

# The next 55 minutes:

- **Topics** (*time dependant*)
  - Ideality
  - Resources
  - Functional Thinking / Library
  - Separation Principles
  - Trimming Technique
  - Inventive Principles

- **Q&A anytime!**



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[www.c2c-solutions.com](http://www.c2c-solutions.com)

*(14 minute video on home page)*



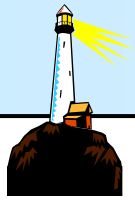
# Ideality and the Ideal System

*"Begin with the end in mind"*

*Dr. Stephen R Covey:*

*"Think of the end before the beginning"*

*Leonardo da Vinci:*

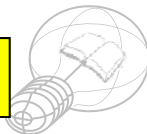


# Ideality Defined

- Ideality is a ratio of the sum of the Useful Functions divided by the sum of the Harmful Effects.
  - Every system generate useful functions and harmful effects.
  - Useful Functions are the desirable "intentions" of the system.
  - Harmful Effects are the undesirable effects of the system such as any costs, pollution, excess heat, any dangers, energy consumption, etc.

	Classics TRIZ Formula	Classics VA/VE Formula	Leading Innovation Software	
Value & Ideality =	$\frac{\Sigma UF}{\Sigma HE}$	$\frac{F}{C}$	$\frac{F^2}{P + C}$	<-- Good Stuff
				<-- Bad Stuff

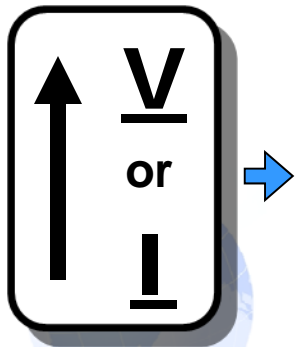
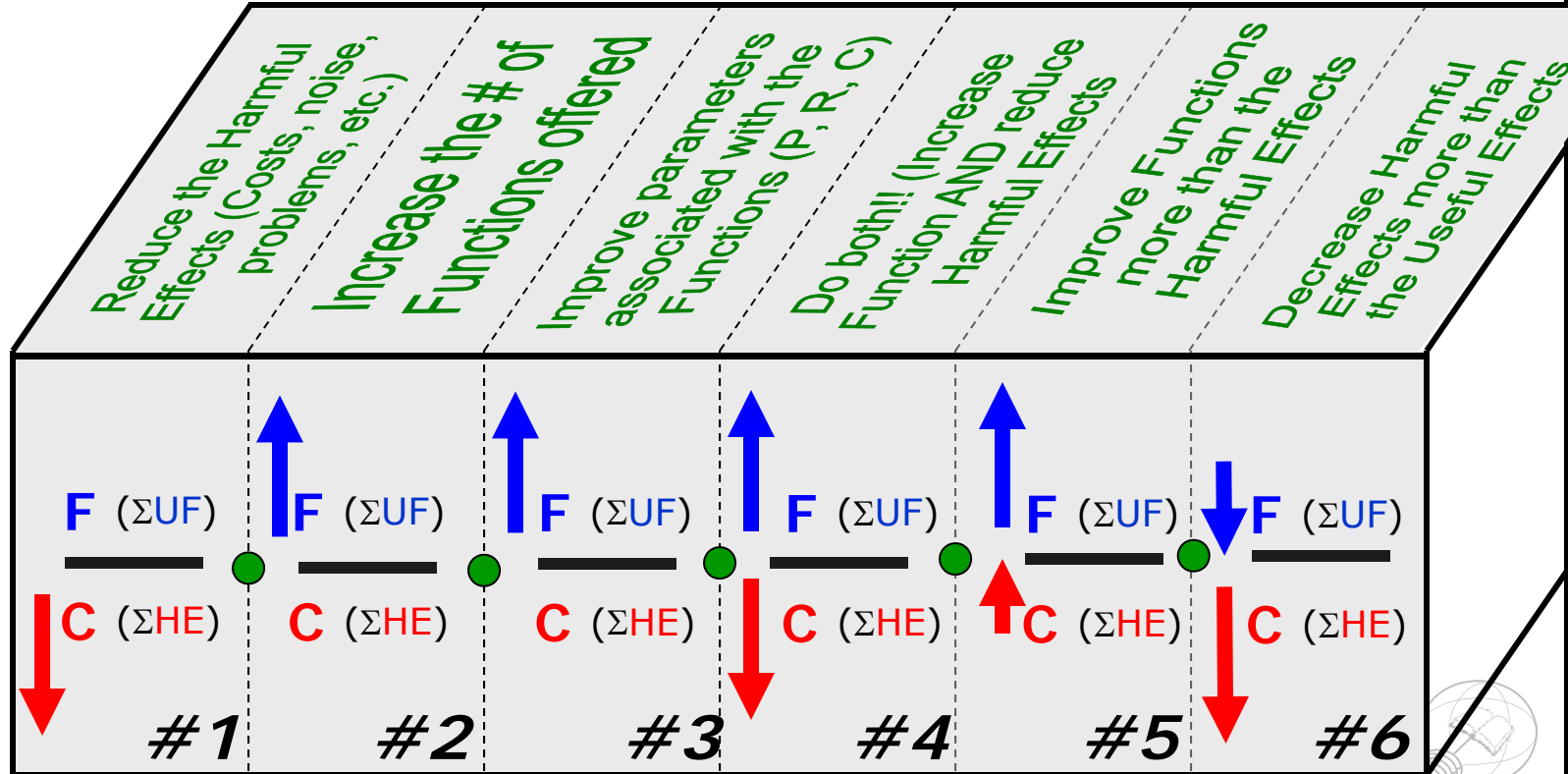
**Given the above equations, what is the "Ideal System"**



# Improving Value & Ideality:

How many different ways are there to Improve Value and Ideality?

Classics <u>V</u> alue Formula	$\frac{F}{C}$	=	Classics <u>I</u> deality Formula	$\frac{\sum UF}{\sum HE}$
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# Improving Ideality – Example Projector & Screen



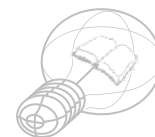
***What does the  
Ideal Screen look like?***



***What does an  
Ideal Toilet look like?***



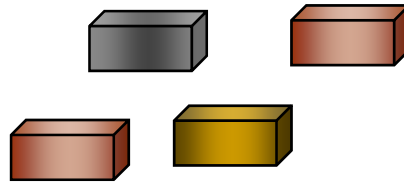
***What does the  
Ideal Projector  
look like?***



# Classic Resource Example

(Testing Alloys for Acid Resistance)

Container  
corrodes after  
only a few tests  
and is expensive  
to replace. What  
can we do?



**Container with Acid  
& Samples for testing**

**Solution**

# The Use of Resources

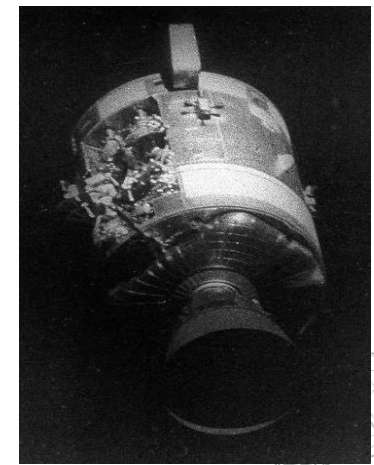
(Thinking “inside the box” to solve problems  
and Improve Ideality!)

# The Use of "Resources"

- What do the 3 men who escaped from Alcatraz Island, Tom Hanks in the Castaway, the professor on Gilligan's Island, Jackie Chan, MacGyver, and the Apollo 13 crew all have in common?

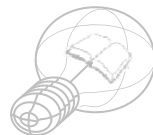


What do they have in common?



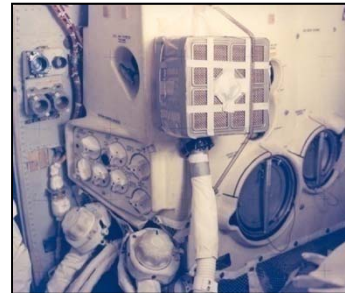


- A Resource is “anything” available in your **(System)** or its environmental surroundings **(Supersystem)** that has useful “properties” and may be able to solve a problem or improve your situation.
  - Think “Inside the box”!
  - Proactively look for latent, free, or inexpensive resources you may be available to exploit.
    - Note: Typically, the more mature your system, the less useful resources typically exist.
- **Two** “states” of resources exist in **5** general categories:
  - State 1: Readily Available Resources – Resources that can be used in their existing state. (Easily recognized)
  - State 2: Derived Resources – Resources that need some transformation before they can be used.



# 5 Resource Categories

- **Five** Main Categories of TRIZ Resources to consider:
  - **1 of 5. Substance** - Any physical parts, systems, or material, or property from which the system and/or its surroundings are composed of.
    - Other systems, adjacent systems or system elements, Other Super-system Elements, Substance properties, Waste products, Raw Materials, People or Money, Computers, Information, Etc.



# 5 Resource Categories

## • **Five** Main Categories of TRIZ Resources to consider: (cont.)

– **2 of 5. Field** - Any type of energy, action, or force in the system or the surrounding environment.

- Mechanical Forces, Electrical or Electromagnetic forces,
- Gravity, Thermal, (*Heat from a car engine keeps passengers warm.*)
- Magnetic, Nuclear, or Chemical forces,
- Motion, flow, or other Kinetic Energy in system, (*Regenerative Breaking, self winding watch*)
- Energy Differentials (*Temperature, Voltage*)
- Etc.



Why did Edison's guests complain about his turnstile gate?



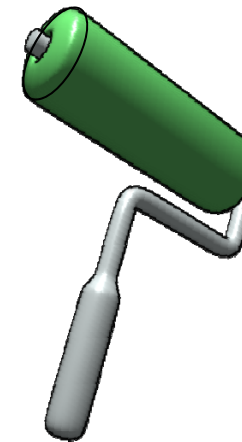
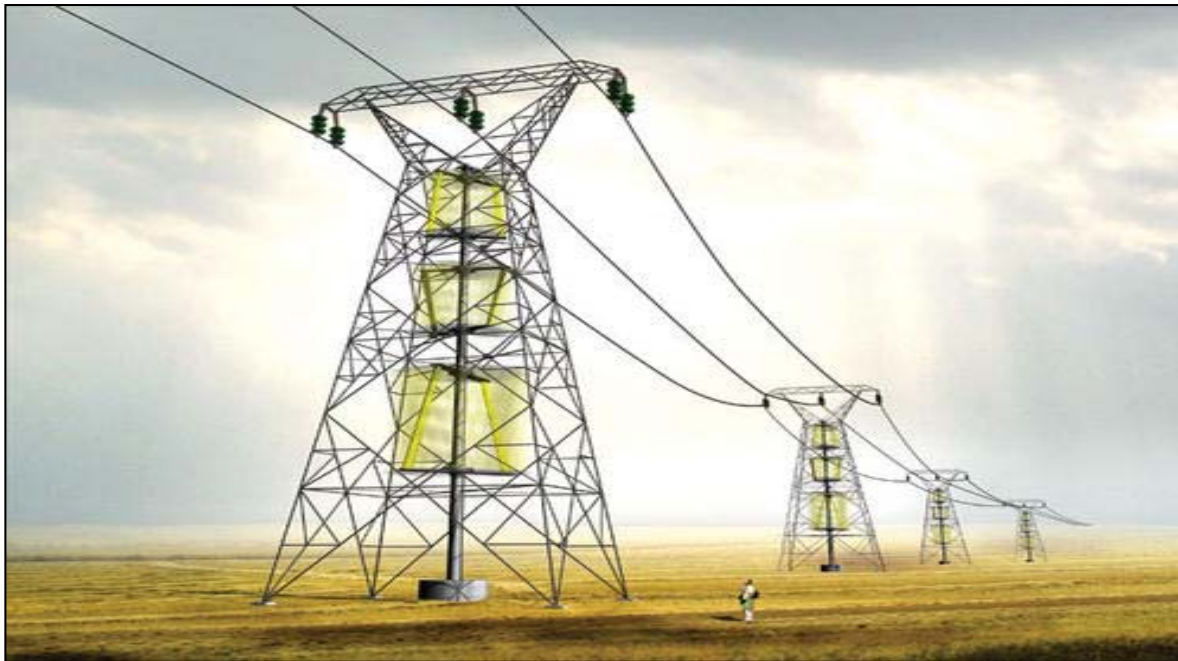
Tub or Garden?

Example:  
Brushing teeth  
& Rinsing  
mouth . . .



- **Five** Main Categories of TRIZ Resources to consider: (cont.)

- **4 of 5. Space** – Any unoccupied or unused space in a system or its surroundings that can be used.
  - Between elements, Inside elements (nesting), in other dimensions, In place of an unnecessary elements, Etc.



The "Paint Runner"

http://function.creax.com/

File Edit View Favorites Tools Help

Search

Facebook Listen to music Amazon YouTube 41° Troy, MI CNN Fun Games Celebrity Options

Favorites Seminars & Education Google Docs - Online doc... Eyeglass Store Online Sho... How To Create Websites t... The Ideas Accelerator This is the Free Video and ...

CREAX - Function Database

# CREAX + Function Database

Function Database **Attribute Database**

Search Function:

Destroys

Solid Liquid Gas Field GO

- Search Found 19 Results
- Acoustic Shock
  - Alexandrov Effect
  - Bio-destruction
  - Burning
  - Cavitation
  - Coherent light
  - Cryolysis
  - Dissolving
  - Explosion
  - Hydrogenation
  - Hyperthermia
  - Optohydraulic Effect
  - Oxidation
  - Ozone
  - Photo-oxidation
  - Radioactivity
  - Resonance
  - Ultrasonics

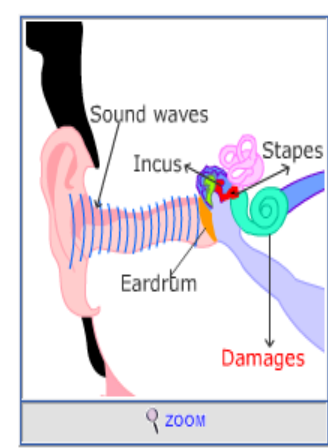
## Acoustic Shock

**Function:** Destroys

**State:** Solid

**Acoustic Shock** is any temporary or permanent disturbance to the functioning of the ear or of the nervous system, which may be caused by a telephone or earphones, by a sudden sharp rise in the acoustic pressure produced by it.

Pressure on the hair cells and nerves in the inner ear from high-pitched signals can cause discomfort and pain, temporary hearing loss, tinnitus, or permanent hearing loss.



Do you know another way to destroy a solid?

Name :

Email :

URL :

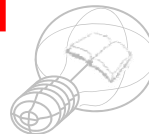
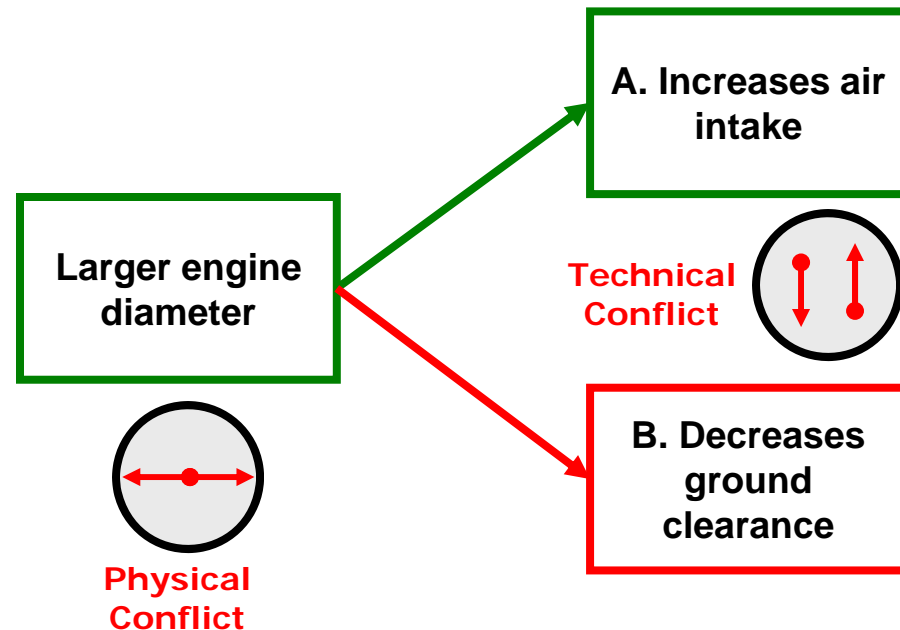


# Contradiction Example

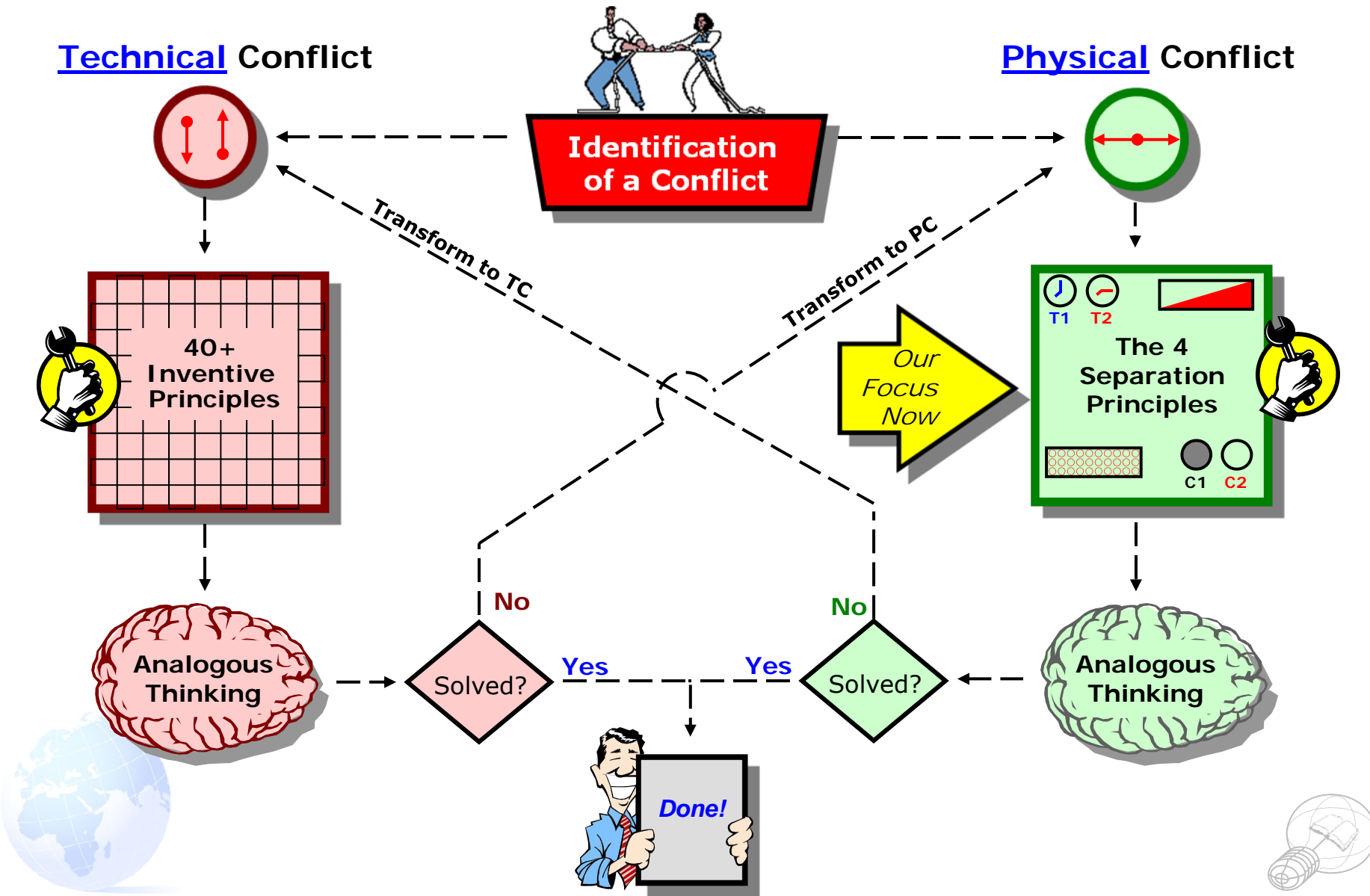
- **Boeing wanted larger engines for more air flow.**
  - Achieved in the past by increasing the diameter of the engine.
  - Problem: Larger air intake on the engine would reduce the ground clearance to unacceptable levels.



**Boeing  
737**



# Conflict Resolution Algorithm

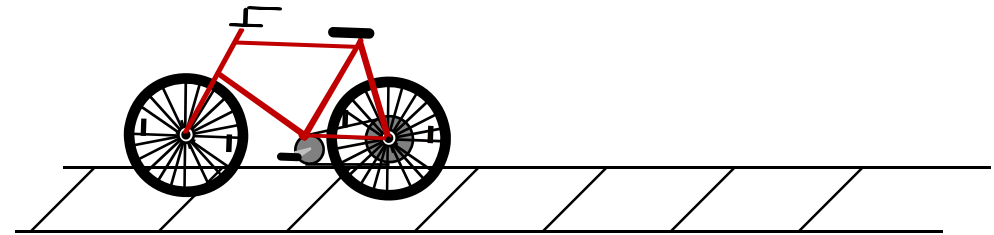


# Bike Performance

## "Step 1" Example



Technical Contradiction: **Having lots of traction often hurts the rolling resistance.**



There is a "Technical Conflict" between Traction & Rolling Resistance. Improving traction can hurt rolling the bike's rolling resistance.

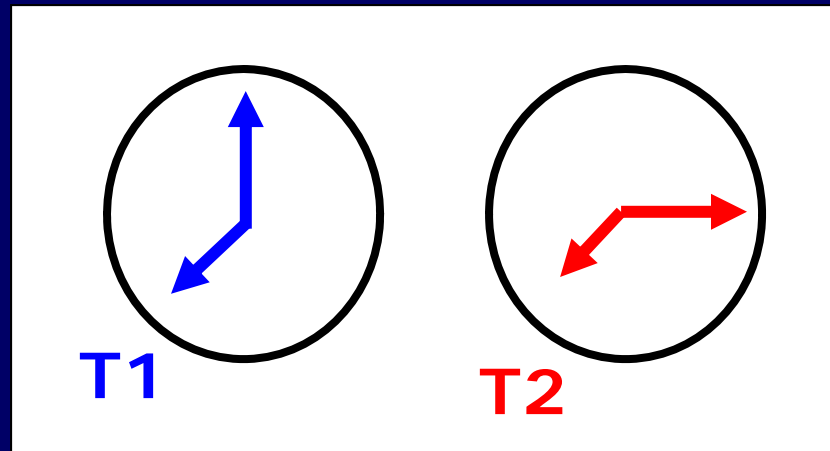
Is there a parameter or characteristic, that in 2 opposite states would accomplish both ?

(Lots of traction & great rolling resistance)



(1 of 4)

# Separation in Time



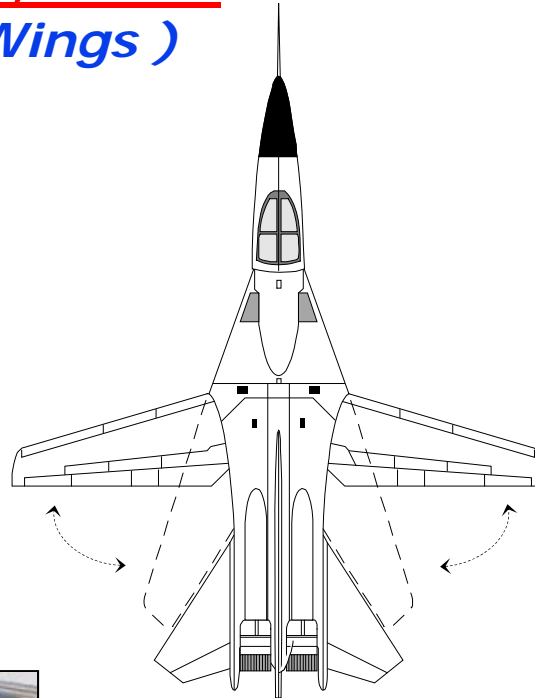
# Separation in TIME Examples:

A parameter or element of a system is present or absent at different times.

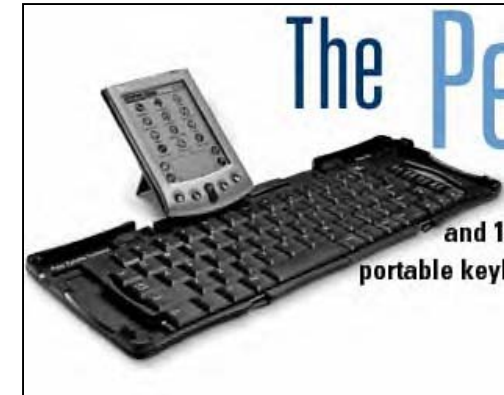
## U.S. Navy's F-14, F-111 ( Long & Short Wings )



## Cup Holder ("There & "Not There")



## PDA Keys ( Big & Small )

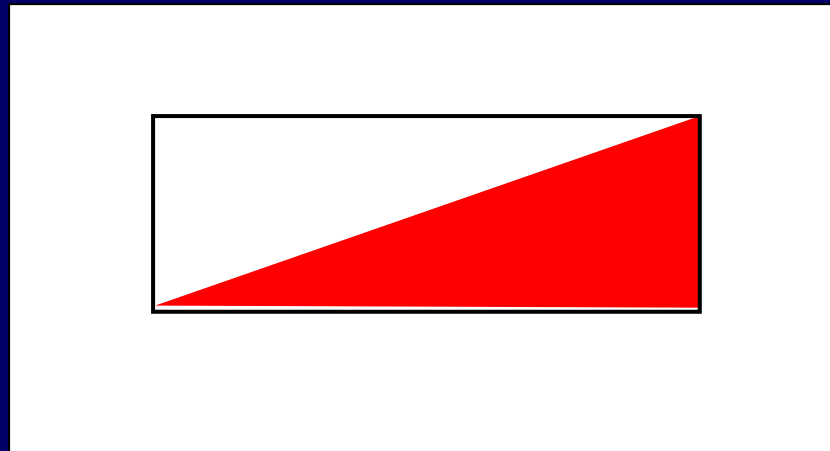


## Software Menu ( Small & Large ) Apple



(2 of 4)

# Separation in Space



# Separation in **SPACE**:

A parameter or element of a system is present or absent in different "spaces".

**Television**  
( Big & Small )



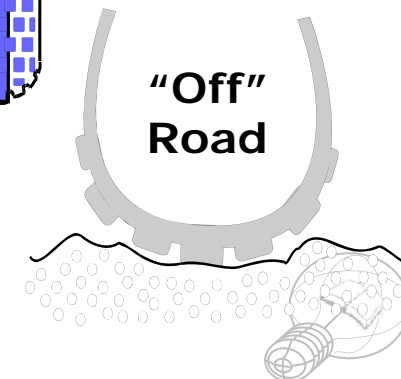
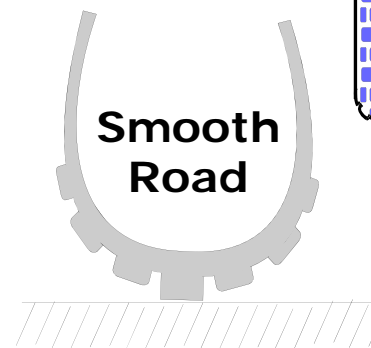
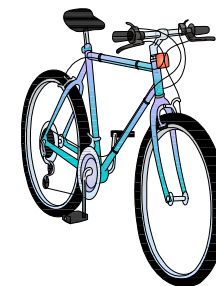
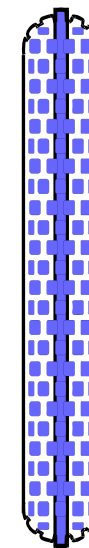
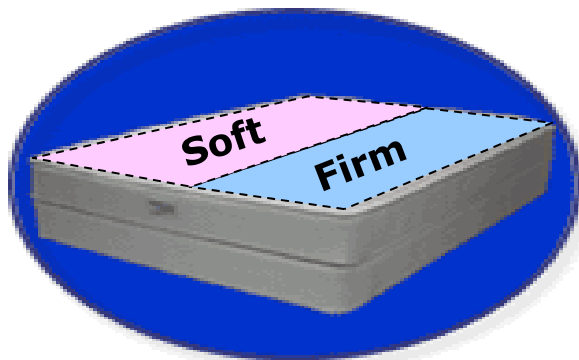
**Bifocal Lens**  
( Far & Close )



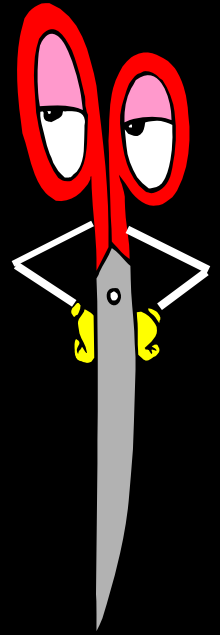
**Bike Tire**  
( Knobby & Smooth )  
( Fat & Thin )



**Bed**  
( Soft & Firm )



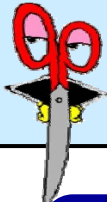
# *The Trimming Technique*



Trim any part in any system, or  
any step in any Process!

*And do this . . .*

- a) *Without impacting Customer Needs, or*
- b) *By creating a new paradigm of operation*



# The 6 Design Trimming Rules

*(You can trim any element if any of the following 6 rules can apply)*

## Rule #1

- **The function can be performed or delivered by other elements of the system or super system.** *(Leverage close by resources (systems/parts/elements) to incorporate the trimmed parts' function)*

## Rule #2

- **The recipient/object of the function can deliver the function itself.** *(The object of the function delivers the function, S-A-O)*

## Rule #3

- **The recipient of the function does not need to exist.** *(There is no need for the "object" of the function)*

## Rule #4

- **The function does not need to exist.** *(Challenge the function, find a way to eliminate or get by without the function)*

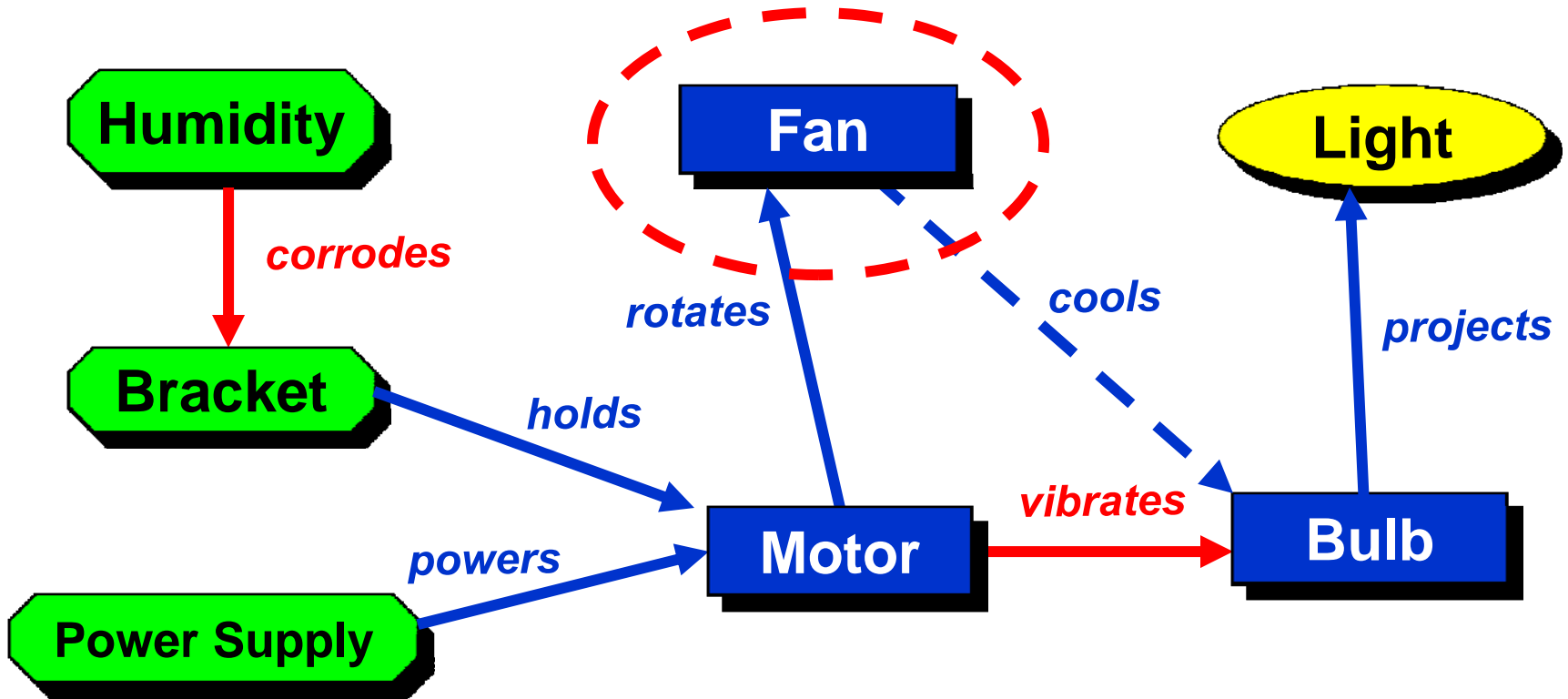
## Rule #5

- **The function is performed by a "new system/part" that has distinct advantages** *(Performance, Reliability, Convenience, or Cost)* **over the current system or part.**

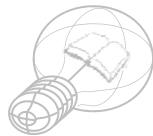
## Rule #6

- **A Niche Market can be identified for the "Trimmed Product".** *(Find a market that would benefit (or not care about) the deficiency)*

# The Trimming Technique (Product Example - projector)



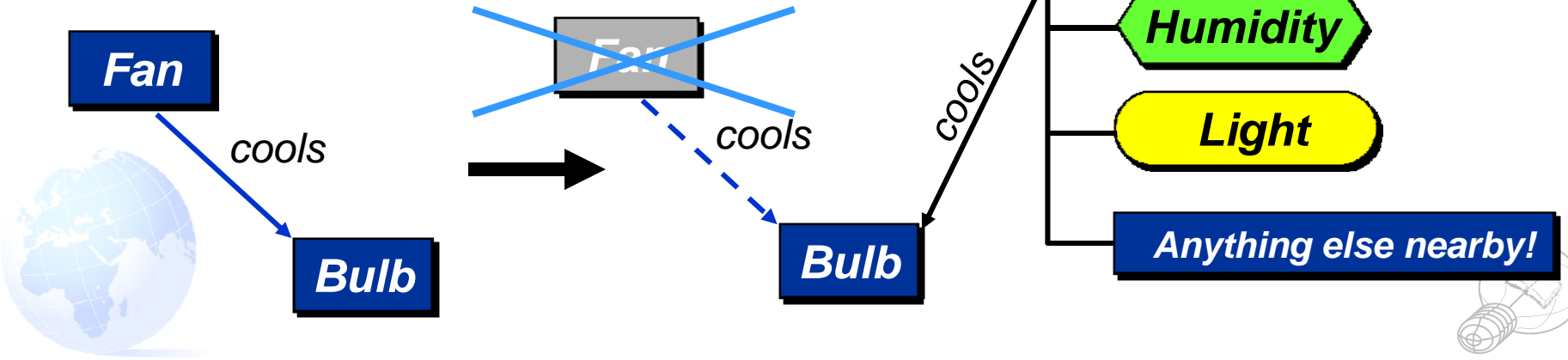
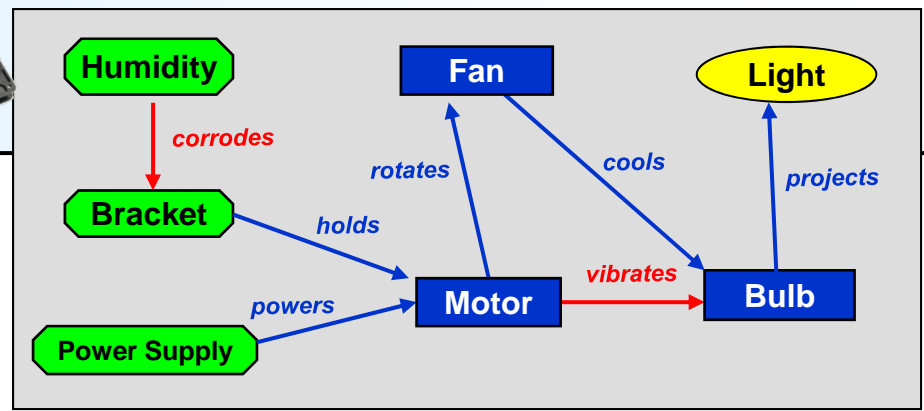
**Can we “trim” the Fan?**



# Can we trim the fan?



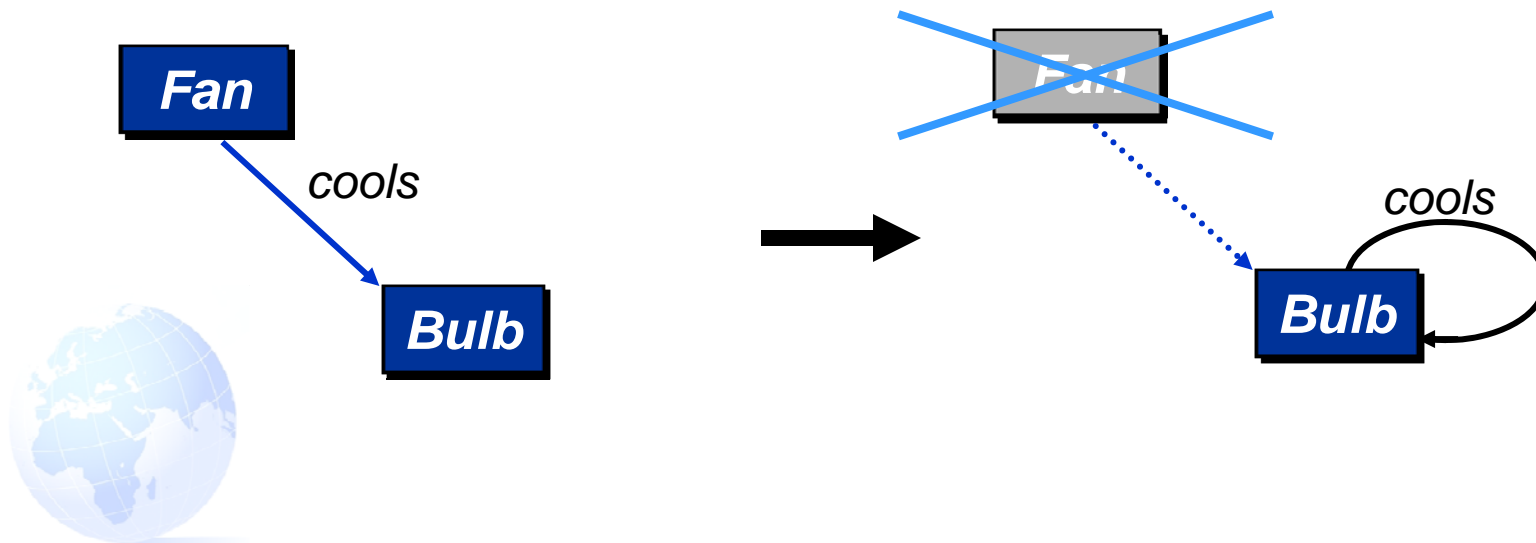
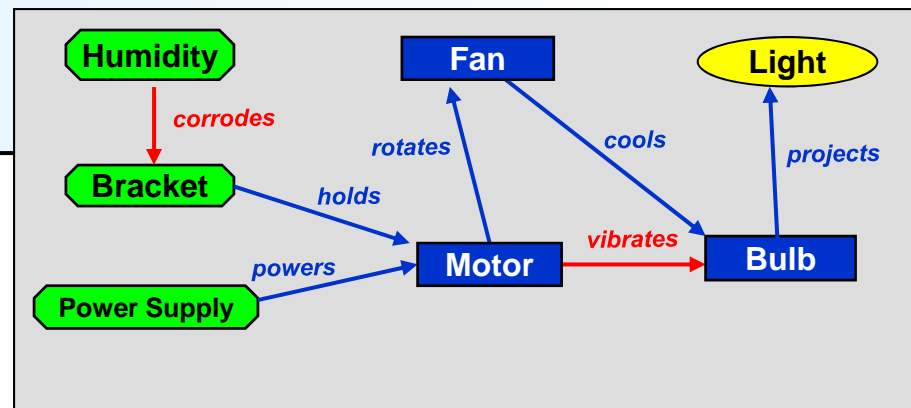
**Rule # 1)** *The function can be performed or delivered by other elements of the System or Super-system.*





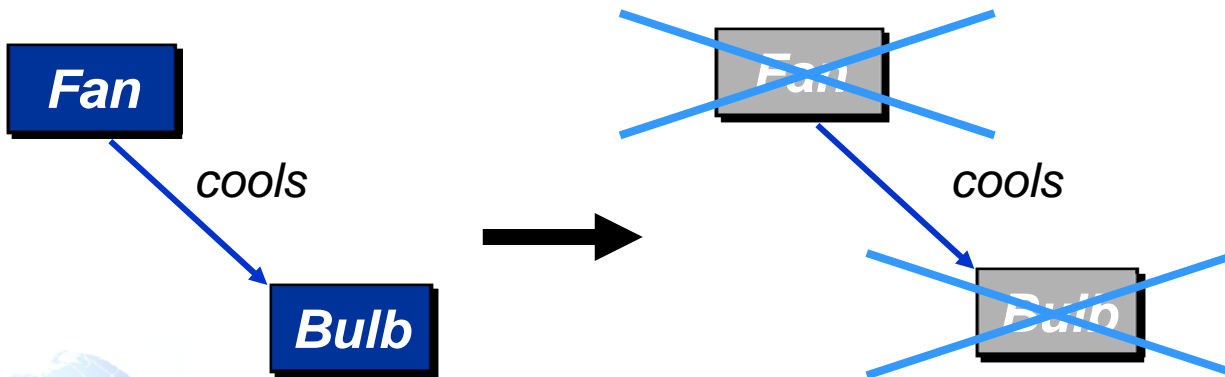
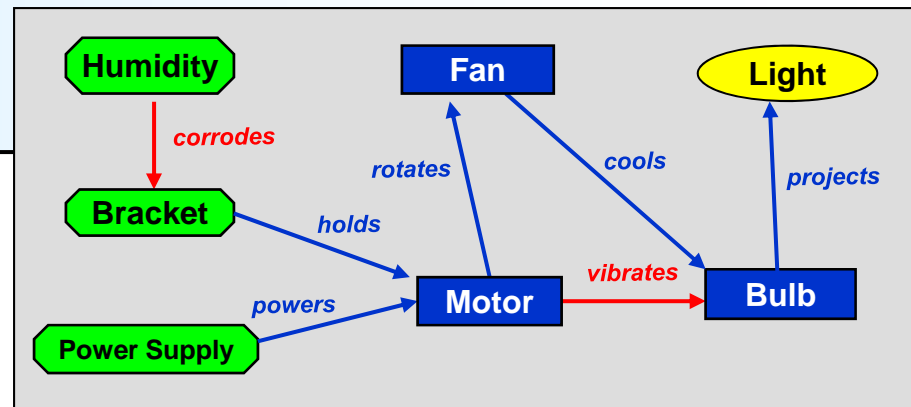
# Can we trim the fan?

**Rule # 2)** The recipient of the function can deliver the function itself. (S-A-O) The object of the function delivers the function



# Can we trim the fan?

**Rule # 3) The recipient of the function does not need to exist.**  
(There is no need for the object of the function)

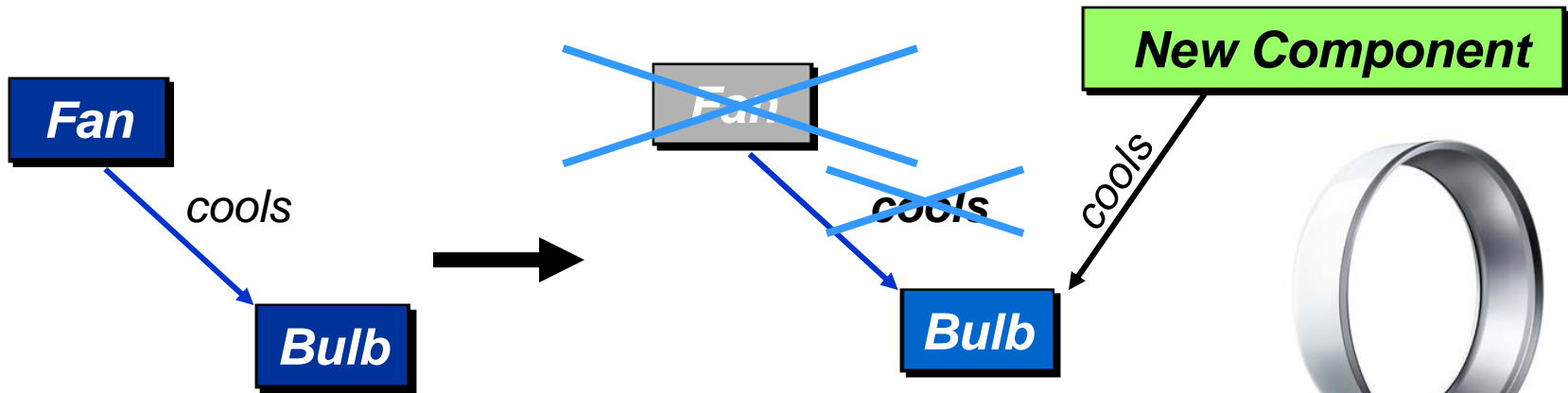
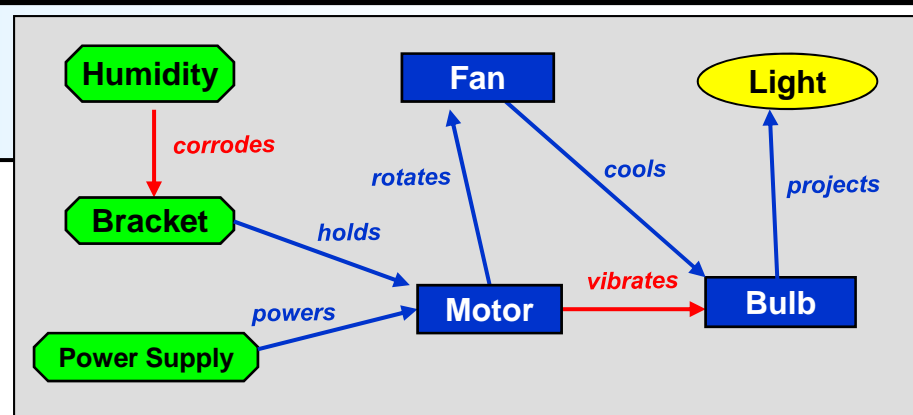


Click to remove




# Can we trim the fan?


**Rule # 5)** The function is performed by a "new system or part" that has distinct advantages over the current system or part.





***The First Innovation?*** Answer: 28400 BC





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**“Inventing is a combination of **BRAINS** and materials. The more brains you use, the less materials you need”** - Charles F. Kettering

### Consulting and Workshops for Systematic Innovation, DFSS, TRIZ, QFD, FMEA, Kano Analysis

The scrolling quotes above are all about inventive thinking, value creation, and survival, three imparitives more important now than ever. Over the past 30 years, companies all over the world have discovered that the product development process is as important as the product itself. To get right to the point, a practical, lean, and efficient front-end development process is essential for business growth, not to mention survival. We believe, whether you sell products or services, success requires three key outputs of your product development process:

- ▶ **VALUE** . . . to attracts customers,
- ▶ **QUALITY** . . . to earn respect, and
- ▶ **INNOVATION** . . .to differentiate yourself from the competition.



When project teams effectively integrate these three elements into the front end of their product development process, they will all but guarantee success. There are several well known methodologies being used that drive **Value** and manage **Quality**, but **Innovation** is far more elusive and less structured. Most organizations rely on simple brainstorming and a . . .

[Read more... ▶](#)


### Systematic Innovation - An oxymoron?

In the fall of 1993, we were first introduced to to the concept of "structured innovation" by several Russians preaching an approach to structured innovation. They had a unique theory and intriguing approach to "Inventive Problem Solving". This meeting, over 18 years ago, fueled our passion to understand innovation and inventive thinking much deeper. Our goal was to make this seemingly complicated methodology more practical for industry. Through dozens of iterations, we have refined this process into what we now call "Systematic Innovation", an 8-step process that is centered around inventive thinking and innovation. It integrates several industry best practices (technological and psychological) into a uniquely effective and efficient process for creating value for your customers.

To the right is a short video that's primary purpose is to introduce the basic concepts our 8-step innovation process. With clients on 5 continents, we offer services including training, facilitation, coaching and webinar tutorials on any or all aspects of our 8-step Systematic Innovation

### Featured Video (Systematic Innovation) HOT

It started with the study of great minds like these: (and thousands of others "not so famous", but equally brilliant inventors and problem solvers!)



00:00 / 14:58

Click the above video for an intro to our 8-Step Systematic Innovation

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