

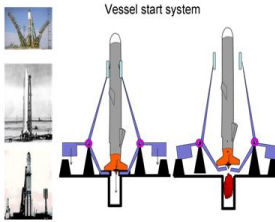
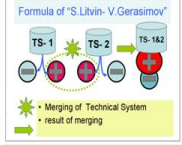
# Power/Energy resources

- Resources are energy, elements and information in the system and its environment.
- Find and use ready resources.
- Uncover and use latent resources.
- Derive and combine resources.



- Power/Energy resources are energy, forces, money etc. available in the system.
- Find and use ready or latent energy resources.
- Use heat from engine to heat passenger cabin
- Consider using energy flows and dissipated or harmful energy.
- Use dissipated heat from refrigerators to heating the store
- Derive and combine power/energy resources.
- Hybrid vehicles combine internal combustion engines with battery and electric motor.

$$i = \frac{N \cdot \sum F}{\sum (cost) + HF}$$

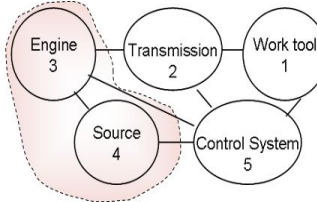


# Power/Energy resources

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## Resources from environment



# Elements

- Elements
- Element resources are objects, materials, substances etc. available in the system.
- Find and use ready or latent element resources.
- Use snow as an air filter media in polar regions.
- Consider using elements flows and elements traditionally viewed as waste or harm.
- Use animal waste as fertilizer
- Derive and combine element resources.
- Combine air and hotel travel bookings to save money



$$i = \frac{N \cdot \sum F}{\sum (cost) + HF}$$

## Resources of field and materials

Problem of small stability of canopy regarding to wind stress

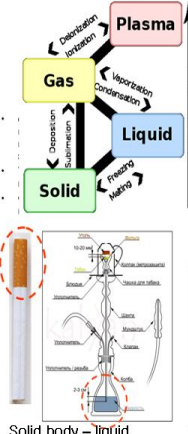
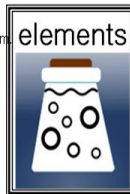


Silica gel is a commonly used desiccant as beads packed in a permeable bag

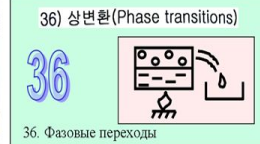
- We can use energy of wind for support of form and remove defined disadvantages
- and air as the special free of charge element

# Elements

- Element resources are objects, materials, substances etc. available in the system.
- Find and use ready or latent element resources.
- Use snow as an air filter media in polar regions.
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- Derive and combine element resources.



## Transfer from macro to micro level



# Information

Information resources are changes in the system properties.

- Find and use ready or latent information resources.

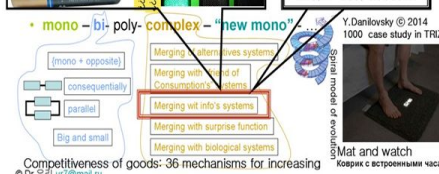
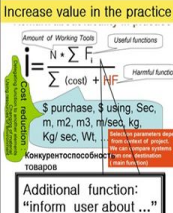
Use customers' feedback to improve a product.

- Consider various flows and changes as sources of information, including harmful ones or "noise".

Temperature sensitive color changing plastic for child feeding spoon.

- Derive and combine information resources.
- Add markers or easily detected elements.

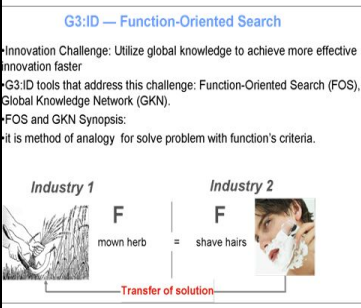
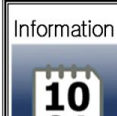
Add an aromatic compound in natural gas to alert users to leakage.



# Information

Information resources are changes in the system properties.

- Find and use ready or latent information resources.









# Use pauses

Use or create pauses in a process to perform something with:

- Elements and objects that the system works with and on.

Perform maintenance work during vacations.

- Activity, process, action or interaction.

Conduct training during pauses in work (at lunch time).

- Environment in and around the system.

Crop rotation to restore soil.

recommendation for application

Sub trend 1 Sub trend 2 Sub trend 3 Sub trend 4

Function of the surprise

Technical mimicry phenomena

giants and dwarves

41. Use the Pauses

41. Harmonization step

Harmonization working gun machine and propeller

## Pauses



# Accelerate

Accelerate an activity, process, action or interaction to:

- Rush through risky or dangerous phases of the process.
- Quickly remove a band-aid to lessen pain.
- Create additional time resources.

Rapid prototyping to shorten the design cycle.

- Get positive effects on elements, objects and environment that the system works with and on.

Flash frozen food to preserve nutrients and flavor.

21) 급히 통과하기(Skipping)

21. Принцип проскока

Accelerate

Pulse

Forward

reciprocating 왕복

Pendulum

Rotary

Wave

Catapult

Stapler

# Stretch out

Stretch out an activity, process, action or interaction to:

- Increase positive effects on a system by giving additional time to the process.
- Bonsai. Make small cuts over a long period of time.
- Reduce negative effects by the distributing or dissipating over a long period of time.
- Monthly re-payment plans.

Stretch out

The paint gets transformed into foam that prolongs the time until the object gets destroyed

Diagram (and plans) for inspect and develop of WT

35) 물성치 변화(Parameter changes)

35. Harmonization gas-spring containers

Solid body Spring

Gas Gas dampers

Fluid Oil dampers

1. LUBRICANT

2. BORE

3. BORE

4. BORE

5. BORE

6. BORE

7. BORE

# Another dimension

Space resources are available unoccupied space in the system and its surroundings.

- Find and use available space resources.
- Rearrange or modify elements to create usable space.

Another dimension

Use additional dimensions as a resource:

- Consider multi-level composition of elements, put them on their side or at an angle, or an opposite surface.
  - Multi-story parking garage.
  - Transition the activity, process, action or interaction from a point to linear, from linear to a surface, from surface to a volume.
  - Two-layer bridge - each layer is a one-way road.
  - Find and use additional dimensions in the environment and around the system.
- Spiral staircase uses less floor area.

Dimension

17) 차원 변경(Dimensionality change)

17. Переход в другое измерение

point

line

flat

volume

3

2

1

0

Tooth thread

Use UV for create of white color

volume

flat

line

point

toothpick

Toothbrushes

Elixir For tooth

Dr.Yuri Min Gyu Lee 2011 AP

100

# Asymmetry

Utilize transition to asymmetry as resource:

- Transform elements or their composition asymmetrically by changing their form or structure.
- Special connectors with complex shape/pin configurations to ensure correct assembly
- Insert asymmetry into activity, process, action or interaction.
- Schedule start time of an event to odd minutes off the hour to make it more memorable
- Transform interactions between the system and its environment into an asymmetric relationship.
- Allow staff to start and finish work at different times to avoid rush hours.

Asymmetry

Harmonization and non harmonization as recommendation for application

Sub trend 1 Sub trend 2 Sub trend 3 Sub trend 4

Function of the surprise

Technical mimicry phenomena

giants and dwarves

4) 대칭성 변경(Symmetry changes)

4. Принцип асимметричности

symmetric -4-8-16 -asymmetric

# Nesting doll

Place one entity inside another:

- Transform elements or their composition into nested configuration.
- Measuring cups or spoons
- Insert one activity, process, action or interaction into another.
- Putting one business inside another - bank inside supermarket.
- Transition to a nested environment.

Las Vegas style: the guest must pass through the casino area to get to the hotel.

Nested doll

7) 중첩(Nested doll)

7. Принцип «матрешки»

White strip

Elastic variant

Ultrasonic

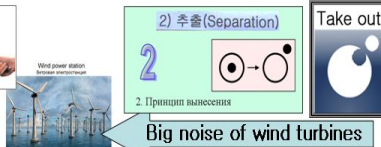
ionic

elixer

Trend in TESE: increasing of dynamicity



## Take out the part



Take something out of the system:

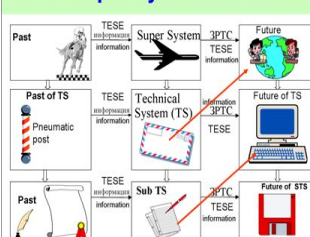
- Relocate elements or their parts to outside the system.
- Outsource design, or HR administration activities.
- Perform activity, process, action or interaction, fully or partially outside the system.

Locate a noisy compressor outside the building where the compressed air is used.

- Reconfigure system environment to accept relocated elements or functions.

Supermarkets pump bakery odors around the store to help advertise bread products.

## TS → Super system as model



## Localize

Localize something into a specific place:

- Place elements or their parts in a specific place.

Position factory or service center near customers.

- Perform activity, process, action or interaction fully or partly in a specific place.

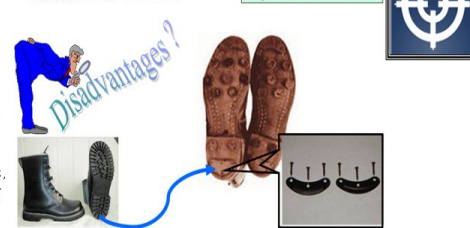
Kids area\* in restaurant.

- Change or substitute the environment in a specific place.

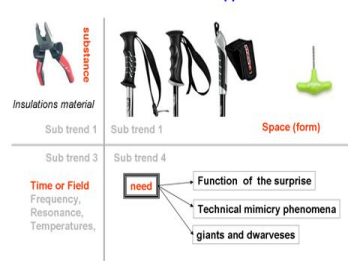
Hire local people to acquire cultural knowledge of local customers.



Define, please, what can be bad in this process or what was **disadvantages** as reason for invent it?



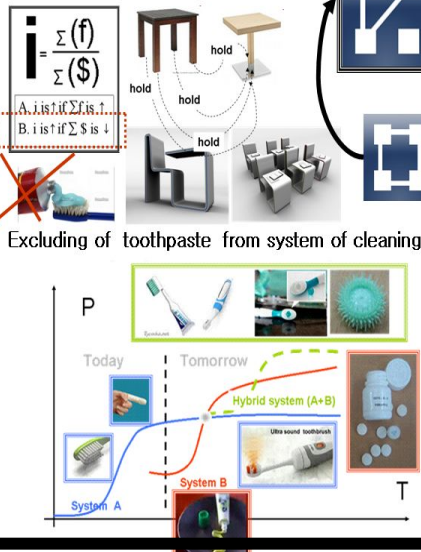
## Harmonization and non harmonization as recommendation for application



## exclude

Trimming of structure (cost reduction)  
Delegating function to another the elements

- Structure is the arrangement of system elements, links and interactions.
- Rearrange existing elements, links or interactions in the system.
- Add, remove or change elements, links or interactions in the system.
- Change how the system or its elements relate to their environment.
- Exclude
- Exclude something from the system.
- Remove an element or part while delegating its functions to the rest of the system or its surroundings.
- Exclude factory time clock -- team leader acts as timekeeper.
- Eliminate an activity, process, action or interaction (in whole or part) while getting the desired result.
- Eliminate raw material inventory -- just-in-time delivery.
- Exclude or neutralize the environment or some of its properties.
- Invisible Fence® for training pets to stay in an area.



## Integrate

Integrate something in the system to get a synergetic affect (1 + 1 > 2 rule):

List-Group">

- Integrate two or more elements or systems.

Swiss Army knife

List-Group">

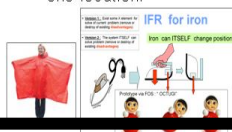
- Combine activities, processes, actions or interactions (in whole or part).

Parallel processing -- lunch and learn programs.

List-Group">

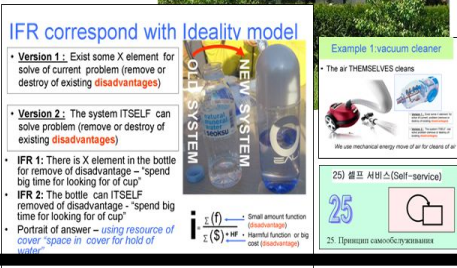
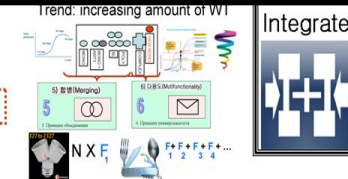
- Combine different environments or integrate additional properties into the existing environment.

One stop shops that offer a wide range of services in one location.

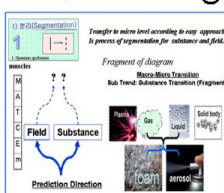


$$i = \frac{\sum(f)}{\sum(\$)}$$

A: i is if \$ is ↑  
B: i is if \$ is ↓



## Partitioning



Divide something into subsets:

- Partition the system or its elements into independent parts.

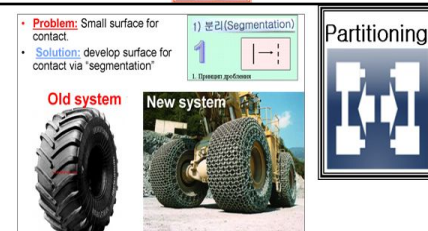
Modular furniture.

- Divide activity, process or action into sub-procedures (compartmentalize).

Sub-dividing a large task into smaller tasks.

- Separate environment into sub-environments.

Marketing segmentation by demographics, psychographics, lifestyles, etc.



## Mediator

Use something as a mediator:

List-Group">

- Insert a buffer or an action transmitting element into the system.

Ice cream cone -- edible ice cream dish.

List-Group">

- Introduce an intermediate action into an activity or process.

Sugar coating a pill.

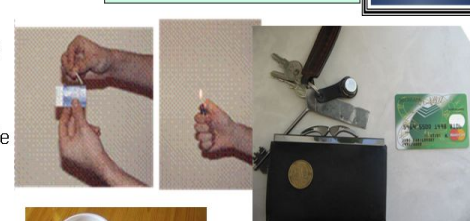
List-Group">

- Use an environmental buffer.

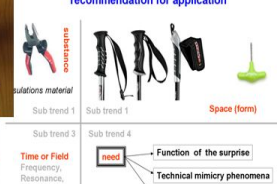
Gloves to get hot dishes out of an oven.



## 24) 매개물을 이용 (Intermediary)



## Harmonization and non harmonization as recommendation for application









# Vaccination

$$i = \frac{N * \sum F}{\sum (cost) + HF}$$



Change Conditions or Parameters

Conditions and parameters are quantitative and qualitative variables of the system operation.

- Change system parameters and conditions.
- Combine different changes in conditions or parameters.

Vaccination

Make the system tolerant, insensitive to undesirable changes:

- Insert neutralizing additives into system or its elements, or perform preliminary change opposite to undesirable one.

Relief valve protects equipment from over-pressure.

- Perform preliminary action to prevent, counteract or compensate undesirable activities.

Back up computer data to reduce loss from hard drive crash

- Modify or substitute environment to make the system resistant to undesirable change.

Use a helium-oxygen mix for diving to eliminate nitrogen narcosis.

(passive) increase regarding to field

(passive) increase regarding to substances

(active) increase stability via function

## Bumper (automobile)



Un submarino es un navio o buque capaz de navegar bajo la superficie del agua del mar o sumergido.

Submarine not afraid the storm

11) 보상 (Beforehand compensation)



# Isolate

$$i = \frac{N * \sum F}{\sum (cost) + HF}$$

Isolate



Isolate the system from undesirable changes:

- Introduce isolative permanent or renewable (self-recoverable) elements into the system to prevent undesirable changes.

Non-stick coatings on cooking pans.

- Perform action to isolate the system from undesirable activities.

Package food in CO2 or nitrogen atmosphere to prevent spoilage.

- Modify or substitute environment or its parts to isolate the system.

"Trade secrets" separate proprietary knowledge from general knowledge.

(passive) increase regarding to field

(passive) increase regarding to substances

(active) increase stability via function



Existing solution: put a cigarette into a crushable capsule with menthol, which is smoked in the last seconds masks the smell of tobacco smell of mint.

11) 보상 (Beforehand compensation)



# Counteract

$$i = \frac{N * \sum F}{\sum (cost) + HF}$$

Counteract

- Counteract undesirable changes:
- Insert active elements to counteract undesirable changes.

Counteract brushfire by setting a backfire.

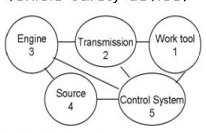
- Perform activity, process or action to counteract undesirable activities in real-time.

Airbag in a car.

- Modify or substitute environment in order to actively counteract undesirable changes.

Decompression chambers counteract effects of rapid ascension of divers.

An airbag is a **active** vehicle safety device.



11) 보상 (Beforehand compensation)



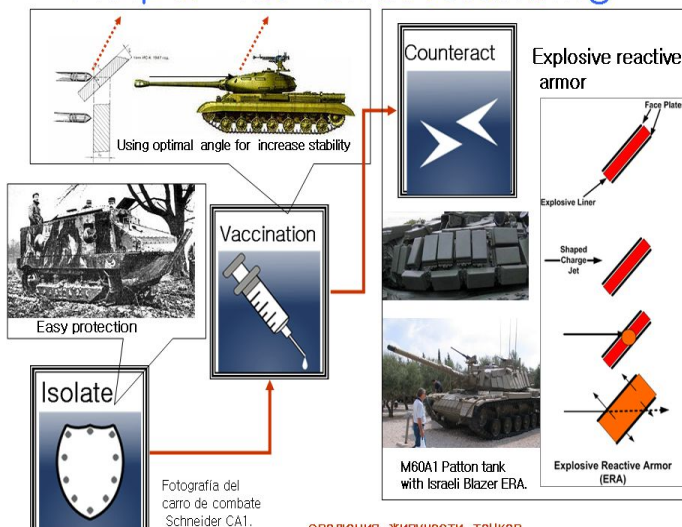
23) 피드백 (Feedback)



## Carro de combate

Evolution of the tank survivability

## Helper for understanding



# Disposable

$$i = \frac{N * \sum F}{\sum (cost) + HF}$$

Disposable

Use something disposable instead of a permanent one:

- Substitute permanent elements by a set of disposable ones.

Diapers.

- Instead of permanent action or interaction perform it once (only when necessary).

Car rental.

- Substitute permanent system surroundings by set of temporary ones.

Dissolving capsules for medicines

Plastic



Paper



27) 값싸고 짧은 수명 (Cheap disposables)

27



# Inversion

Do something opposite.

- Change properties or parameters of the system or its elements by opposite ones: turned upside down or inside out, movable instead of immovable, cold instead of hot, etc.

Frappuccino - use cold coffee instead of hot.

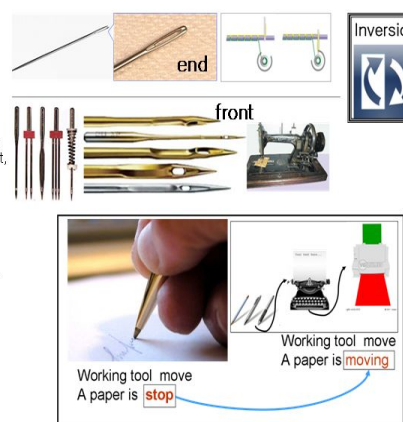
- Replace action by the opposite ones, or reverse their sequence; substitute internal activities with external ones, or vice-versa.

Moving sidewalk with standing people.

List-Group">

- Substitute properties of the system's surroundings by opposite ones.

Test pressure vessels by varying pressure outside rather than inside the vessel.



## TS → Super system as model

