Research of Development type TRIZ Technique (Part 7)

Case study of technical contradiction

Japan VE Association (Kansai Branch, West Japan)
Easy-to-use TRIZ Study Group (former TRIZ Spreading and Utilizing Study Group)

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Current content of activity

The case study project was done from 2006 to 2011.

1.Entrance	①Problem definition	The 1st report
	②Product analysis	
	③Analysis why why	The 2nd report
	④Attribute analysis	
2.Individual tool 1	⑤technical contradiction	technical contradiction report omission
	⑥Physical contradiction	The 3rd report
3.Individual tool 2	⑦Place material-analysis	The 4th report
	⑧Law of technological system evolution	The 5th report
	⑨SLP	The 6th report

Content of presentation

1.Purport of this report

2.Introduction of ″Examination procedure of technical contradiction cancellation (idea)″

3.Introduction of outline of case study

4.Reflection of finding obtained by case study

5.Summary

1. Main message of this report

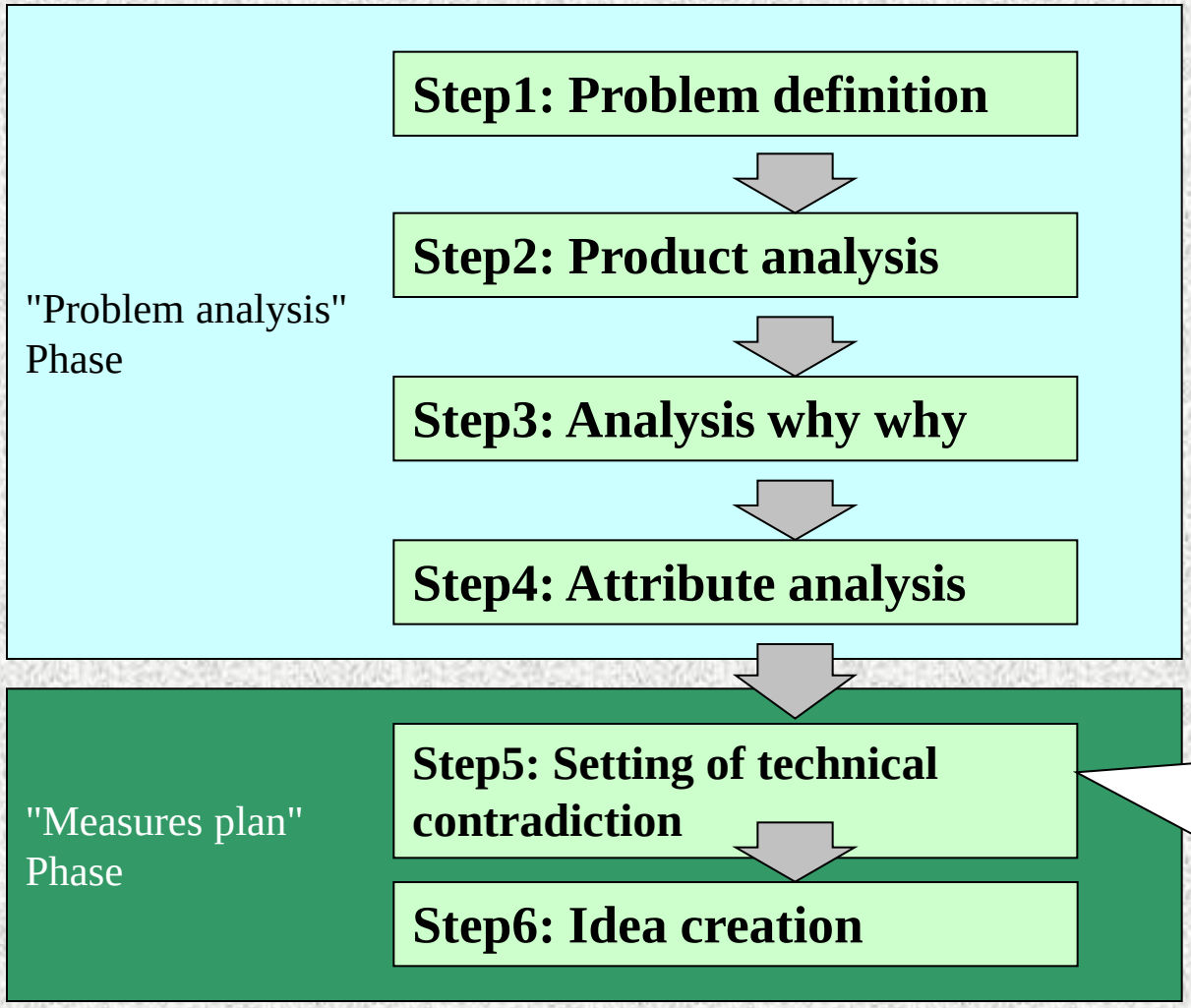
The case study project was done during 2006 – 2011.

From 2012, it is examined to maintain it as a guidance used easily.

This time, it reports concerning the technical contradiction omitted in past reports.

2. Introduction of "Examination procedure of technical contradiction cancellation (idea)"

"Examination procedure of the technical contradiction cancellation (idea)" obtained from the case study project executed in 2006 – fiscal year 2011 is as follows.



This time,
It explains around "Step5: the setting of technical contradiction".

Step5: Setting of technical contradiction

Step5-1: Selection of primary cause

Step5-2: Definition of profitable action

Step5-3: Definition of excessive harmful/shortage/action

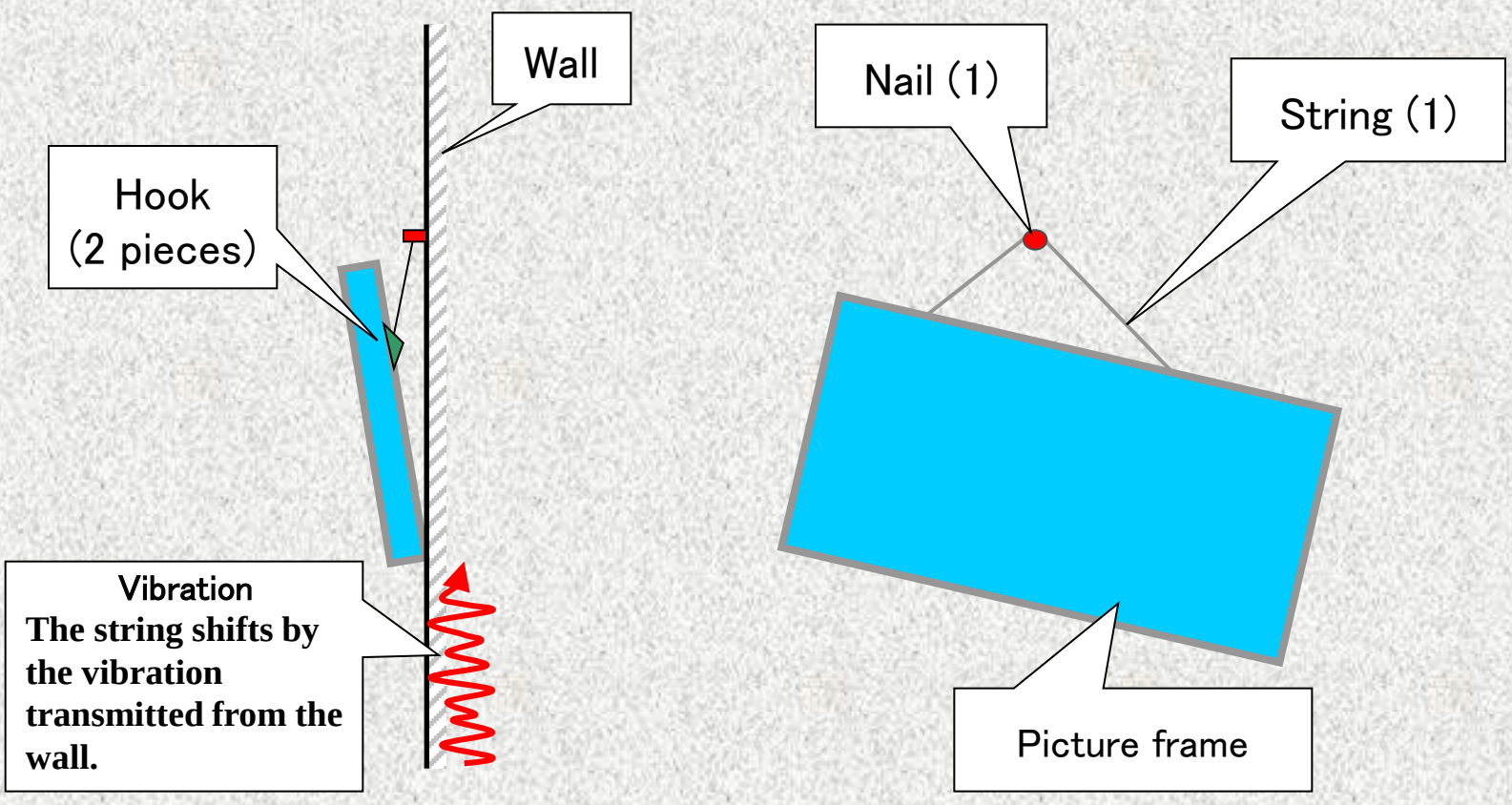
Step5-4: The contradiction model's making

Step5-5: Setting of technical contradiction

3. Introduction of the outline of the case study

″Problem of the inclination of the picture frame″ was caught as a theme, it examined according to ″Examination procedure of the technical contradiction cancellation″ made with this society, and it verified it concerning this procedure.

New case: Problem of inclination of picture frame

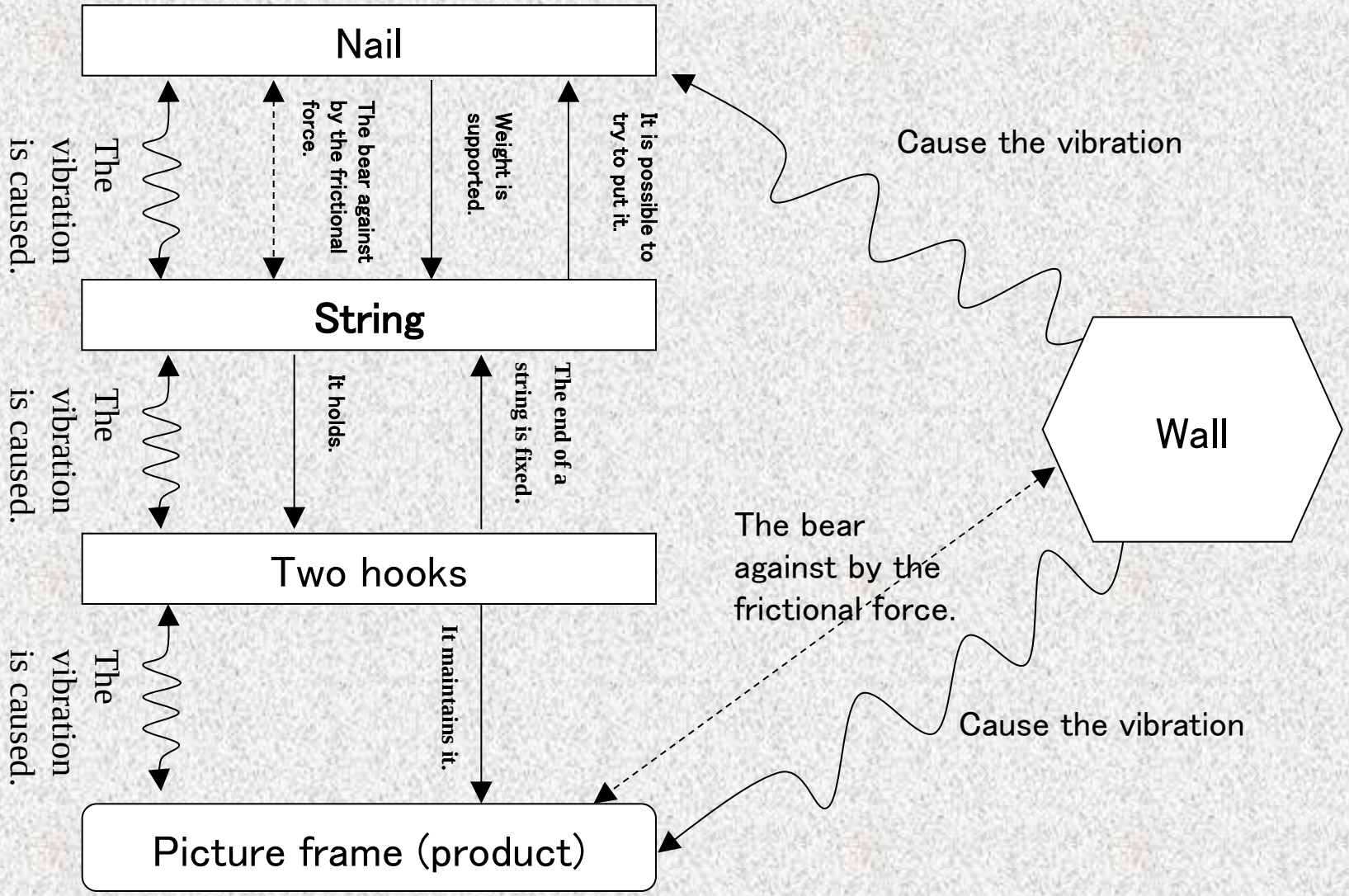


I want to prevent the picture frame from inclining even if there is a vibration that exists in standard living conditions. Measures against the inclination of the picture frame in the environment with an abnormally large vibration that the train passes immediately side near the construction site are not done this time.

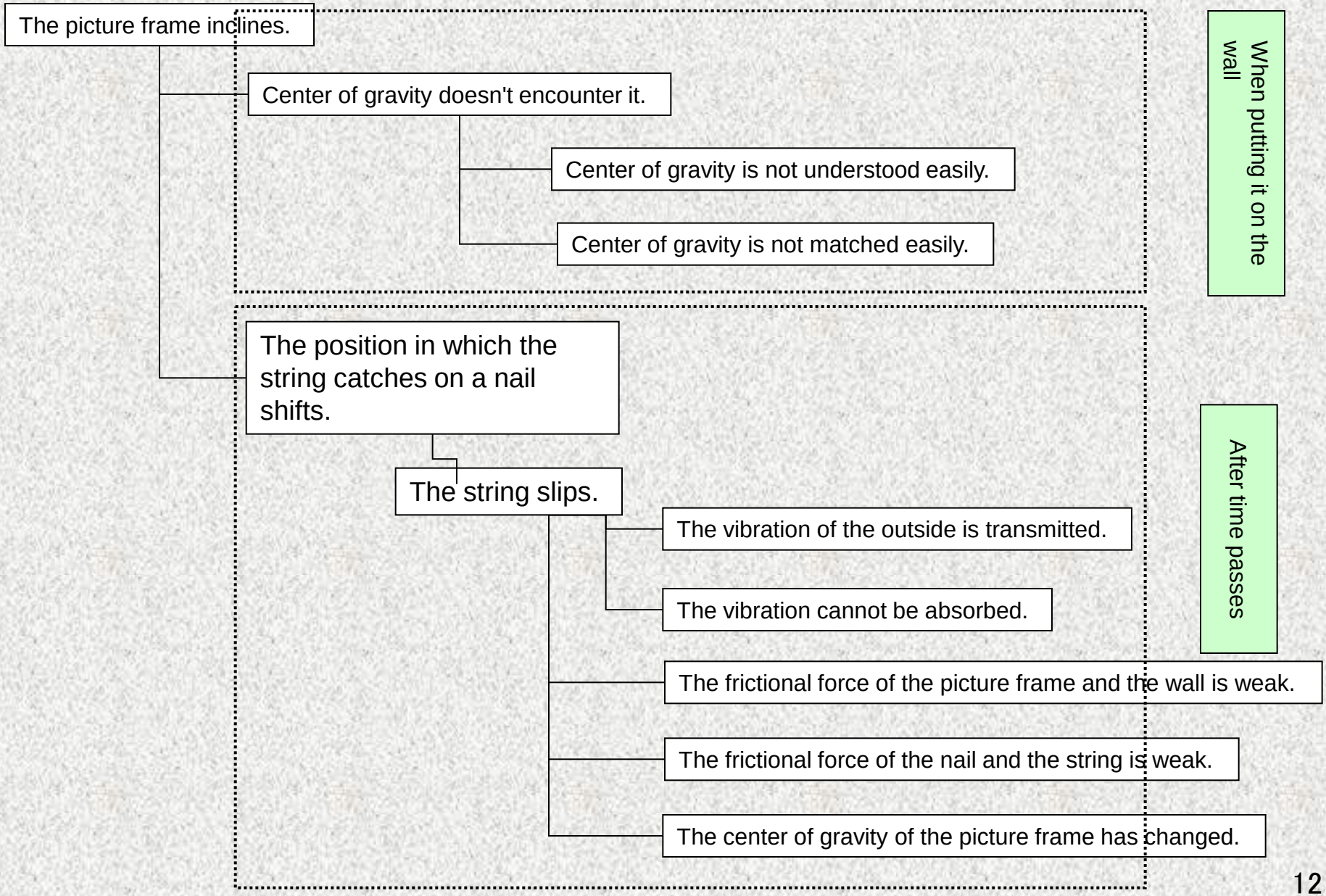
Step1: Problem definition

1.System name	Picture frame set
2.Background	The going string on the nail shifts gradually by the vibration transmitted from the wall, and the picture frame inclines.
3.Ideal solution	The picture frame doesn't incline even if detaching and the registration of the picture frame are easy and there is a vibration.
4.The main element that composes technological system and the function	Omission (Refer to the product analysis).
5.Solution problem	It improves it so that the picture frame should not incline even if there is a vibration that exists without greatly basically changing a present method in standard living conditions.
6.Limiting condition	・Measures against the inclination of the picture frame in the environment with an abnormally large vibration that the train passes immediately side near the construction site are not done this time. ・The string is 1, and both sides are fixed in the hook. ・The string is not wrapped around the nail. ・The bottom of the picture frame has come in contact with the wall. ・Only the roll : the vibration transmitted from the wall.

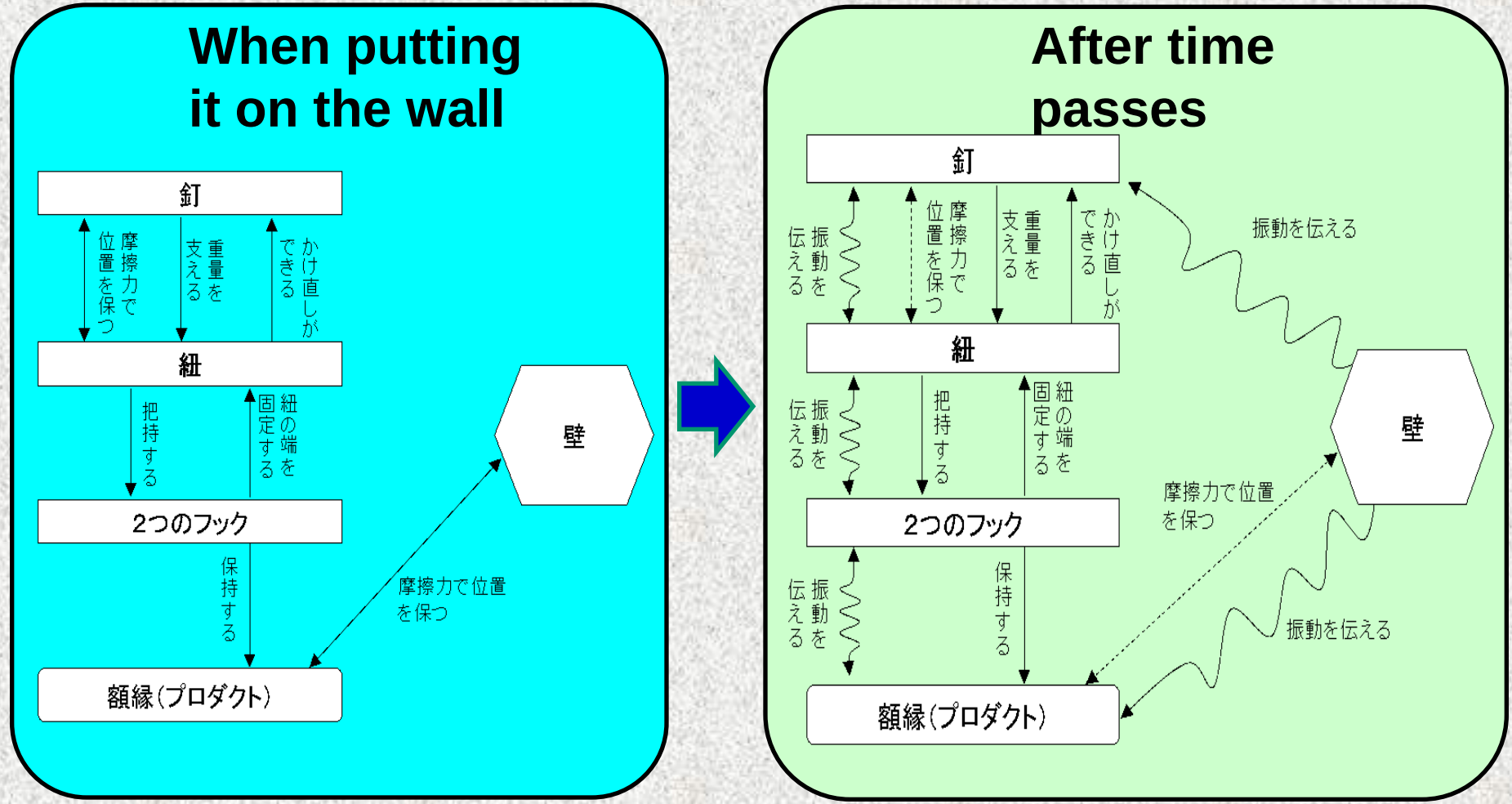
Step2: Product analysis



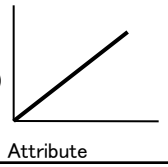
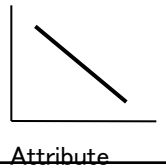
Step3: “Why why” Analysis



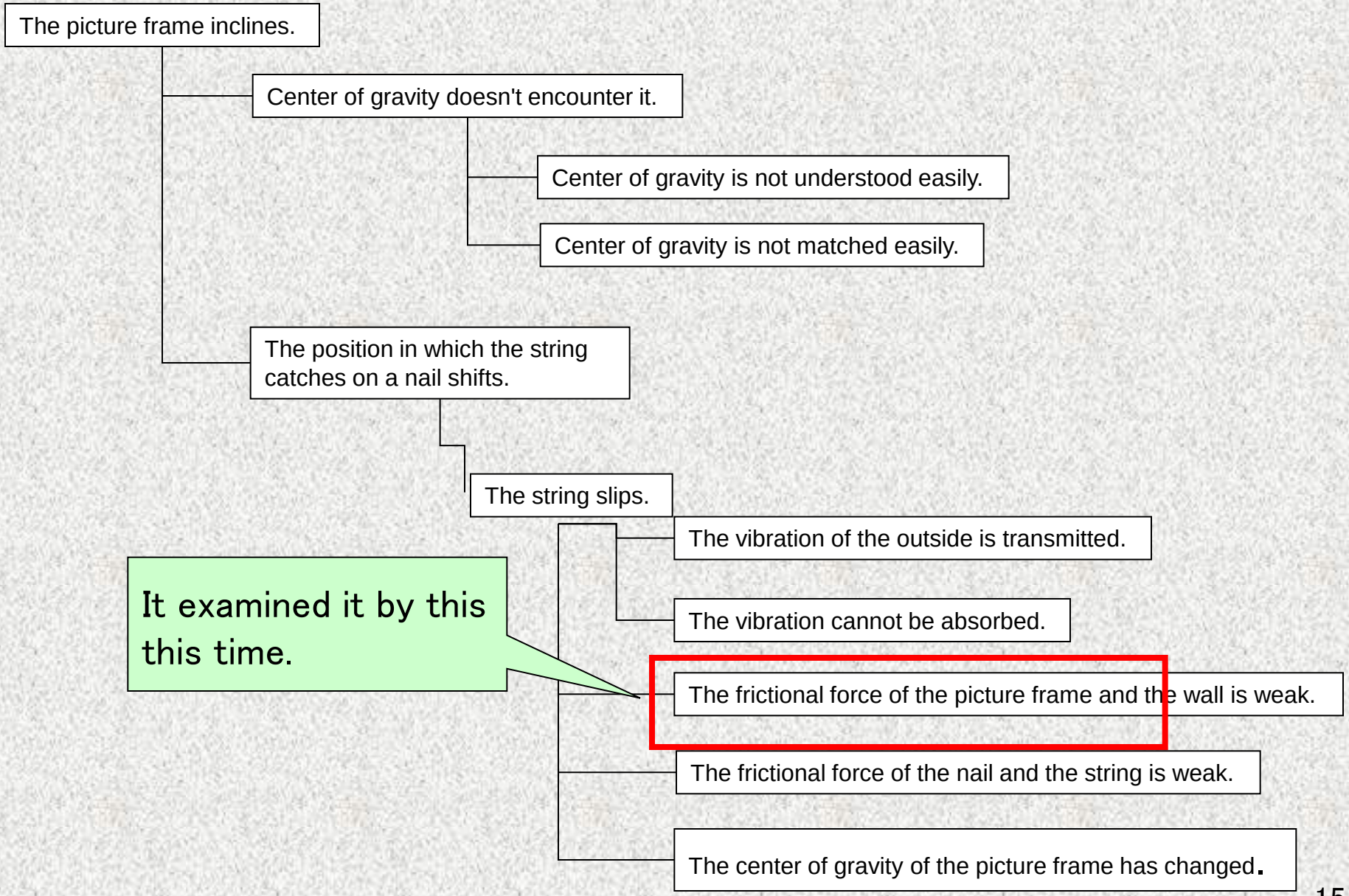
Change in product analysis by passage of time



Step4: Attribute analysis

Thing	Attribute		
	Increase Relation 	/that cannot be called which investigation necessity	A decrease Relation 
String	-	Thickness Elasticity Flat rate Transformation	Water permeability Weight Frictional properties
Nail	-	Thickness Inclination (installation angle) Flat rate	Easiness to rust Frictional properties

Step5-1: Selection of primary cause



Step5-2: Definition of profitable action

- Selected primary cause
- Object (The thing that is original of the primary cause . The attribute is not included).
- Purpose of object (reason wanting it like current state each other)
- Being acted thing (thing to receive action from object)
- Action that causes it for thing that it acts object

Primary cause selected from result of analysis why why.

The thing (object) that is original of the selected primary cause is clarified.

Because it is that the reason wanting it like the current state each other (purpose) is sure to exist, the purpose is clarified to the object.

When some actions have been caused for the thing (being acted thing) to achieve the purpose, the object is caught.

Step5-2: Definition of profitable action

- Selected primary cause

  The frictional force of the nail and the string is weak.

- Object (The thing that is original of the primary cause . The attribute is not included).

  String

- Purpose of object (reason wanting it like current state each other)

  ???

  The purpose of the object (string) was not defined easily.

- Being acted thing (thing to receive action from object)

  Nail

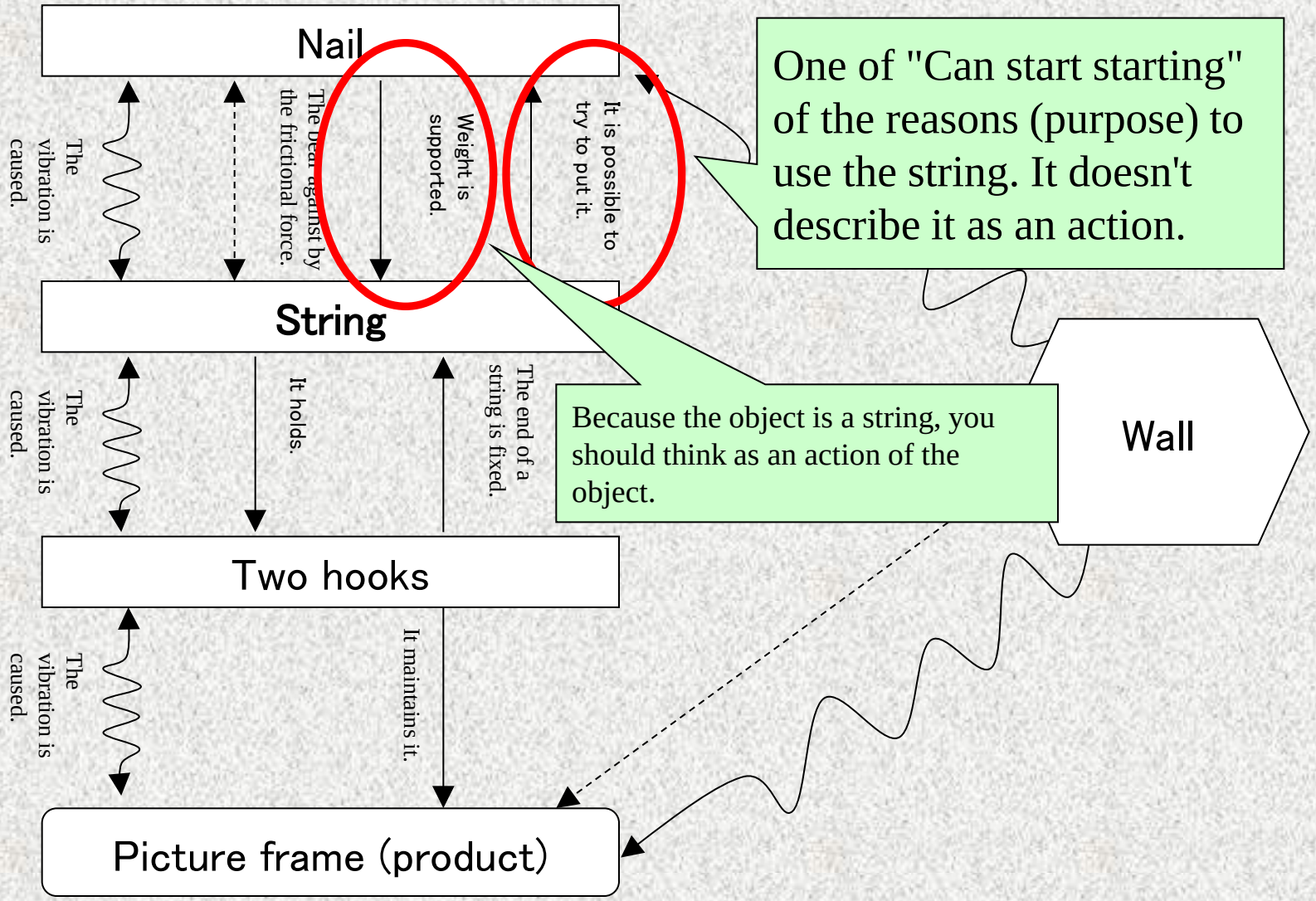
- Action that causes it for thing that it acts object

Consideration concerning reason why purpose of object is not put out easily

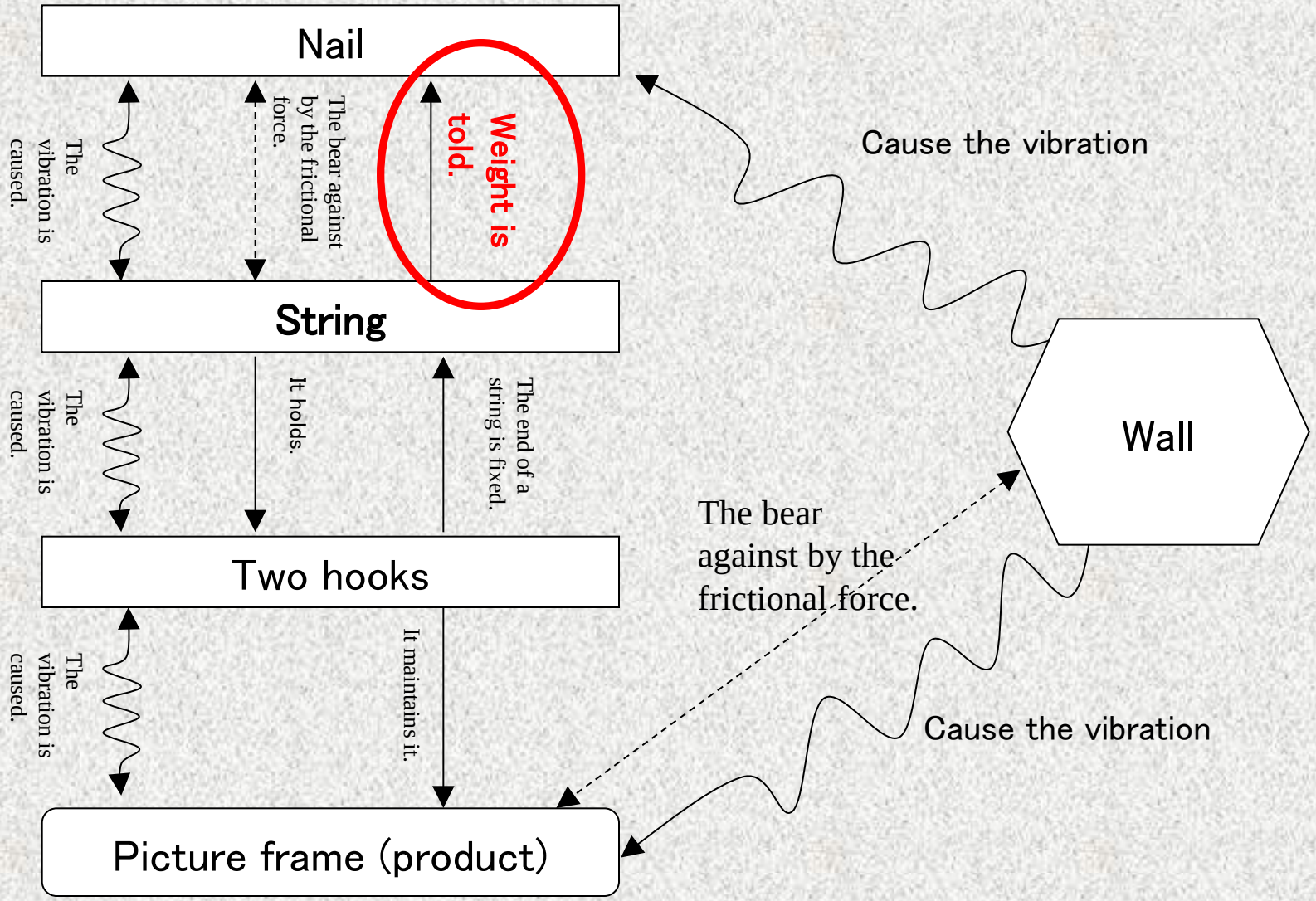
Because the action is not correctly expressible by the product analysis, it is likely not to think easily.

After deciding the object, you should review the product analysis for the thing and the action of the object surroundings.

Review of product analysis



Reviewed product analysis



Step5-2: Definition of profitable action

- Selected primary cause

  The frictional force of the nail and the string is weak.

- Object (The thing that is original of the primary cause . The attribute is not included).

  String

- Purpose of object (reason wanting it like current state each other)

  Detaching the picture frame is easy and the adjustment of the inclination is facilitated.

- Being acted thing (thing to receive action from object)

  Nail

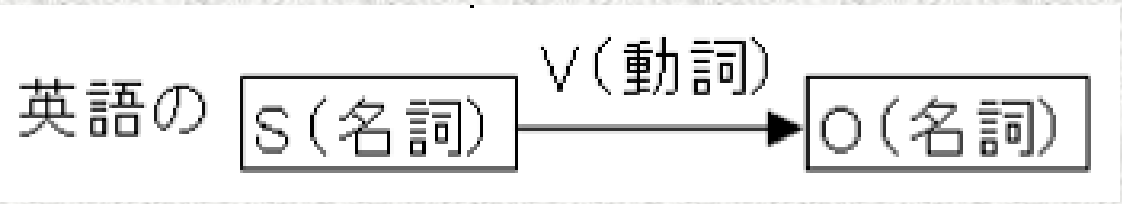
- Action that causes it for thing that it acts object

  The weight of the picture frame is told.

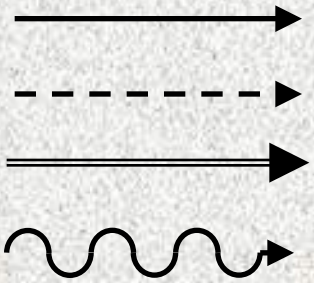
Rule of drawing

The model expresses the clarification.

- It models because of object (S), being acted thing (O), and action (V).



- A profitable action is shown by the solid line.
  The lack action is shown in the short dashed line.
  An excessive action is shown in a double line.
  The adverse effect is shown in the wavy line.



Step5-2: Definition of profitable action

The purpose: Detaching the picture frame is easy and the adjustment of the inclination is facilitated.

A profitable action: The weight of the picture frame is told.

Step5-3: Definition of harmful/insufficient/excessive actions

- Selected primary cause
- At each embarrassment that the selected primary cause causes
- Object (The thing that is original of the primary cause . The attribute is not included).
- Being acted thing (thing to receive action from object)
- Action that causes it for thing that it acts object

In general, a high-ranking factor shows one about the primary cause selected when analyzing it why why at this each embarrassment.

"Each embarrassment" that the selected primary cause causes is caught when having caused as a result of causing some actions for the thing that it acts the object.

Step5-3: Definition of harmful/insufficient/excessive actions

- Selected primary cause

  The frictional force of the nail and the string is weak.

- At each embarrassment (a ..one.. high-ranking factor of the selected primary cause)

  The string slips.

- Object (The thing that is original of the primary cause . The attribute is not included).

  String

- Being acted thing (thing to receive action from object)

  Nail

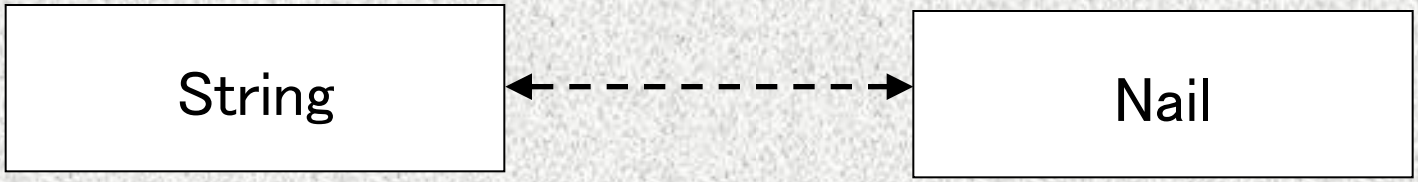
- Excessive harmful/shortage/action that causes it for thing that it acts object

  The bear against by the frictional force (lack action).

Step5-3: Definition of harmful/insufficient/excessive actions

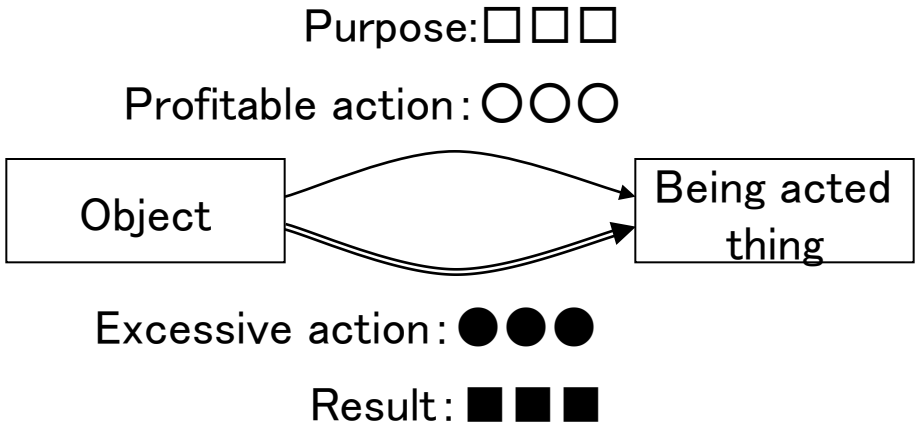
The result: The string slips.

The lack action: Bear against by the frictional force.



Step5-3: Definition of harmful/insufficient/excessive actions

Action model assumed at first



Excessive harmful/shortage/action in problem of inclination of picture frame

The lack action: Bear against by the frictional force.

The result: The string slips.

The action model is made from the object as a model that the being acted thing and the action work. (above figure)

However, there is impossibility in the expression as the action that works at one direction to the thing act from the object because the frictional force is power to work mutually between two things. (figure below)

The way things are going, the contradiction model cannot be made. ｡｡

Consideration on the model structuring

What is the purpose of structuring the action model?
→Device to make contradiction easy to see.

The model might not have to express contradiction forcibly.

The model was made in the image that pulled out the part (surroundings of the object) that became a focus from the product analysis, contradiction was expressed in the word referring to this model, and it changed to the method.

The name of the model also changed from ″Contradiction model″ to ″Action model″.

Step5-4: Structuring the action model

The purpose: Detaching the picture frame is easy and the adjustment of the inclination is facilitated.

A profitable action: The weight of the picture frame is told.

The lack action: Bear against by the frictional force.

The result: The string slips.

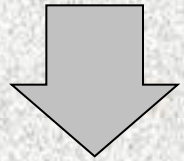
Explanation ≫ of model of record on ≪

I have occurred the phenomenon "The string slips" because of "Bear against by the frictional force" insufficient, and want to prevent this from occurring.
It becomes impossible to achieve the purpose "Detaching the picture frame is easy and the adjustment of the inclination is facilitated" though it only has to fix the string to the nail and to prevent the position of the string and the nail from shifting for that.

Step5-5: Setting of technical contradictions

The improved characteristic and the deteriorating characteristic are defined.

I have occurred the phenomenon "The string slips" because of "Bear against by the frictional force" insufficient, and want to prevent this from occurring. It becomes impossible to achieve the purpose "Detaching the picture frame is easy and the adjustment of the inclination is facilitated" though it only has to fix the string to the nail and to prevent the position of the string and the nail from shifting for that.



The improved characteristic and the deteriorating characteristic are chosen referring to the above-mentioned sentences.

Improved characteristic	Power (power to fix position of string and nail)
Deteriorating characteristic	Easiness of operation (easiness of detaching and registration of picture frame to do)

4. Reflection of findings obtained by the case study

The procedure of ″Step5: the setting of technical contradiction″ was changed as follows.

Step5-1: Selection of primary cause

Step5-2: Review of product analysis

It newly adds it.

Step5-3: Definition of profitable action

Step5-4: Definition of excessive harmful/shortage/action

Step5-5: The action model's making

"Contradiction model" is changed to "Action model".

Step5-6: Setting of technical contradiction

5. Summary: Result of the case study

The following result was achieved as a result of doing the case study concerning technical contradiction that assumed ″Problem of the inclination of the picture frame″ to be a theme.

- When you set technical contradiction
  1.Necessity and the method of reviewing product analysis
  2.Method of making more logical ″Action model″
  [Ni] was concerned, and the new insight was able to be obtained.

- When the product was analyzed, awareness with an important consideration analysis of the time passage was obtained.

- The above-mentioned finding was reflected in ″Examination procedure of the technical contradiction cancellation″, and this examination procedure was able to be made a refinement.

Thank you for your attention

END