Hierarchical TRIZ Algorithms

7th Installment--Nov 2005

Hierarchical TRIZ Algorithms is a how-to TRIZ book. It is designed to assist both beginning and advanced users. Each month, the TRIZ-Journal will publish another chapter of the book. This month's installment includes the sixth step of the 10 step algorithm (shown on the cover):

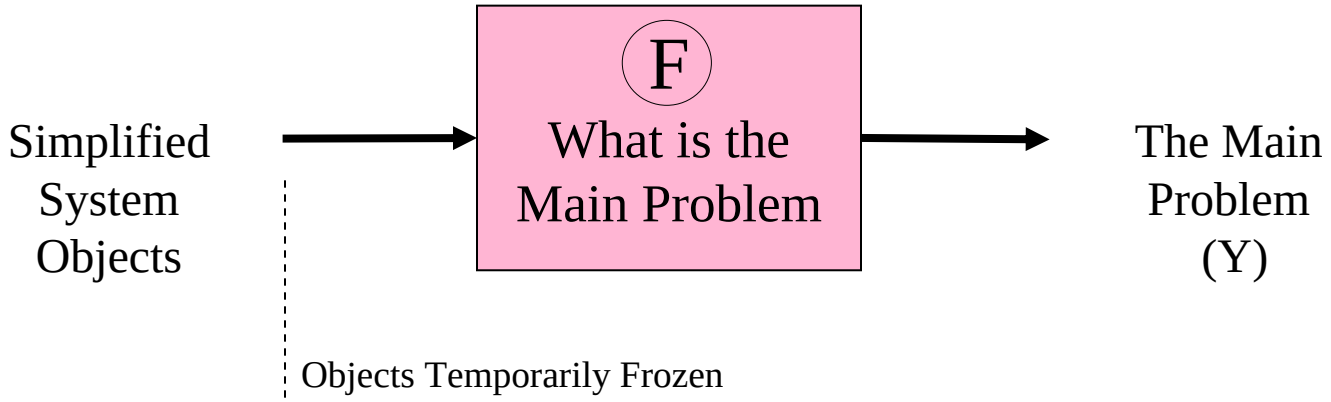
F. What is the Main Problem?

Next month's installation will cover the appendix which is required to perform steps 7 and 8:

L. Appendix--Table of Knobs (Object Properties)

In all, there will be 12 installments. Should you decide to purchase the most current edition of the complete book contact the publisher at:

http://www.3mpub.com/TRIZ/



Introduction

Most problem solvers unknowingly start at this point in the hierarchy of change and bypass the previous steps. While starting at this step is very direct, many important opportunities have already been forfeited. Too much is taken for granted. Often, the problems that we seek to solve will magically melt away as we consider completely new systems to deliver functions. The leverage on the problem in these initial steps is very great.

As we begin this step, it is necessary to consider the objects of the system to be temporarily frozen. In other words, we will not yet consider adding more objects, but will look at the situation that we have created in our minds and ask what we could do to improve on the situation.

This question can be asked in a variety of ways, but in the end, we would like to capture a very short phrase, or better yet, a single word that describes what we want to improve.

Let's consider a situation where we are measuring the effect of acids on various metals. In order to investigate the corrosive effects of acid, we form cubes of the metal and place them in a container filled with acid and then heat them in an oven. After a period of time, the cubes are removed and studied. Unfortunately, the container that contains the acid becomes corroded and must be removed periodically.

This operation is very expensive and we would like to reduce the cost of replacing the container. I could state the problem in long form: "The cost of replacing the container is high." The improvement could be shortened to a single phrase: "cost of replacement".

The improvement is the dependant variable in an important equation that we are about to write. In the six-sigma world, this is often referred to as the big Y

$$Y = f(\ldots$$

Stating this in English, we would say that Y is a function of . . . Or Y is caused by . . . For our situation this looks like:

$$\text{Cost of Replacement} = f(\ldots$$

In English we would say: Cost of replacement is a function of . . . Or cost of replacement is controlled by . . .

It is very rare that only one improvement is required when we create a new product. On the contrary, there will often be many problems. This leads to the idea that this and the following steps are recursive. We find something that needs to be improved and then we improve it. We find another and then we improve that. This process continues until the idea becomes practical. As time goes on, new markets will require other improvements and so the process continues.

Sometimes problems with our products or ideas are not evident to us and we need to see our product from the viewpoint of our markets. Tools are provided in this chapter to help us to see our product from the point of view of our market.

In summary, the output of this step is a brief phrase describing the main problem

Simplified

Determine Main Problems

Better Market Servant ?

- Focus on the main jobs that this system does for the market segment.
- What would constitute “doing a better job” for this market segment?

Identify Main System Disadvantages or Desired Outcome

Y =

- What is the main disadvantage of this system compared to the competition?
- If this is a new system, what is the main desired outcome of the system?

Sufficient Penalties ?

$ Costs

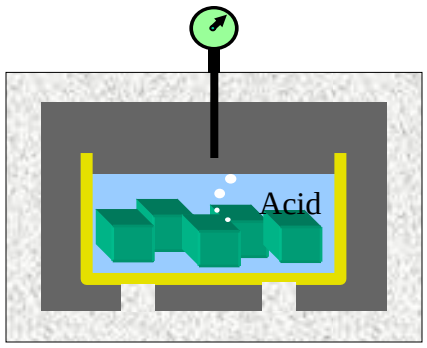
- Gather **costs and penalties** associated with these disadvantages
- Is there a tangible demand for this system?
- Is there really an interested market?
- Are the problems worth pursuing?

Detailed

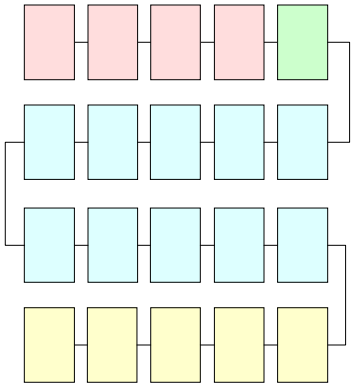
Determine Main Problems

Situation

Cubes are placed in warm acid to investigate the effect of various acids on the cubes. Unfortunately, the container that holds the acid and cubes is corroded. The container is made from a gold and is very expensive to replace. Because the acid is so reactive and the test is performed often, the pan must be replaced frequently.



Consider Product Lifecycle



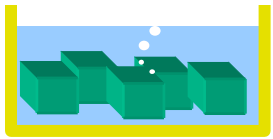
1. Focus on the main jobs that this system does for the market segment.
2. What would constitute "doing a better job" for this market segment?
3. This step allows us to look at our product from the viewpoint of the market.

Oven container needs frequent replacement

Identify Main System Disadvantages or Desired Outcome

Y =

1. What is the main disadvantage of this system compared to the competition?
2. If this is a new system, what is the main desired outcome of the system?



Y = Cost per year = $$

Sufficient Penalties ?

$ Costs

1. Gather **costs and penalties** associated with these disadvantages
2. Is there a tangible demand for this system?
3. Is there really an interested customer?
4. Are the problems worth pursuing?

Yearly cost is $5000. There is an interested customer and the problem is worth pursuing.

If Problems are not Known

Life Cycle Opportunities

Observe or Consider Various Life Cycle Stages

- Observe or consider this baseline and competing systems in as many of the Life Stages as possible
- **Look for problems. When do these problems arise?**