Hierarchical TRIZ Algorithms

4th Installment--Aug 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 third step of the 10 step algorithm (shown on the cover):

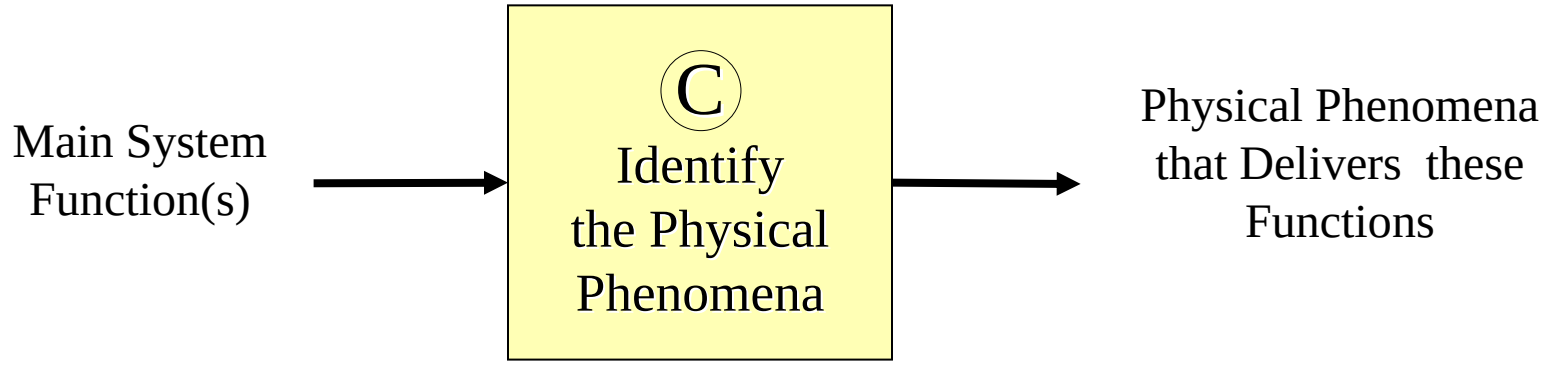
C. Identify the Physical Phenomena

Next month's installation will cover the fourth process step:

D. Identify the System Objects

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

Now that we have clarified the main system function, it is necessary to determine the physical phenomena which will deliver these functions

This decision is very important for a number of reasons. First, if we are dealing with a **recognized** market, it is unwise to deliver the system function with a *completely* new physical phenomena. This is because the value (performance per unit dollar) to legacy customers is likely to be worse in the beginning than systems using the legacy physical phenomena. The competing phenomena has had time to be refined and the bugs worked out. Also, the competing phenomena will likely continue to outpace the new phenomena if it is still in the rapid growth phase, since more resources are available to develop it. In fact, if the recognized market is still in the rapid growth stage, then is is imperative to continue with the same physical phenomena. As long as there are ample resources available to improve these systems, this strategy will result in the most rapid return on investment.

On the other hand, if the recognized market has reached a **mature stage** in which growth has drastically slowed, then it is best to consider a **hybrid** of a new physical phenomena and the old. The resulting system will likely have enhanced performance, which will delight legacy customers.

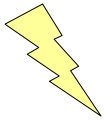
If the market is **unrecognized**, then opportunities to use a completely new physical phenomena abound. In this case, it is essential that a physical phenomenon be found which has natural tendencies to delight this new market. If possible, a phenomenon should be identified where the weaknesses perceived by the legacy market are considered strengths in the new market. Remember that you are competing against non-consumption. This market has nothing to compare to and is much more forgiving since there is no competition.

Systems which employ new physical phenomena often have many new resources which can be developed as the technology moves to higher margin markets and displaces the legacy technologies in these markets.

Simplified

Ideal Effect?

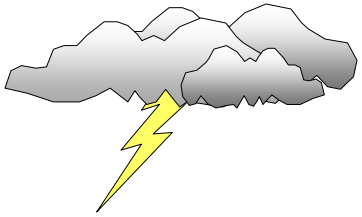
Abundant Native Fields



- Identify abundant fields and try to make use of at least one of these

•Gravity	•Waves
•Inertia	•Current
•Buoyancy	•Heat
•Pressure	•Electromagnetic
•Sound	•Magnetic
•Vibrations	•Light

Brainstorm Physical Phenomena

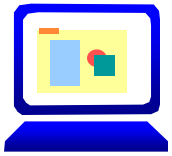


- Brainstorm physical phenomena which can deliver the required function. Consider the four possibilities from the 40 principles shown below.

Go to the Store

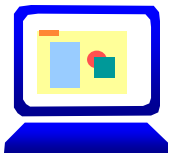
1. Go to a store that would sell products that deliver the required modification.

Internet Product Search



1. Use an internet search-engine to determine what products are offered.
2. Refine the search by noting and using nomenclature and names that are common to the industry

Patent Search



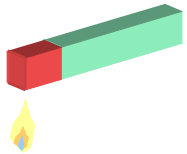
6,543,345
5,678,432
3,234,211

1. Go to **www.uspto.gov**
2. Go to **Patents**
3. Using **Advanced Search**, search for key words in the abstract or body of the patents.
4. Look for physical phenomena that others have used.

29 Pneumatic or Hydraulic Structures

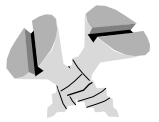
- Move from mechanical systems to pneumatic or hydraulic structures

37 Thermal Expansion



- Move from mechanical systems to Systems which employ thermal expansion

28 Replacement of Mechanical System

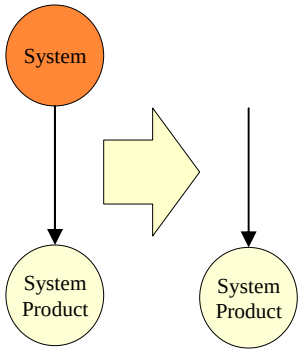


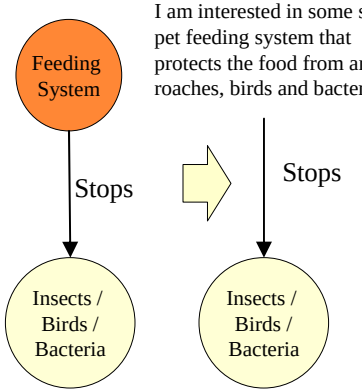
- Move from mechanical systems to electrical, magnetic, optical systems

Detailed

Identify The Main Modification

Isolate the Modification on the System Product





I am interested in some sort of pet feeding system that protects the food from ants, roaches, birds and bacteria

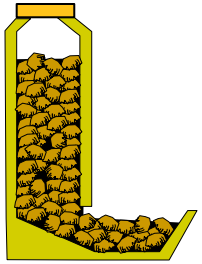
Do Competitors Exist?

Who Makes a Product that Delivers this Modification?

Go to the Store

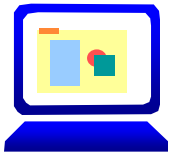
1. Go to a store that would sell products that deliver the required modification.
   - I am interested in containers that serve pet food, so I go to a pet store or the pet section of a department or grocery store

2. Note brands and producers, Do the producers sell more than one product? Who are the main producers?
   - I note that there are three main manufacturers that sell products in the category that I am interested in
3. Look for product trends
   - The trend is to combine the food bowls with large storage containers and to keep the food at a level that is comfortable for the pet.



4. Read the labels. What do they claim?
   - One claims to slow down bugs

Internet Product Search

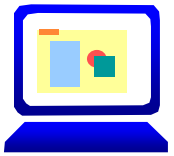


1. Use an internet search-engine to determine what products are offered.
2. Refine the search by noting and using nomenclature and names that are common to the industry

Learn from the competitors products. What jobs do they do? What functions do they perform? What Physical Phenomena delivers the functions?

If you are searching for an unrecognized market and you find a major competitor then go back to the drawing board.

Patent Search



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To set up:

1. Go to **www.uspto.gov**
2. Go to **Patents** and bookmark this page
3. Download **patent viewer** for viewing patent drawings. Look for:
   - How to access full page images
   - www.alternatiff.com
   - ActiveXcontrol, autoinstall
   - Autoinstall alternatiff ActiveX Control
4. Bookmark the **definition of patent classifications**
5. Bookmark the **index of classifications**
6. Bookmark the **Advanced Search** page and study the examples for Boolean searches. (Note that you can search for phrases in parenthesizes).

Now you are ready to begin the search:

1. Using **Advanced Search**, search for key words in the abstract or body of the patents.
2. When you finally find a patent which is close to the intended subject, identify the classification
3. Search by classification, making use of the Definitions and Index of Classifications. Make sure that classification includes possible patents that cover the field that you are interest in
4. When find good representative patents, note and **view all patents cited**
5. Now search these patents and continue the process until no new patents regarding your area of interest show up

Is it Time for a New Effect?

Study the History

1. From patents and literature, study the history of the **functions** that are typically involved in the job.
   - What functions have been added?

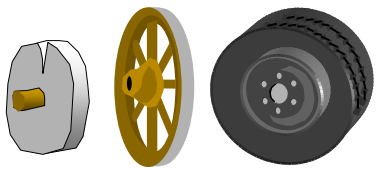
Considering the market of those that transport objects for pay. (Postal services, etc)
1. Purchasing of service and movement of object.
2. Delivery of object to point of use
3. Protection of objects (container movement)
4. Tracking of objects and informing customer.

   - What main physical parameters have improved?

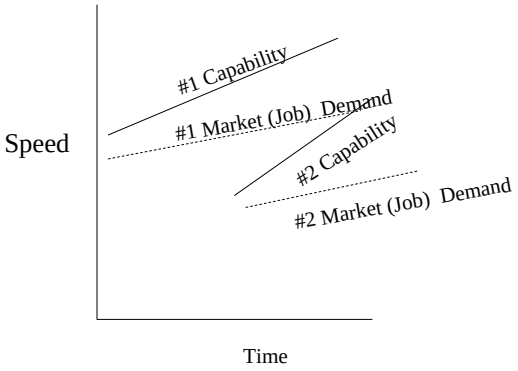
1. Speed
2. Damage
3. Knowledge of object location

2. From patents and literature, study the history of the **technologies (physical phenomena)** that typically deliver these functions. How have these technologies changed?

Wagon --> Train and Boat --
>Trucks and Planes

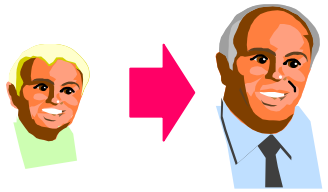


Check for Disruptive Technologies

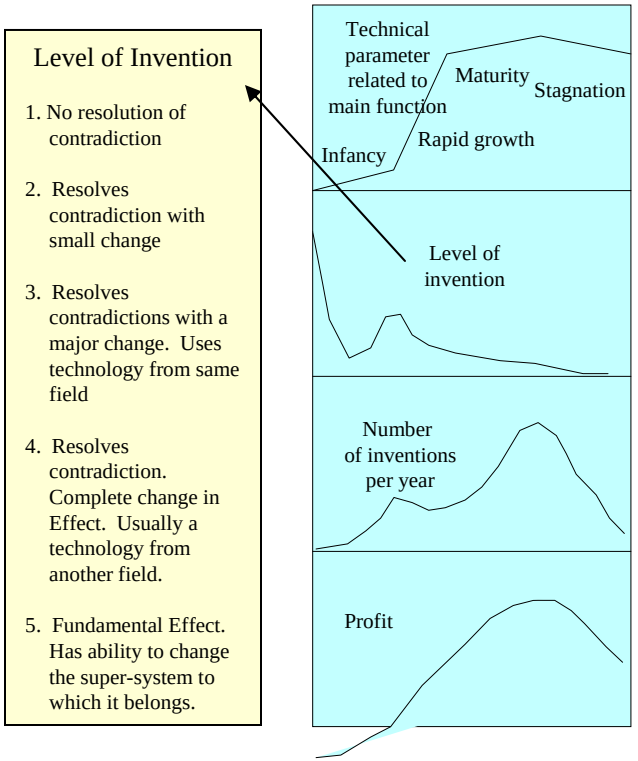


1. Each recognized market (job) is focused on a competitive parameter. Determine the competitive parameter. The progression of competitive parameters is as follows:
   - **Performance--**Identify the primary parameter such as speed, power, memory, etc
   - **Reliability**
   - **Convenience**
   - **Cost**
2. Plot this main competitive parameter for the most advanced leaders with respect to time for each market (job). This gives the capability curve.
3. Plot the average of the competitive parameter for all products for that market. This gives the demand curve for each market
4. If the capability of the lower performing market appears to be on a course to cross the demand line of the market with the upper capability, then it is imperative that you find a way to switch to the technology used by the encroaching market. It may be necessary to spin off an independent group which is given proper resources and incentives to market this new technology. This may be difficult since the new market is likely to have developed new delivery channels.

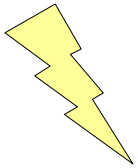
Determine The System Maturity



From your study of patents, determine the degree of maturity for the system whether the market is recognized or not.

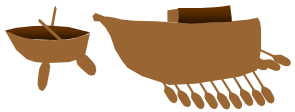


Time For a New Effect?

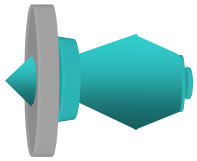


1. Consider the questions below to determine whether a new phenomena should be used.
2. If the time is not right, then continue with the existing physical phenomena to deliver the effect.

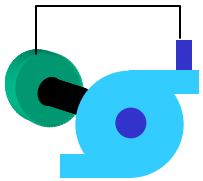
- Has the super-system become very specialized?



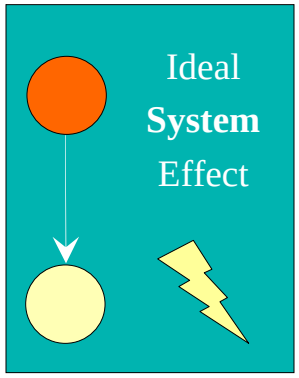
- Has the super-system reached the point of diminishing return?



- Is automatic feedback used to perform the main super-system function?

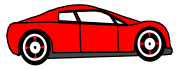


- Must multiple conflicts be resolved for improvement? (Do too many rocks appear when we begin to drain the pond?)



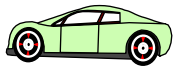
Hybrid or Completely new Physical Phenomenon

1. If the market is a recognized and mature market then consider a hybrid of the old and new phenomenon.



Hybrid Car--Gas and Electric

2. If the market is an emerging or unrecognized market then consider using a completely new physical phenomena in which the native weaknesses of the physical phenomena are considered a strength. (Usually starts small)



Electric Car for Teen Drivers

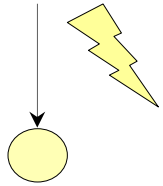
1. Extremely safe enclosure
2. Limited speeds
3. Restricted driving range
4. Full entertainment system

Ideal Physical Phenomena *Ideal Final Result* (IFR)

- Use the **Appendix--Idealizing Functions** to the section dealing with Ideal Physical Phenomena to help identify a more ideal physical phenomena to use to deliver the main system functions.

I would like to stop insects (ants and cockroaches) from contaminating the pets food

Use of an abundant resource (water) which is already part of the job of nourishing the pet is suggested.



Liquid Barrier