# Hierarchical TRIZ Algorithms

## 1st Installment-- May 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 book introduction and the first step of the 10 step algorithm (shown on the cover):

**A. Discovery of Market**

Next month's installment includes one of the appendices which is required to perform several of the steps:

**K. Appendix--Idealizing Functions**

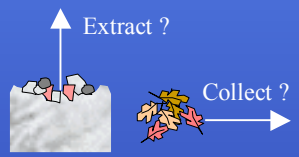
In all, there will be 12 installments. Should you decide to purchase the most current edition of the complete book contact the publisher at:

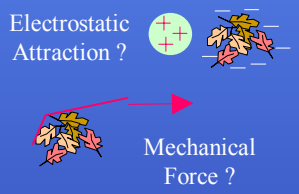
http://www.3mpub.com/TRIZ/

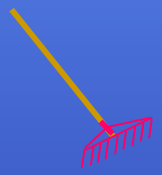
Hierarchical

# Triz Algorithms

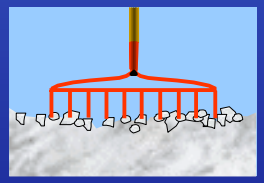
## Processes-Tools-Recipes-Tables-Charts

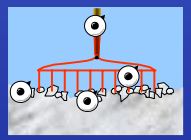



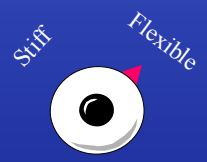

Discovery of Market → Clarify the System Function → Identify the Physical Phenomena → Identify the System Objects → Simplify the System



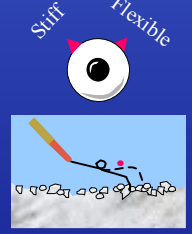
Debris Leakage is High



High Leakage = f (
Surface profile (uneven)
Debris amount (large)
Tine flexibility (stiff) . . . )




Tine flexibility




What is the Main Problem ? → What Causes the Problem ? → Turn Object Knobs to Fix the Problem → Resolve Resulting Contradictions → Implement the Solution

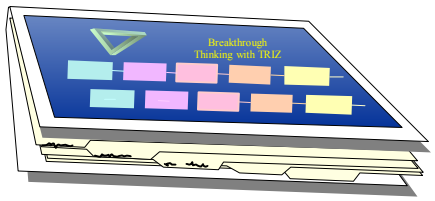
**Next Problem**

**Introduction**

This is a TRIZ "how to" book. It explains a step-by-step process designed for beginners or advanced users. Each step has a simplified level (for beginners and less involved problems) and a detailed level.

It reads like a pictorial recipe book, starting on the upper left of each page and ending at the lower right. The user is encouraged to read the introduction for each step first. If further clarification for the simplified steps are required, the detailed version is helpful.

Viewing this book in electronic format is difficult. Readers who download electronic versions are encouraged to print the material and place it into a binder. The main sections are marked for tabbing. Each section (and hence each tab) corresponds to one of the steps shown on the front of the binder. Printed versions come with printed tabs, which require insertion.




While the author's company has given him permission to publish TRIZ articles, this permission does not imply endorsement of any of the author's publications.

Following are key discussion points that explain the logic behind *Hierarchical TRIZ Algorithms.*

**Format Goals** the format for presentation has been guided by the following goals:

- **Adjustability** The solution process can be taught and used at a variety of levels to suit the interest of the student or the degree of difficulty of the problem. Three levels are available:
  1. The top steps shown on the cover. At this level, the user simply brainstorms each step and records the answers before going to the next.
  2. A simplified level shown at the beginning of each chapter
  3. A detailed level for more advanced users and involved problems

  This method of teaching is widely used to teach many subjects from music to mathematics. The focus should be on gradually increasing the ability of students while having for successful experiences.

- **Simple Nomenclature** As with many disciplines, the nomenclature of TRIZ is often difficult to learn. One goal is to make the nomenclature fit ideas that the student is already familiar with. For instance, "Dynamism" is changed to "Make Adjustable" and "Local Quality" is changed to "Non-uniform." A certain amount of new nomenclature is unavoidable, and care is taken to introduce it at higher levels.

- **Smaller Steps** Most beginners are baffled by the seemingly "obvious" target- solutions presented in TRIZ literature. Many of these solutions are only obvious after the fact and represent large jumps in intuition. Some teachers may feel that these large jumps are a testament to the power of TRIZ and will try to impress the student with them. Unfortunately, many beginners are discouraged that such solutions are not as obvious to them. One goal of this solution-process is to decrease the step size, so that solutions are the result of several smaller steps rather than a few major leaps.

- **Visualization** Along with the concept of "smaller steps" is the idea that solutions need to be visualized in order to become reality. Each step should help the user to visualize a final solution. Some may feel that elegance or compactness is sacrificed by expanding classical TRIZ steps, but the goal is to make the solution more easily visualized.

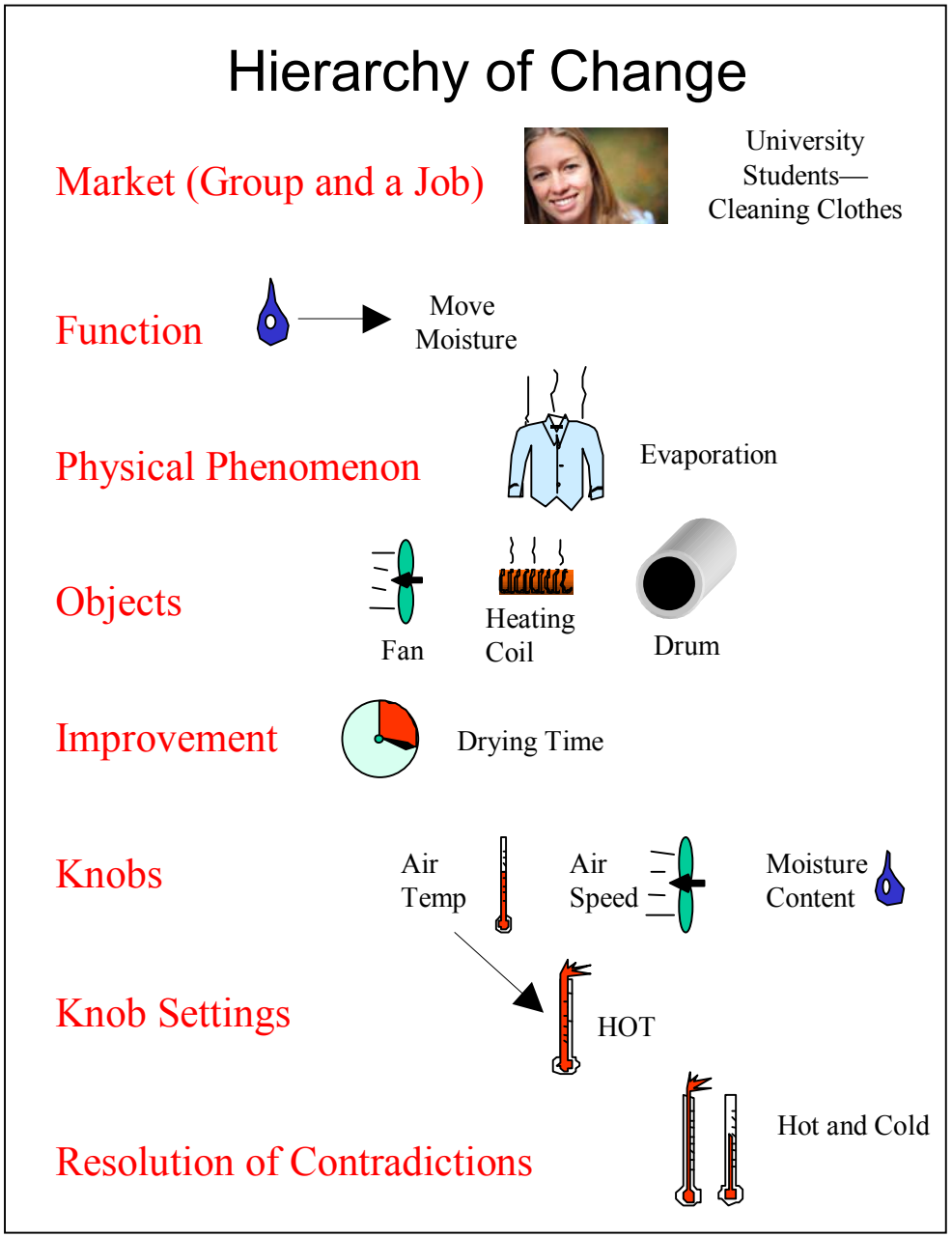
- **Completeness of Solution** The term "solution" means different things to different people. In this book, a solution is defined as a sketch that someone could work from to design hardware. No difficult contradictions or problems would remain to be solved. Simply pointing out a physical phenomenon that might be used to solve a problem would not, in this context, be considered a solution, since difficult challenges would inevitably remain

**A Hierarchy of Change** is proposed, which assumes that, certain decisions must ***unavoidably*** precede *others*. Here are the decision points in the hierarchy

1. The Market (Group of people and a Job)
2. The System Function
3. The Physical Phenomenon which delivers the function
4. The Objects which deliver the Physical Phenomenon
5. A required Improvement (Y)
6. Independent variables which control Y (x1,x2,x3,…) (Knobs)
7. Knob Settings (Often creating contradictions)
8. Resolution of the contradiction
9. Less critical design parameters

A change at any level affects all levels that follow.. If change were to begin at any step other than the first, assumptions must unavoidably be consciously or unconsciously made.

If such a hierarchy exists, *then all change processes can be viewed as a management of this hierarchy*. It is hoped that this declaration will stir useful debate in the TRIZ community.




**Sequencing of TRIZ Tools** Classical TRIZ tools are spread across many stages of this hierarchy. There are several major drawbacks to this approach.

- It is difficult to make progress in the basic theory of TRIZ when this gross overlap occurs. When the overlap is removed, patterns emerge which were not visible before. These patterns allow for the further development of TRIZ theories and tools.

- Science advances by watching how theory matches reality. Without a consistent theory, it is difficult to tell when a tool is missing or where a tool fits once it is discovered. When exceptions to the theory are found, new theories can be advanced which account for the exception. (A hierarchy of change could be the beginning of such a theory).

- Beginners often find it difficult to know where to begin. A hierarchy of change gives a clear starting point and solution path.

The material presented in this book is the result of disassembling the classical TRIZ tools and then reassembling them into steps that follow this hierarchy. Care was taken to sequence the steps to ensure that in order to perform a given step, the output of previous steps would be required.

**Solution Branches** Each decision point in this linear sequence follows the Hierarchy of Change. As a result, the solution process follows natural decision points, which branch to multiple solutions.

**How this book came to be**

As a youth, I dreamed of and built many "inventions" that were disappointing failures. (Later I came to realize that these failures prepared me for a career in inventing). When I finished high school, I was convinced that the path to inventing was to get an education in engineering. As an engineer, I continued my efforts to invent and to patent. Since I did research and development, I had many opportunities to invent. Work was enjoyable, but I always felt that I could do better.

Around 1992, a coworker introduced me to my first TRIZ contact. During our introduction he explained that it was possible to resolve a contradiction without compromising. This intrigued me. He suggested that I read a book called *Creativity as an Exact Science* by Henry Altshuller. The book was as fascinating as I had hoped and contained a repeatable algorithm for problem difficult inventive problems. I copied the algorithm (a version of ARIZ) and then began the painstaking task of applying it to every reasonable problem.

At first, I used a worksheet that forced me to fill in the answers to each step of the algorithm. As I used the algorithm I became increasingly frustrated. The algorithm required that the "technical contradiction" first be discovered, and then the "physical contradiction". I stumbled over this step every time, and wondered what I was doing wrong. It had been explained to me that finding the physical contradiction was like peeling an onion. The technical contradiction was the outer layers and physical contradictions would be found inside. Fortunately, an early DOS version of the Invention Machine™ software used an algorithm to discover the technical contradiction by *first* discovering a form of the physical contradiction. This gave me a key which allowed me to reformulate the algorithm into a much simpler version for finding both the technical and physical contradiction. (See the introduction to resolving contradictions). I began to gain confidence in using the algorithm.

Other authors described methods of solving problems that were not in the algorithm. These were also added along with tables, lists and charts. By now, I had a ready reference that could be used repeatedly. Each time that I used it, a little more rubbed off.

Around this time, I became very interested in improving my ability to resolve physical contradictions. Most books mentioned three general categories: Separation in time, separation in space and separation between the whole and the parts of an object or system. I thought that I could be more efficient at solving physical contradictions if I could break each category down into smaller steps. As a starting point I extracted many of the 40 principles which could be directly applied to solving physical contradictions and separated them into these three categories. While some of the principles appeared to be very useful for solving physical contradictions, they did not fall directly under the three known categories. This necessitated adding more unique categories.

The principles that were left over from this extraction process intrigued me. Where did they really fit? Some principles appeared to address earlier phases in the invention process. The same issues were true with substance-field analysis and the Standard Solutions. What I wanted was a process which took all of the TRIZ tools and put them into a process in which each step built upon what was learned in previous steps. Thus I began the process of breaking down the various methods into what I thought should be earlier and later steps. This was the beginning of a hierarchical approach to TRIZ.

Around 1996, I began to teach occasional classes in TRIZ. Having to explain TRIZ to others required me to understand it better. In order to teach the class, additional explanations were required. The short algorithms became a more detailed book. This approach did not work as well as I had hoped.

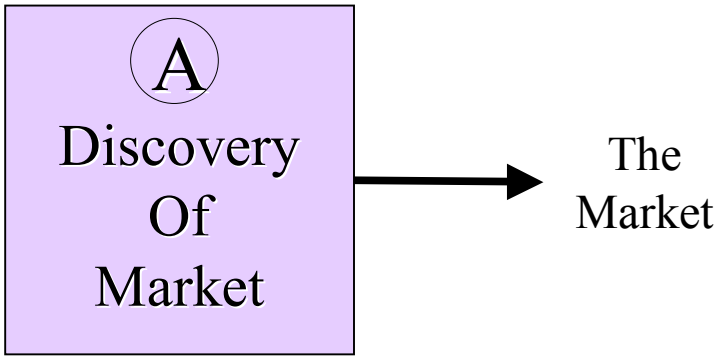
One day a student suggested that the steps in the book were becoming too ponderous to follow. What he wanted was a shortened version of each step that gave the bare details, much akin to ARIZ. He described the desired format as a "cheat sheet". I obliged and produced a very short booklet consisting of a few pages of algorithms and the required tables and lists. This approach seemed to work well for the class, but now the new material could not stand alone from the class.

On the other hand, a new benefit was discovered. Having the book in this form made it easier to discover holes in the theory and processes. Over the years the book of algorithms has continued to grow as new tools and examples are added. (Unfortunately, it has grown to the same ponderous size as before!)

In the March 2003 edition of the TRIZ-Journal, the first version of this book was published for free viewing under the title of Breakthrough Thinking with TRIZ. The second edition was published in January of 2004 and a low-cost printed version was made available. Later in 2004 the title was changed to Breakthrough Inventing with TRIZ. Early in 2005 the title was once again changed to *Hierarchical TRIZ Algorithms* to better describe the unique features of this book. This version of the book includes chapter introductions and more examples

A special thanks goes to my family who has encourage me, edited this book and endured TRIZ discussions around the dinner table, and other forums from which they could not escape. Inventing has become a common part of their life as they have helped me and encouraged me with countless prototypes in my garage.

Larry Ball




## Introduction

Most marketing studies segment the market according to customer attributes, such as gender, race and age. This type of market segmentation ignores a fact: when you go to the store to buy something, you are not looking for something for old people or young people, Caucasians or Hispanic; you are looking for something that helps you to perform a task or to get a job done. In effect, you are hiring the product to do a job. Markets are organized according to the job that customers are trying to do: Cooking, cleaning, tending health, etc. From here on, we will define a market as **a group of people trying to perform a job.**

The fact that a group of people are trying to perform the same job does not dictate that any business is trying to meet their needs. In fact, undiscovered markets abound. In order to establish a foundation to discuss how these markets might be found, let us define the various market types.

A **sustaining market** is a market whose needs are recognized and an industry is focused on meeting their needs. These markets are readily studied because they constitute known customers. The common job that they are trying to perform is deduced from the function that the product or service provides. In spite of this fact, new market studies continue to segment the market according to gender, etc. rather than the various jobs which the process or product performs. In fact, one way to discover new markets is to watch how known customers use our product or service. Sometimes a subgroup of the market is discovered who is trying to use the product to perform an unexpected job.

A sustaining market can be broken into those willing to pay a premium for higher performance **(the high-end market)** and those who are satisfied with lower performance and are reluctant to pay high prices **(low-end market)** for improved performance. Businesses find it compelling to satisfy the high-end market and shed the lower paying customers. They constantly push the performance of their products and services in order to provide enhanced performance. Eventually these businesses modify their values to accept only high margins. This often leave the low-end market with pricey products that over-perform. The low-end of the market is always on the lookout for low priced products that meet their needs.

An **unrecognized market** is a market whose needs are not satisfied by any industry. These people may be clumsily attempting to meet their own needs. Sometimes, a product or service price is so high that it is out of reach. Consequently, they remain unsatisfied or have the service performed after excessive delays. These unrecognized markets would flock to a product that allowed them to perform the job themselves (if the price was affordable). Studies indicate that the highest returns and the highest likelihood of startup success comes from meeting the needs of these unrecognized markets. In these markets, the competition is irrelevant because it does not exist. This market is easy to please because it expects little and no one is providing any product to meet their needs.

Unrecognized markets come in several flavors:

1. The job is recognized for some groups, but is out-of-reach for others. This occurs for a variety of reasons: the job is too complex, requires expensive equipment or is too dangerous. Consequently a specialist is required or the customer must go to a central location to perform the job.
2. The job is unrecognized by industry, but products exist in imperfect form. The product is clumsily used or modified to meet the needs of this group.
3. The job is completely new

Products that meet the needs of unrecognized markets usually perform more poorly in the beginning than products associated with sustaining markets. Consequently the sustaining markets do not buy them. However, once the needs are met and the market gains momentum, resources become available to improve the performance of these products. Eventually the performance begins to meet the needs of the original sustaining market and low-end customers begin to buy. Finally, the high-end market also accepts the new products. The products and services that do this are often referred to a **disruptive**, since they disrupt the status quo of the sustaining market, including all services and the entire product delivery process.

Studying customers of unrecognized markets is not possible because they are not yet identified. So-called marketing studies on these markets are notoriously incorrect. Products launched on a large scale, which base their assumptions on these marketing reports, are usually off-base. The true market potential is missed and massive resources are wasted.

A better approach is to reverse the normal strategy and establish what constitutes economic success. Working backwards, determine the assumptions that must be proven to reach this success. Then, begin a low cost learning and experimentation process to determine whether these assumptions are correct. This requires developing trial products or prototypes and testing them on potential customers. This takes more time than money, but allows for a higher probability of success.

You may be asking: "Is it time that our company develop a new market?" This question is especially vexing if you are growing rapidly, the pace is hectic and it is difficult to concentrate resources on new ventures.

From a strategic point of view, it is **always** time for developing new markets. Whether a company is growing rapidly or is seeing its sales stall, it is necessary to constantly add new disruptive products and services. The best time to add new disruptive products is while the company has strong growth. This is because the resources are available and the company can afford to be patient for growth. If new products are not continually added, the success of the company seeds its eventual demise. In time, the company will find itself in the situation of having huge sales and needing correspondingly huge sales growth to satisfy investors. The growth that investors require is "unexpected" growth which outpaces the market. If sales are huge, then it is nearly impossible to re-ignite an "unexpected" growth increase. The required jump in sales volume is virtually impossible. This is because most disruptive markets begin small. Consequently, it is imperative that the company have a constant crop of new disruptive products in the pipeline to satisfy future growth requirements.

While it is important to continually add new disruptive products and services, it is also crucial to consider *how* they will be added.

Companies that insist on trying to generate new products within the existing processes and values of the company will find that these products cannot compete against the entrenched customers which hold the company hostage. Resources will always be drawn away to these customers and little excitement will be generated by the inevitably small orders of new products. The likelihood of success is greatest if these products and services are developed by independent spin-offs which are given the resources, incentives, leadership and process knowledge that allows them to be successful.

If you are in the position of creating new disruptive products, this step of the process gives many powerful ways to generate ideas for disruptive growth.

If you have developed a product that is mature, it is possible to develop disruptive strategies without developing new products. Some companies have made the jump from disruptive products to disruptive services that make the products more convenient to the customer. Other companies have developed disruptive delivery methods that bring the product to the customer more inexpensively or conveniently. The natural evolution is from disruptive **products** to disruptive **services** to disruptive **delivery** of the products.

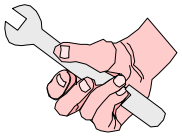
So far, this introduction to discovering markets has emphasized the importance of new disruptive products and markets. This focus is somewhat lopsided as most development and innovation will occur in established sustaining markets. In reality, companies must pursue both recognized, sustaining markets and new, unrecognized markets. Most innovators will be involved in supporting a sustaining market. Innovation in a sustaining market allows the company to move up-market for higher margins (or to another point in the market where the performance is not yet good enough. This is where the money is).

The primary intent of this step is to either identify the recognized market that you are already trying to satisfy or to discover an unrecognized market with the potential for disrupting other markets.

# Simplified

What is the market-- A Group of people with a common objective and Job

## Personal or Customer Irritants



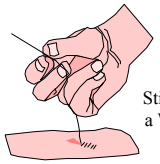
It seems like this sink is always leaking!

1. Identify something that irritates you or a known customer.
2. Clearly identify the job related to this problem.
3. Identify the job and group of people interested in this job.

## Observe Then Interview

1. Pick a product with known customers
2. Observe the system in use. **Note unexpected behaviors.**
3. Interview people who use the system. **Ask about unexpected behaviors.**
4. What are the **unexpected jobs** and objectives?

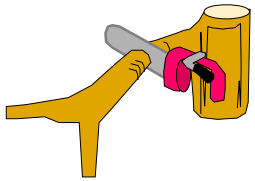
## Complex Job (Needs an Expert)



Stitch Up a Wound

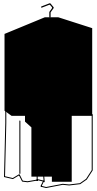
1. Identify a complex job which requires an expert with specialized knowledge.
2. What groups of people exclude themselves from doing this job but would likely perform it if there was a **simple and foolproof** way to get it done?

## Dangerous Jobs



1. Pick any job that is dangerous
2. What groups of people exclude themselves from doing this job, but would do it if it were safe and foolproof?

## High Capital Costs



Dry Cleaning

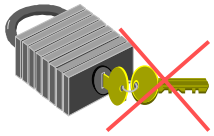
1. Identify any high-cost product, service or activity that is expensive because is requires a high capital expenditure for equipment, office space, land, etc.
2. What groups of people are excluded from doing this activity or job but would likely do it if it were foolproof and did not require large expenditures of capital?

## Serendipitous Discoveries

Wow, What can I do with this stuff?

1. A substance or physical phenomenon is developed which has unusual properties. The effect was unexpected.
2. What jobs might people use this for?
3. What different objectives might people have in doing this job?
4. Form this as a market segment

## ASIT Sacrifice Tool



A Lock without keys?

1. Pick a product that you would like to improve
2. **Remove a main part** of the product or process. This is your new "virtual product"
3. Who might be interested in this new product?

## Segment Markets by Objectives and Jobs

1. Segment the market into groups with **different objectives or goals**.
2. Further segment these markets by the **jobs or tasks** people are **hiring** this system to do?
3. Clearly identify each market segment
4. Pick the market segment that you would like your system to serve

# Detailed

## 1 Analyze Your Company

1. Does current sales growth for the company exceed the average industry growth?

   XYZ Camera Products has a growth pattern that fits the growth of its legacy market. It barely matches GNP growth.

2. Is your company in the early stages of developing products for unrecognized markets?

   As with most large companies that have once experienced growth, it has depended on a few stellar products that grew to large sustaining markets

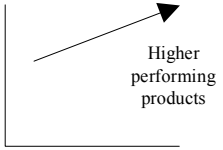
3. Is your company willing to invest in a continuous stream of unrecognized markets or disruptive technologies?

   The company is desperate for growth, but unwilling to move into unrecognized markets

## 2 Analyze Current Markets

1. Do any of your products appeal to low end customers?

   XYZ Camera Products has tried to move up-market and has consequently shed most of its low end customers




2. What share of each market do you currently have?
   - If you own a high market share, growth will be limited by the growth of your current market. Having a lower market share may remove this bottleneck, but entering an established market has other disadvantages.
     - Lower intellectual capitol
     - Lower brand awareness

   New competition has reduced market share to about 40%

## 3 Identify Several Markets

1. Understanding the company growth climate and the current markets can help you to decide on where to focus your energy.
2. Use the following methods to identify markets of interest.

   XYZ Camera Products has identified several potential markets

   1. People who want to record high energy collisions such as automobile accidents (insurance companies)

   2. Low end animation hobbyists who want to create their own animated movies from the computer or from stop motion techniques.

   3. Low end hobbyists who want to film high speed events and play back in slow motion.

## Method #1

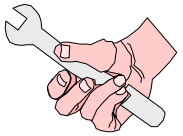
---

### Recognized Markets

---

For recognized markets, usually a problem is discovered and you work backwards to clarify the market

### Personal or Customer Irritants



Your product has to be removed every 8 months

1. Identify a problem that you or your customer has

   An oil change is required every 3000 miles

2. What job or task is associated with this irritant?

   Maintaining the car

3. What group of people are trying to get this job done?

   All car owners

4. Can this group that do the same job be broken into groups with different objectives?

   All car owners and long haul truckers

# Method #2

---

Recognized Customers

**But**

Unrecognized Jobs

---

Observe

<u>then</u>

Interview

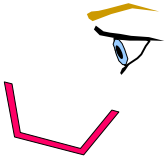
## Observe a Product at Rest

1. Pick a product that you would like to improve.

Pet Water Bowl

2. If the system exists, carefully look the entire system over.
   - Note how it is constructed and what processes were likely used to construct it.

Most water bowls are constructed from durable plastic materials--most likely injection molded



   - If there are known problems, observe the parts of the system that are associated with this problem

## Observe The System in Use

- **Watch people** using the system. If possible, watch them in ways that will not influence how they use the system. Look for instances where the users are using the product for a job that is difficult or clumsy to do. **Note unexpected behaviors**

During Summer some owners fill large buckets of water each day

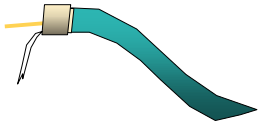
- Observe the system in use by **Experts.** Often the greatest experts are **Lead Users**. Lead users are people who have an intense interest in the use of these systems. Very often these people have handicaps which make use of the system imperative.

Separate Example: Watch deaf people using video communication

- If the system does not exist, try to create a situation or role play ways in which people attempt to meet this need

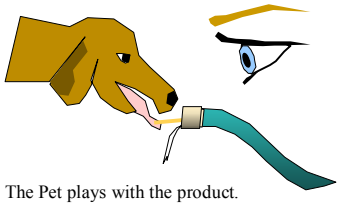
## Observe Competing Systems in Use

1. Identify competing systems (what the user would be using if the system in question were not available)



A product exists which is comprised of a valve operated by a rod which protrudes from the nozzle. The pet moves the rod and water comes out.

2. **Watch people** using the competing systems. If possible, watch them in ways that will not influence how they use the system. **Note unexpected behaviors.**



The Pet plays with the product. There appears to be an additional benefit

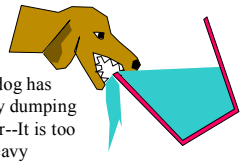
## Interview Users

1. Interview people who use the system **after** observing. Ask about **unexpected behaviors** that you observed.

Why do you fill large buckets of water each day?

Answer: The water seems cleaner for longer

- What do you use the system for? (What **job** have you hired this product to do?)



The dog has difficulty dumping the water--It is too heavy

- Under what conditions do you use the system?
- Do you use the system for unusual purposes or jobs?
- What would you use if you were not using this product or process? What are the **competing objects** that perform this job? This is the real competition. (If nothing else competes, then you are competing against non-consumption).

# Method # 3

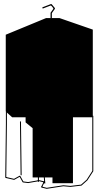
---

Unrecognized Markets
Because
Products or Services are
Out of Reach

## High Capital Costs

$$

1. Identify a high-cost product, service or activity that is expensive because it requires a high capital expenditure for equipment, office space, land, etc.



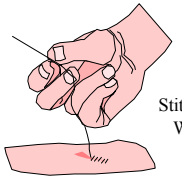
Dry Cleaning

2. What are the **jobs** that this product or service is hired to do?
    - Clean soiled clothing that cannot be washed in a washer (wool, etc)
    - Provide crisp and starched clothing to impress business associates, dates, etc.
3. What groups of people are excluded from doing this activity or job but would likely do it if it were foolproof and did not require large expenditures of capital?
    - Many middle class dry clean-their clothes less often then they would like, due to the perceived high costs.
3. Can these groups be broken into further groups with different objectives and jobs?
    - Dating age youth--Dating age adults--Professionals seeking advancement--Church goers--Club members.

## Complex Jobs (Needs an Expert)

??

1. Identify a complex process which requires an expert with specialized knowledge to perform.
2. Explain this complex process in terms of a job that this expert is hired to do?



Stitch Up a Wound

    - Close a deep, but not life threatening wound so that little scaring is left and so that there is little concern for infection.

3. What groups of people exclude themselves from doing this job but would likely perform it if there was a **simple and foolproof** way to get it done?
    - School nurses, family members, Backpackers, Company medical people, EMTs
4. Can these groups be broken into further groups with different objectives?
    - The backpacker may only want to fix the wound well enough to get back home.
    - The school nurse may need to perform this on low income children and may want to do a good job so that a doctor is not required
    - An EMT may have time to quickly fix a wound, or may fix it en-route.
5. Additionally consider large groups of people that may be easily confused such as the elderly, or youth, or people who would normally have difficulty performing the task due to common handicaps which make the job relatively complex.

## Very Inconvenient Jobs

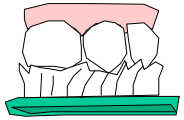
1. Identify any job
2. Identify situations in which a job or task is inconvenient but best performed immediately.
    - While on the move. (Typical equipment is not portable)
        - While riding a bike
        - While walking
        - While riding the b us
        - While driving
        - While on an airplane
        - While jogging
    - Inaccessible environment. (Typically you can't get to it without a lot of work removing other objects)
    - Very time consuming
    - Job needs to be done remotely (Typical equipment requires lots of links)

Checking on a Pet While Away

    - In public where it is embarrassing. (Typical equipment or process is visible to those around you).
        - Office situations
        - Crowds
        - Market
        - At sports events
        - While making an arrest
    - While your hands are full of other things. (Typical operation requires hands)
    - During Combat (typical equipment requires relaxed conditions).
2. What groups of people exclude themselves from doing this job but would likely perform it if it was **no longer inconvenient**?
3. Can these groups be broken into further groups with different objectives?

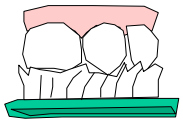
## Groups Unable to Perform Common Jobs

1. Identify any **common** job



Brushing Your Teeth

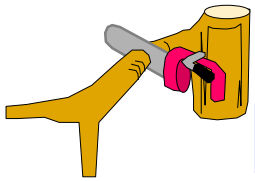
2. What groups of people exclude themselves from doing this job because they are handicapped compared to the average population, but would likely perform it themselves if it was not so difficult?
   - Elderly
     - Arthritic
     - Impaired memory
     - Impaired movement
   - Children
   - Physically Handicapped
     - Missing limbs
     - Paralyzed
     - Blind
     - Deaf
   - Chronically Ill
   - Mentally Handicapped



These groups of people have trouble:
- Small Children
- The paralyzed
- Missing Hands
- Mentally Handicapped

## Dangerous Jobs

1. Pick any job that is dangerous.



Pruning High Limbs

2. What groups of people exclude themselves from doing this job at all,or doing it as often as it should be done. (They may delay it until others are compelled to do it or until conditions become unbearable. They may delay it until someone is hired to perform the job). These people would likely perform it themselves if it was no longer dangerous?

Almost everyone excludes themselves

3. What types of **recreational activities** are dangerous? Consider simulating the job (Video games, etc).
   - Sky diving
   - Ski jumping
   - Racing
   - Bull fighting

4. Can these groups be broken into further groups with different objectives?

## Jobs in Harsh Environments

1. Identify any job.
2. Identify **environments** in which this job or task is currently impossible to perform.
   - Under water (typical equipment is not waterproof)
   - In an aircraft or spacecraft
   - During a transportation accident
   - In the wilderness
   - In the desert heat
   - In an explosive environment
   - In a smoke filled room
   - In the dark
   - In a storm
   - In high winds
   - In a fire
   - In a high noise environment
   - In remote isolation

Take a picture during an accident

3. What groups of people exclude themselves from doing this job, but would likely perform it if it was no longer in a harsh environment?

Insurance Agencies

4. Can these groups be broken into further groups with different objectives?

# Method # 4

## Unrecognized Markets

## Completely New Jobs

### 1 Identify a New Situation

Most completely new Jobs come from situations that are new . Pick one of the following situations.

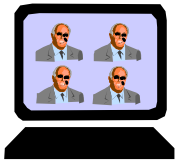
- New Product
- New Recreation or Sport
- New Vocation
- New Entertainment
- New form of Socialization
- New type of Rejuvenation
- New form of Transportation
- New form of grooming
- New form of Health Care
- New Food
- New Plant

New Situation: Digital Pictures

### 2 Identify a New Job Related to the Situation

Pick one of the following jobs and relate it to the new situation from step #1

- Protect other objects from
- Recreate with
- Enjoy with
- Operate
- Protect
- Transport
- Install or plant
- Make secure
- Store
- Organize
- Refurbish or Fix
- Maintain
- Prepare or Cook
- Dismantle
- Dispose of
- Measure
- Educate
- Assemble
- Communicate
- Search For



New Job: Preserving Digital Pictures

There is a huge need here that is not being met. As time has gone on, information has a shorter and shorter life. This is not necessarily due to the life of the media itself, but rather the technology that retrieves the data has a very short life.

### 3 Identify Alternative Markets

Consider Other Industries that might be interested in doing this Job. These other industries may be even more interesting than what you start with.

Examples of other markets that may also have this need are:

- Public Records
- Medical Information
- Crime Evidence
- Copies of Works of Art

# Method # 5

---

## Recognized & Unrecognized Markets

---

## A Product in Search of a Market

### Serendipitous Discoveries

1. A substance or physical phenomenon is developed which has unusual properties. The effect was unexpected. This discovery may have been made by you or others.

Wow, What can I do with this stuff?

2. Describe the new product in terms of general functions that it can perform

It is sticky. It can adhere objects together

3. Does it allow for Adjustability of the main function?

The tackiness can be adjusted for different tasks

4. Describe the virtual product in terms of its function and jobs that it can do
5. What groups of people cannot currently get this job done?
6. Can these groups be broken into further groups with different objectives

### Lemonade from Lemons

1. Pick a product which delivers a function with a new physical phenomena, yet has not caught on.

An Electric Car

2. Make a list of **negative attributes**.


1. Low Acceleration
2. Low Driving Range

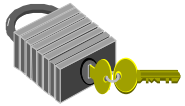
3. Brainstorm situations in which the **negative attributes are actually considered an asset** or at least neutral.

**Teen Drivers**

The car can be modified to give other attributes that allow teens to perform other jobs such as interesting horn sounds or car styling

### ASIT Sacrifice Tool

1. Pick a product or process

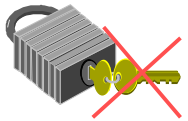


A Lock

2. Break down the product or process into individual parts. List by importance
   - Clasp
   - Keys
   - Body

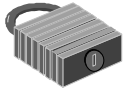
3. Pick one of these parts (preferably one of the more important ones) and eliminate it. This is the "Virtual Product"

A Lock without keys?



4. What people never require the function that the missing part delivers?
   - A person who wants to lock something up and never release it again.

5. When do objects that are normally served by the missing object not require the service?
   - When locking together objects that never need to be taken apart
   - In emergencies
6. When is the function not required?
7. When is it appropriate to look like the part is existing, but only a fake part is in place?



A fake lock?

8. Define the market: A group of people which require the job that this product performs.

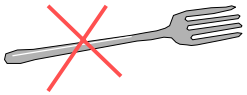
## ASIT Parasite Tool

1. Pick a product or process

A Fork

2.Break down the product or process into individual parts. List by importance
   - •Tines
   - •Handle

3. Pick one of the parts (preferably one of the more important ones) and eliminate it.



The Handle

4. Find objects in the environment with similarities to the chosen object

A Spoon

4. One of these objects takes over the function of the missing part. This is the "Virtual Product"

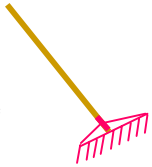
A spoon with a Fork Parasite

5. Look for natural synergies between the remaining parts.
6. Define the market: A group of people which require the job that this product performs.

Backpackers

## ASIT Unification Tool

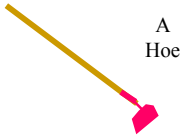
1. Pick a product or process



A Rake

2. What jobs are this product used for?
   - •Collecting debris
   - •Moving earth

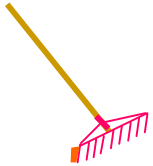
3. List objects in the environment associated with the job. Take special note of objects with similar functions (operate on the same objects).



A Hoe

4. The "Virtual Product" takes over all or part of the objects functions. This is not simply a combining of products. Look for good "convergence":
   - • One of the two original products should be "invisible"
   - • There should be no compromise in the original functions.

A small plate is added to the tines



A Rake-Hoe

5. Define a market: Who wants to perform this job and what are their objectives.

Home Gardner

## Special Case: Competing Objects

1. Pick a product

A PDA

2. Identify the Job that the product does.

Organizes Information

3. Identify other objects or processes that seek to provide the same job or functions. These objects may not be obvious. These are the competing systems. (The true competition)

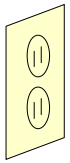
A photo album competes

4. Combine the objects. The virtual product takes over all or part of these objects functions. Identify synergies

PDA organizes Pictures of Business Contacts. May also take a picture

## Special Case of Unification: Absorb the Anti-Function

1. Identify a product



Electrical
Wall Socket
Plug

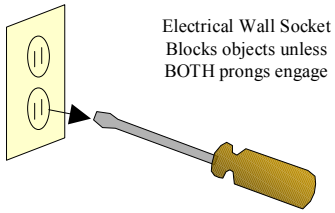
2. Identify its function

Position electrical plugs
and conduct electricity

3 Identify the Anti-function

Disengage the Plug

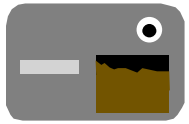
4. The baseline object takes over the anti-function? This is the virtual product.



Electrical Wall Socket
Blocks objects unless
BOTH prongs engage

## ASIT Multiplication Tool

1. Pick a product

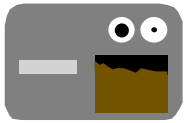


A Pencil
Sharpener

2. Make a list of the parts of the product or process. List by importance.

- Sharpening Mechanism
- Waste bin
- Motor

3. Pick one of the parts and add a second part which is somehow different from the first part. This is the "Virtual Product"



A Pencil Sharpener with an
extra large Sharpening
mechanism for crayons

4. Consider different configurations
   - Consider different times that the two parts will be manifest
   - Consider multiples other than just two
   - Consider making the two parts interact in some new way.

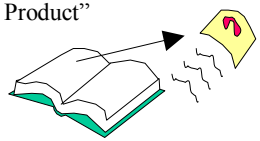
## ASIT Division Tool

1. Pick a product.

A
Book

2. Make a list of the parts of the product or process. List by importance
   - Words
   - Illustrations
   - Cover
   - Pages

3. Pick one of the parts and separate it away from the others, allowing a new organization. This is the "Virtual Product"



Move the
Illustrations
and Text

4. Consider different versions of the virtual product.
   - Consider different configurations or locations that the extracted part may be recombined

     Combined only when required

   - Consider ways that the extracted part may exist away from the main parts

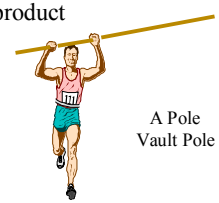
     Exists in a data base, may be used by several texts

   - Consider recombining with the main group but with the extracted part un-matching.

     Illustration covers
     the book

## ASIT Breaking Symmetry Tool

1. Pick a product



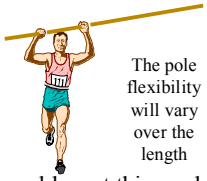
A Pole Vault Pole

2. Make a list of the main characteristics

1. Length
2. Flexibility
3. Balance

3. Consider the following ways in which we can make a part non-symmetric (This is similar to different methods for resolving contradictions)
   - Space Dimensions
   - Time Dimensions
   - User Dimensions
   - Environmental Dimensions
   - Group Dimensions
   - Characteristic dimensions

4. Pick one of the main characteristics and allow it to vary in one of the dimensions. This is the virtual product. For example:
   - Flexibility will change with time
   - Size will change with location



The pole flexibility will vary over the length

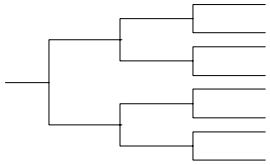
5. Who would want this product?

# Pick the Market Segments the System will Serve

## Segment Markets by Objectives and Jobs

1. Identify the group of people

People researching their family history



2. Identify the job

Preserving the history, including pictures, for further generations

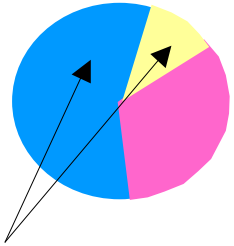
3. Identify any special condition under which the job must be done

The data is volatile (Integrity of stored data must be guaranteed)

4. Identify if this is part of a larger objective

Tying families together or making medical pedigrees

## Pick Market Segments Your System will Serve



1. Pick one or two market segments that your system will serve. If possible, focus on the largest group in which the competition is expected to be irrelevant.

2. If the capability curve of a low-end disruptive market is catching up with market demand in a market that you currently serve, consider reducing the capabilities of the product and moving to the new disruptive technology.

3. If the market already exists, and you are not already in the business, consider another market.

4. Look for markets where the customer has nothing. (New Markets) Then you are competing against non consumption. It is easy to satisfy such markets with products that under-perform (the common beginning state of most new products) since they have nothing to compare it to.