

# Radical Design Creativity and Groups

Week 4 – Lectures 7-8

Selecting the Groups

# Homework discussion

- IDEO approach
- Review products

# Your group

- Over the next 3 weeks you are to design a concept for a radical new product based on your group's product

# Creativity

Creative - Innovative - Radical

What is it?

# Definition of Creativity

- Creativity is a desired quality
- What is a creative product?
- What is this *wow* factor?
  
- There are so many characteristics to creativity
  - original, of value, novel, interesting, simple, elegant, changing conventions, surprising, not obvious, different, ...

# Definition of Creativity

- How shall we define it?
- Can we measure it?

# Creativity as a field of study

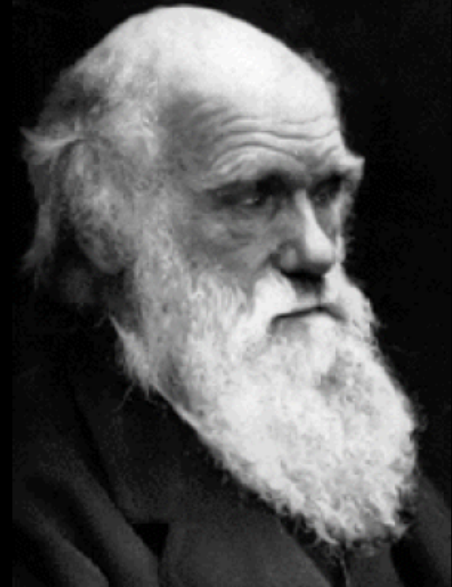
- Creativity is divine inspiration, a spark that cannot be controlled, insight happening at random times, ...
- Creative thinking is a process involving a leap that cannot be formulated, analyzed or reconstructed (the creative spark)
- Thus there is little need to investigate the creative process (NOT)
- This is the reason it took so long to start this research field

# Taxonomy of research streams

- The creative person
- The creative process
- The creative idea

“It is not the strongest of the species that survive, but the one most responsive to change”

Charles Darwin





# Creativity Techniques and Tools

- Tools began appearing for helping the creative process in the 1970s

- The CREATE Project

<http://www.diegm.uniud.it/create/index.htm>

- The Creativity and Innovation Metro Map

<http://www.m1creativity.com/tube/tube.htm>

# Creativity and Innovation

- We've seen
  - Creativity techniques (brainstorming)
  - Design techniques (IDEOs)
  - Management of creativity techniques (6 Thinking Hats)
- These deal with human aspects
- Other approaches deal with
  - Engineering innovation

# Genrikh Saulovich Altshuller and TRIZ

<http://www.altshuller.ru/world/eng/>

And

<http://www.triz.org>,  
<http://www.aitriz.org>,  
[http://\\*triz\\*.com](http://*triz*.com)

# Altshuller

October 15, 1926 - September 24, 1998

- At 15 he received his first *certificate of the authorship of invention* for an underwater device
- At 20 he developed a method for escaping from an immobilized submarine without diving gear
- Classified as a military secret he was offered employment in the patent department of the Caspian Sea Military Soviet Navy where he inspected invention proposals, helped document them, and helped others to invent
- He postulated that there must be identifiable repeated patterns or formulas underlying creative ideas and products

# The Creative Idea

- Altshuller's goal was to devise a systematic method to guide ordinary engineers toward creative solutions
- He analyzed 200,000 patents\* and technological inventions and postulated that there must be identifiable repeated patterns or formulas underlying creative ideas and products
- He identified 40 such patterns of invention which he called standard patterns

\*certificates of authorships of invention

# Standard Patterns of Invention

- This implies there is no need to look at the person nor at the process
- These can be described, predicted and controlled independently of external influences
- They consist of system dynamics that can be determined solely by the intrinsic features of products

# Altshuller Biography

- In 1950 Altshuller and Rafael Shapiro (former schoolmate) won a National Competition Award for inventing a flame and heat resistant suit
- He was soon after imprisoned for “heretical” work and inventor’s sabotage
  - in various of Siberia’s Gulags he worked on inventions based on patterns
  - released 1 1/2 years after the death of Stalin
- In 1956 the first paper written by Altshuller and Shapiro *Psychology of Inventive Creativity* was published in the *Problems of Psychology Journal*
- In 1969 Altshuller published *Algorithms of Inventing*

# TRIZ

- During the period 1956-1986, TRIZ developed and spread rapidly
- Such tools, concepts and methods as
  - the Inventive Principles
  - ARIZ
  - the course on creative imagination development (CID)
  - the Index of Sci-Fi Ideas and Situations
  - the laws of technological system evolution
  - the Life Strategy of a Creative Person (LSCP)
- 10 of Altshuller's books were published (total circulation – over 1 million copies)
- Some two hundred TRIZ centers were founded



# Inventing is Contradiction Removal via Certain Principles

- By examining a large database of his own and other people's inventions, Altshuller soon arrived at his most important observation:

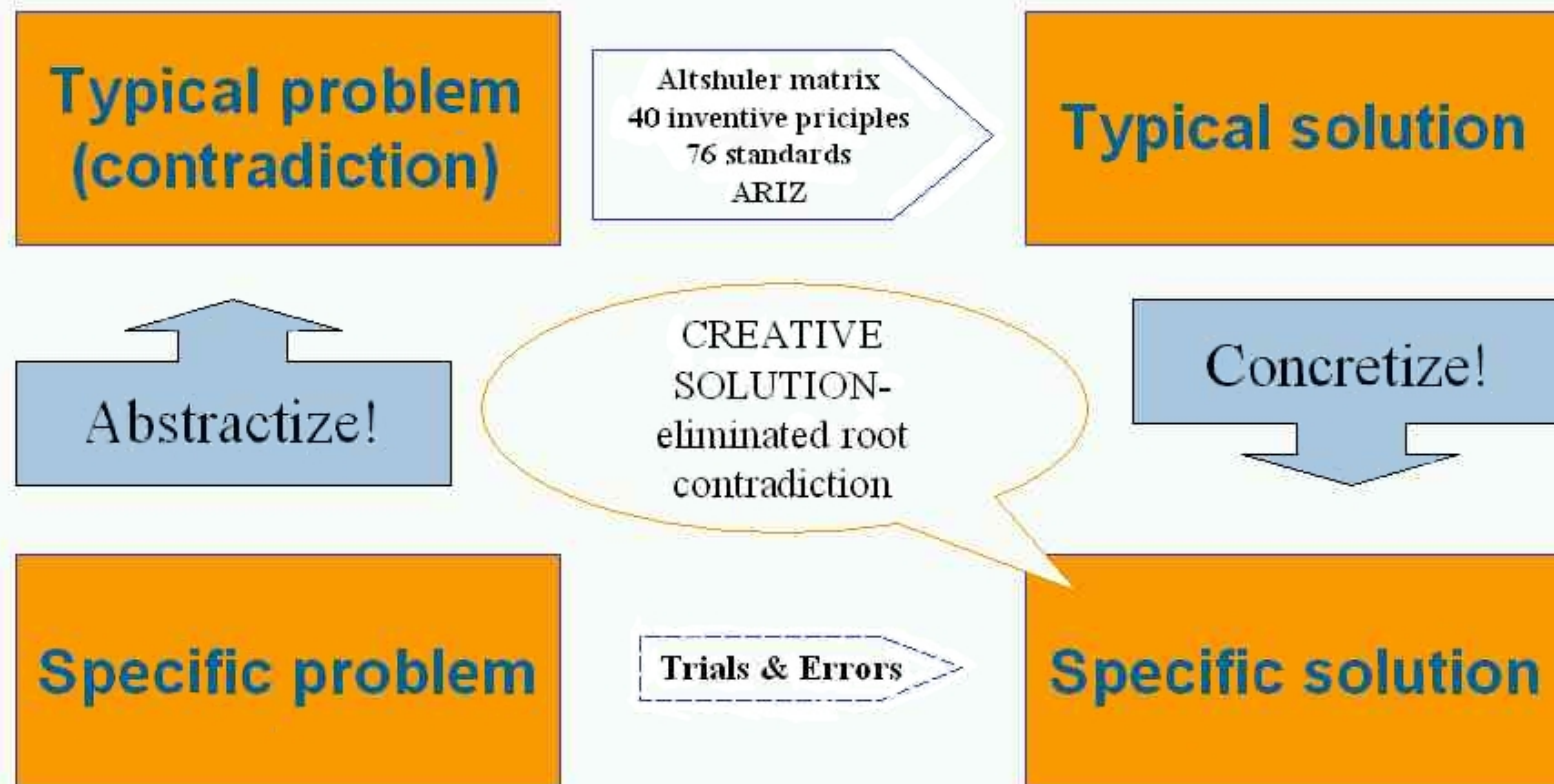
*Inventing is the removal of a technical contradiction with the help of certain principles*

- To develop a method for inventing, he argued, one must scan a large number of inventions, identify the contradictions underlying them, and formulate the principle used by the inventor for their removal
- His results are being applied to solve creative invention problems not just within all branches of engineering, but within many other technical and non-technical fields as well

# TRIZ

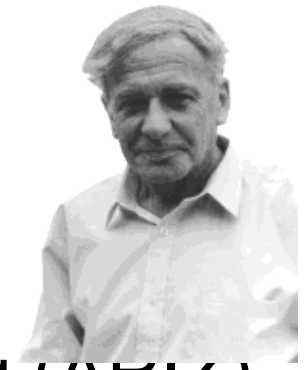
- Altschuller generalized his discoveries into 40 "principles" and placed them within a matrix
- To use TRIZ, you first find the characteristics that need to be improved in the product you're designing (*human element here*)
- The matrix then suggests a conflict resolution or principle that should be followed to solve it

# TRIZ Process



# TRIZ

- Теория решения изобретательских задач  
The theory of solving inventor's problems
  - 40 Principles of Invention
  - 76 Standard Inventive Solutions
  - Laws of Technical Systems Evolution
  - Altshuller's Contradiction Matrix
  - Algorithm of Inventive Problem Solving (ARIZ)



# TRIZ

- A number of design and engineering challenges were solved using this technique, including an airbag design for the Ford Escort, a paper output mechanism for a Hewlett-Packard ink jet printer and streamlining production changeovers at Dow
- Fortune 500 companies successfully using the TRIZ methodology
  - Ford
  - General Motors
  - Chrysler
  - Eastman Kodak
  - Exxon
  - Rockwell International
  - Procter & Gamble
  - Xerox
  - Hewlett Packard
  - Motorola

# The Creative Idea

- He developed many templates most for problem-solving
- Goldenberg & Mazursky (Creativity in Product Innovation) found that majority of successful products could be based on 5 templates

# The Creativity Templates

- Hypothesis
  - Codes are embedded in the product itself and in trends observed in its evolution
  - Those templates that are more successful and effective are likely to underlie products that survived well
- Conclusion
  - Templates may be used in the framework of creative thinking
  - The well defined sequence of operations that underlie the change between previous and current product version enables the construction of a prescribed procedure of invention

# The Creativity Templates

- The Attribute Dependency Template
- The Replacement Template
- The Displacement Template
- The Component Control Template
  
- Definitions needed: component, variable, forecast, template



# Components vs. variables

<b>Components</b>	<b>Variables</b>
Eyes	Color, sharpness of vision, time
Sugar in a cake	Weight of sugar added in mix, sweetness of cake, time
Handle and head of hammer	Length, thickness, height and weight of hammer, time
Screws	Number of, length and thickness, size of screw head, number of threads, time
Alcoholic drink	Percentage, color of drink, time
Hat	Size, color, water-repellence, time
Drinking glass	Material, color, shape, size, transparency, time
Your product	

# Operational Prescription for a Forecasting Matrix

1. Make a list of internal variables (under the manufacturer's control)
2. Make a list of external variables (not under the manufacturer's control)
3. Build a matrix in which the column variables are the internal variables and the rows all the variables
4. For each cell mark whether there is no dependency (it is in 0 mode) or there is a dependency (it is in 1 mode)

# Forecasting Matrix for Cylindrical Glass

<i>Internal</i> → <i>External Variables</i> ↓	Height	Diameter	Color	Heat Conductivity	Transparency
Height					
Diameter					
Color					
Heat Conductivity					
Transparency					
Temperature					
% alcohol, sugar, ..., in drink					
Type of drink, ...					
Time					

# Class Exercise: Forecasting Matrix for Your Product

<i>Internal →</i> <i>External Variables ↓</i>	Height	Diameter	Color	Heat Conductivity	Transparency

Group Activity – 15 minutes

# Your group

- Over the next 3 weeks you are to design a concept for a radical new product
- One requirement for TRIZ or other template approaches is to find the characteristics that you want improved or revolutionized in the product you're designing
- This is one place where IDEOs techniques can help

# Homework 3 – page 1

## 1. Learn - Competitive Product Survey

HOW: Collect, compare, and conduct evaluation of the product's competition

WHY: This is a useful way to establish functional requirements, performance standards, and other benchmarks

# Homework 3 – page 2

## 2. Look – Still Photo Survey

HOW: Follow a planned shooting script and capture pictures of specific objects, activities, etc..

WHY: The team can use this visual evidence to uncover patterns of behavior and perceptions related to a particular product or context, as well as structure and inspire design ideas

# Homework 3 – page 3

## 3. Ask – Extreme User Interviews

**HOW:** Identify individuals who are extremely familiar or completely unfamiliar with the product and ask them to evaluate their experience using it

**WHY:** These individuals are often able to highlight the key issues of the design problem and provide insights for design improvements



# Homework 3 – page 4

## 4. Try – Bodystorming

HOW: Set up a scenario and act out roles, with or without props, focusing on the intuitive responses prompted by the physical enactment

WHY: This method helps to quickly generate and test many context- and behavior-based concepts

# Homework 3 – page 5

Integrate the four topics into one describing what, how, when, where, and the results

- Learn - Competitive Product Survey
- Look – Still Photo Survey
- Ask – Extreme User Interviews
- Try – Bodystorming

You can do some others if you wish

We will discuss these in class next week

# Homework 3 – page 6

Read

1. Bubbles and balloons
2. Genrich Altshuller's brief biography  
[http://www.aitriz.org/index.php?option=com\\_content&task=view&id=12&Itemid=26](http://www.aitriz.org/index.php?option=com_content&task=view&id=12&Itemid=26)
3. 40 Inventive Principles with examples  
<http://www.triz-journal.com/archives/1997/07/b/index.html>

Check out also for reference the TRIZ homepage  
<http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/>

# Homework 4 – page 1

- Read Goldenberg and Mazursky
  - Introduction (pages 1-10)
  - Chapter 2 (pages 29-41)
  - Chapter 4 (pages 59-75)
  - Chapter 5 (pages 76-98)

# Homework 4 – page 2

- After reading Goldenberg and Mazursky build a forecasting matrix for your product
- See if you can find connections between variables that appear interesting and could potentially evolve your product