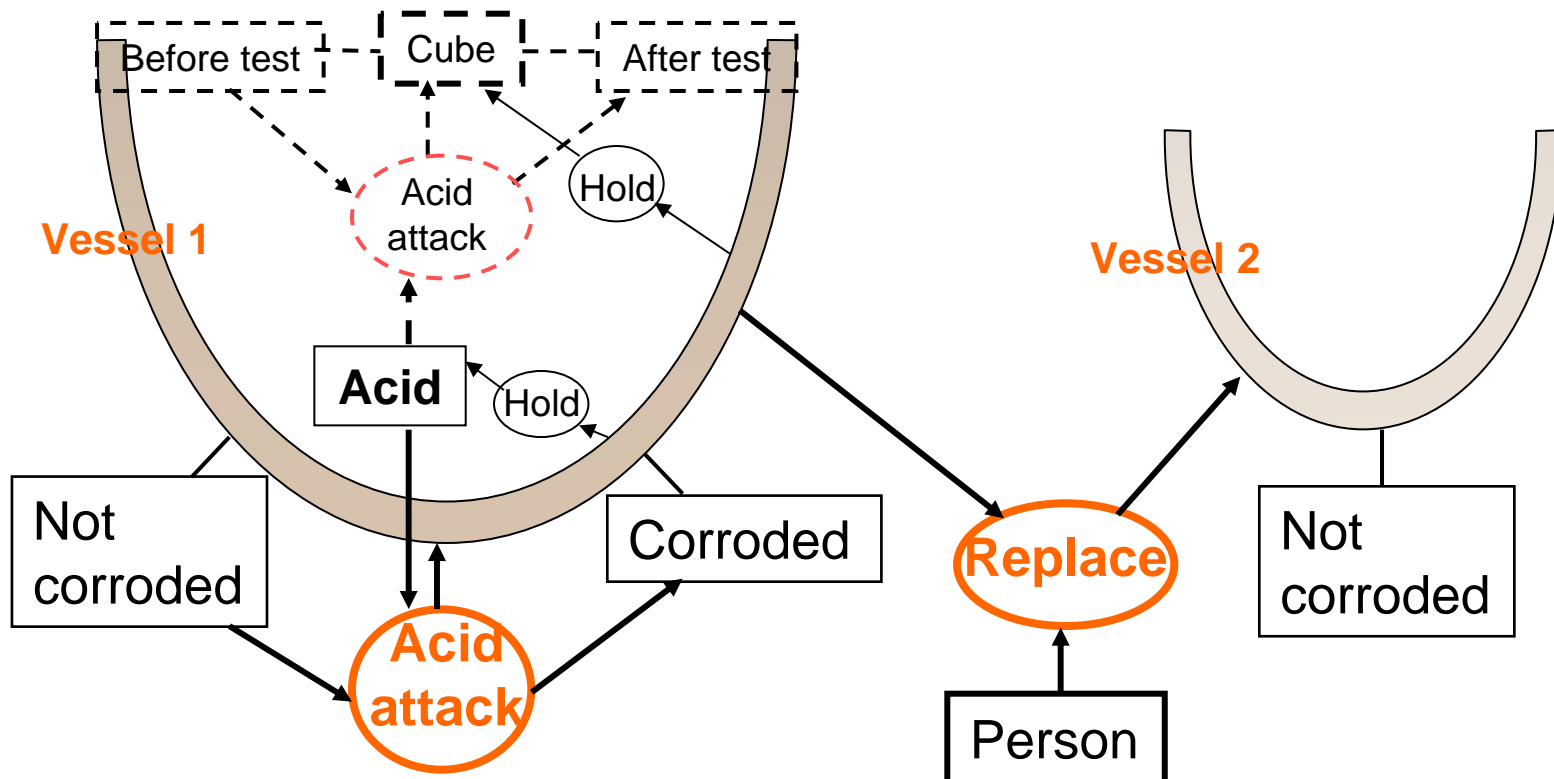
Solve Technical Contradiction in advance.

3. The Ideal of TRIZ 3.5 TRIZ needs improvements for spread to everyone and advance

- Proper attitude for Object, granularity, structure of Object and attributes
- Proper attitude for “institution”
- Lack of logical exhaustiveness in Object and method
- Method to synthesize (this paper don't deal with)
- Need to activate radical thinking for enumeration which dialectics and TRIZ originally have

Example: Acid attack-1 [TS2] [TS3]

Cubes are placed in acid to investigate the effect of various acids on the cubes. The vessel that holds the acid and cube is corroded. Because the acid is so reactive, the vessel must be replaced frequently. Reduce the cost of replacing the vessel.



Example: Acid attack-2

Enumerate System Objects: Cubes, Acid, Vessel (Attribute: cost, its value: C)

Enumerate Process Object:

Test of Cubes (Attribute : operating time, its value: t),

Hold Cubes (Field: Gravity, Centrifugal Force, Surface Tension, Buoyant Force, Current,,)

Corrode Vessel (Attribute : operating time, its value: t), (Attribute: rate of corrosion, its value: replace n times in t)

Replace Vessel (Attribute: cost of vessel, its value: C), (Attribute: cost of work of replace , its value: Cr)

Enumerate candidates of purposes

Examples of purposes are to

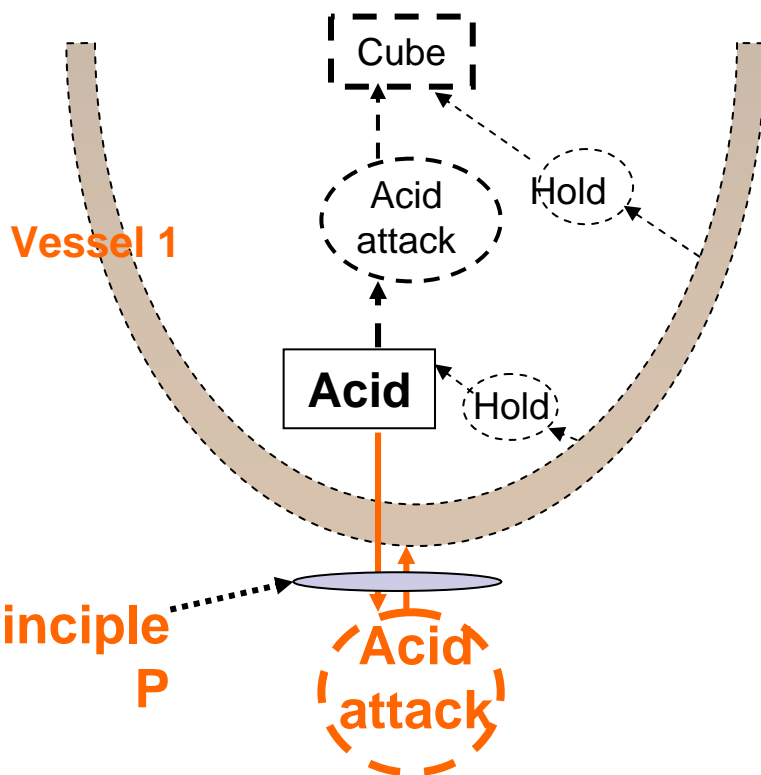
Minimize cost of replacement per unit time $(C + Cr) n / t$: **1**

Eliminate Process Object that acid corrodes vessel: **2**

Eliminate Process Object to replace vessel: **3**

Example: Acid attack-3

Example of solution : If we eliminated vessel to eliminate corroding vessel by acid using Principle P, we could not execute test of cube because of a side effect that vessel lost the function to hold acid and cube.



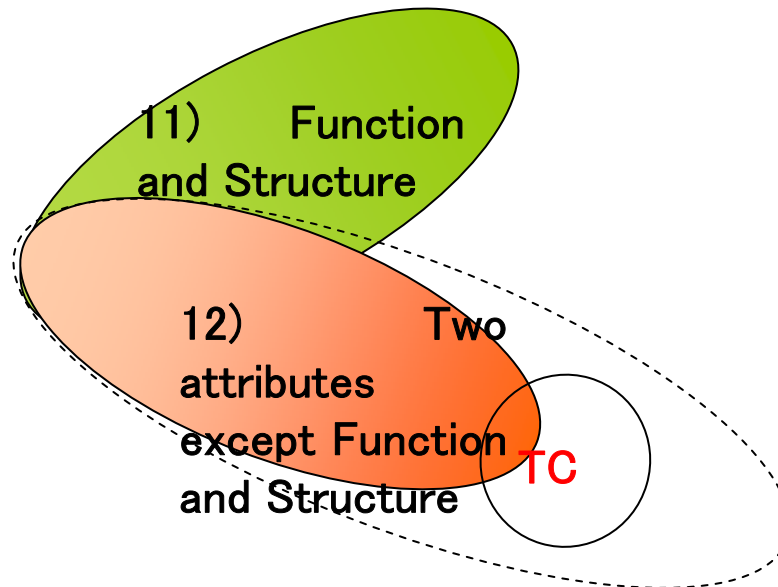
Solve the technical contradiction at various granularity. **Types of Realization 2)**

1. Test of cube vs eliminating vessel
2. Holding cube and acid vs eliminating vessel
3. Contact of acid and cube vs eliminating vessel
- (4. Contact of acid and cube vs no contact of acid and vessel)
- (5. Acid corrode cube vs acid not corrode vessel)

4. Radical thinking for enumeration

4.1 Attitude at the moment

■ Grasp movement at the moment



- Viewpoint or Attitude **at the moment**; “To be or not to be”, Function and Granularity, Definition from outside and inside, Modesty and Criticism

4.1 Attitude at this moment Structure of Contradiction

Real World and Attitude				Recognition
0) Identity and Difference	11) Form and Content	12) Two attributes except Form and Content	2) Each part of one body, Unity	3) Mutually dependent two different recognitions
Two values of one attribute Physical Contradiction A state and other state at the same time To be or not to be	Two attributes of one Object Function and Structure	Two attributes (Technical Contradiction) Opposites of movement except Function and Structure	History and Logic Recognition and Action Purpose and Mean Objectification and Unification Possession and belonging Emotion and Logic Viewpoint and Attitude Modesty and Criticism Spread and Advance	Part and Whole Phenomenon and Essence Concreteness and Abstraction Granularity and Inner Structure Function and Granularity Definition from outside and inside

4.2 Radical thinking for enumeration

Radical thinking for structural enumeration of related thing to achieve possible extreme change

1. Enumeration for viewpoint of thinking, granularity and value (and purposes which is concrete value) , types of thinking and thing acted by thinking
2. For systematic knowledge in situation-independent area, enumeration for Object, attributes, related thing, types of proposition, law, area and generation and improvement of proposition and law

4.2 Radical thinking for enumeration

3. In situation- dependent area, according to the situation, enumerate granularity and value (and purpose which is concrete value).

For each granularity, value and purposes,

- Enumerate attributes, Object, Object group, their relation and their movement,
- Enumerate method to obtain Object change, method to obtain Object change, candidates of Object change,
- Seek possibility of radical and extreme change for recognition and change.

Changing attributes of Object includes change values of attributes and change of inner structure. Especially extreme change to minimize attributes is to delete Object.

5. Conclusion

- Trial for the **Ideal TRIZ** is made
- Object and structure of Object is important
- Ideal TRIZ make TRIZ Simple
- **Radical Thinking for Enumeration to recognize and change the Real World** [F10]

The contents of this and previous paper are obtained by this thinking.[TS1-5]

References

- [TS2] TAKAHARA Toshio: A Method of Resolving Differences Based on the Concepts of Function and Process Object , The Second Symposium in Japan, Japan, Sept. 2006.
- [TS3] TAKAHARA Toshio, A Method of Resolving Differences Based on the Concepts of Functions and Process Objects: Part 2, The Third TRIZ Symposium in Japan, Japan, Sept. 2007." A Collection of Papers Written by Toshio Takahara (2003-2007) <http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/epapers/e2008Papers/eTakahara2003-2007/eTakaharaBiblio080323.html>
- [TS4] The General Picture of TRIZ From the Viewpoint of Changing Objects —A Method of Resolving Differences Based on the Concepts of Functions and Process Objects Part 3— The Fourth TRIZ Symposium in Japan, Sept. 2008. <http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/epapers/e2009Papers/eTakaharaTRIZSymp2008/eTakahara-TRIZSymp2008-090708.html>