Radical Design
Creativity and Groups

Lecture 3
Selecting the Groups
The IDEO Approach

Homework discussion

- IDEO approach
- Review products

Vote

Product	Votes	Names
The theramin		
Toilets		
Smart showerhead		
Bean bags		
Razors		
Hearing aids		
Stereo Headphones		
Power efficient laptop		
Breathable insulation		
Microbe cleaning toxic waste		
The internet		
Chairs		
Multi touch		
Stereo Headphones		
Power efficient laptop		
Breathable insulation		
Microbe cleaning toxic waste		

Your group

- Over the next 3 weeks you are to design a concept for a radical new 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
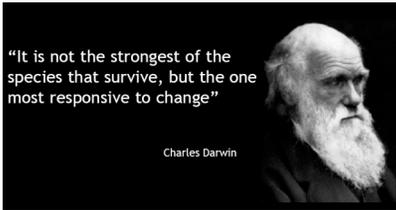
- How shall we define it?

- 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

IDEO Techniques

Working with People 1

- Approach people with courtesy
- Identify yourself, your intent, and what you are looking for
- Offer to compensate participants
- Describe how you will use this information and why it's valuable

Working with People 2

- Get permission to use the information and any photos or videos
- Keep all the information you gather confidential
- Let people know they can decline to answer questions or stop participating at any time
- Maintain a non-judgmental, relaxed, and enjoyable atmosphere

IDEO Approach

- Learn
- Look
- Ask
- Try

- The following in class exercises may change

Learn

- Cognitive Task Analysis
  - HOW: List and summarize all of the user's sensory inputs, decision points, and actions
  - WHY: This is good for understanding user's perceptual, attentional, and informational needs and to identify bottlenecks where errors may occur

Learn

- Analyze the information you've collected to identify patterns and insights
  - Activity analysis, affinity diagrams
  - Anthropomorphic analysis, character profiles
  - Cognitive task analysis, error analysis
  - Competitive product survey, flow analysis
  - Cross-cultural comparisons, historical analysis
  - Long-range forecasts, secondary research

Learn

- Long-Range Forecasts
  - HOW: write up prose scenarios that describe how social and/or technological trends might influence people's behavior and the user of a product, service, or environment
  - WHY: Predicting changes in behavior, industry, or technology can help clients understand the implications of design decisions

Learn

- Secondary Research
  - HOW: Review published articles, papers, and other pertinent documents to develop an informed point of view on the design issues
  - WHY: This is a useful way to ground observations and to develop a point of view on the state of the art

Learn

- Affinity Diagrams
  - HOW: Cluster design elements according to intuitive relationships such as similarity, dependence, proximity, etc…
  - WHY: This method is a useful way to identify connections between issues and reveal innovation opportunities

Learn – Class Activity

- Activity Analysis
  - HOW: List or represent in detail all tasks, actions, objects, performers, and interactions involved in a process
  - WHY: This is a useful way to identify and prioritize which stakeholders to interview as well as which issues to address

- Break up into your groups (15 minutes)

IDEO In Class Exercise

- Divide into groups of about 3-4
- Look around room and see
- Select an object

- Long range forecast
  - Come up with a future evolution of your object

- Draw on Whiteboard or Paper your concept

Look

- Observe people to discover what they do rather than what they say they do
  - A day in the life, fly on the wall
  - Behavioral archeology, guided tours
  - Behavioral mapping, personal inventory
  - Rapid ethnography, still photo survey
  - Social network mapping, shadowing
  - Time-lapse video

Look

- Time-Lapse Video
  - HOW: Set up a time-lapse camera to record movements in a space over an extended period of time
  - WHY: Useful for providing objective, longitudinal view of activity within a context

Look

- Social Network Mapping
  - HOW: Notice different kinds of social relationships within a user group and map the network of their interactions
  - WHY: This is a useful way to understand interpersonal and professional relationship structures within workgroups

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

Look

- Behavioral Archeology
  - HOW: Look for the evidence of people's activities inherent in the placement, wear patterns, and organization of places and things
  - WHY: This reveals how artifacts and environments figure in people's lives, highlighting aspects of their lifestyle, habits, priorities, and values

Look

- Personal Inventory
  - HOW: Document the things that people identify as important to them as a way of cataloguing evidence of their lifestyles
  - WHY: This method is useful for revealing people's activities, perceptions and values as well as patterns among them

Ask

- Draw the Experience
  - HOW: Ask participants to visualize an experience through drawings and diagrams
  - WHY: This can be a good way to debunk assumptions and reveal how people conceive of and order their experience or activities

Ask

- Word-Concept Association
  - HOW: Ask people to associate descriptive works within different design concepts of features in order to sow how they perceive and value the issues
  - WHY: Clustering users' perceptions helps to evaluate and prioritize design features and concepts

Ask

- Camera Journal
  - HOW: Ask potential users to keep a written and visual diary of their impressions, circumstances, and activities related to the product
  - WHY: This rich, self-conducted notation technique is useful for prompting users to reveal points of view and patterns of behavior

Ask

- Surveys and Questionnaires
  - HOW: Ask a series of targeted questions in order to ascertain particular characteristics and perceptions of users
  - WHY: This a quick way to elicit answers from a large number of people

Ask

- Five Whys?
  - HOW: Ask "Why?" questions in response to five consecutive answers
  - WHY: This exercise forces people to examine and express the underlying reasons for their behavior and attitudes

Ask – Class Activity

- Card Sort
  - HOW: On separate cards, name possible features, functions, or design attributes. Ask people to organize the cards spatially, in ways that make sense to them
  - WHY: This helps expose people's mental models of a device or system. Their organization reveals expectations and priorities about the intended functions

- Break into groups (20 minutes)

IDEO In Class Exercise

- Stay in your groups
- Ask the five whys of each other

- Summarize on Whiteboard or Paper

Try

- Scenarios
  - HOW: Illustrate a character-rich story line describing the context of use for a product or service
  - WHY: This process helps to communicate and test the essence of a design idea within its probable context of use. It is especially useful for the evaluation for service concepts.

Try

- Predict Next Year's Headlines
  - HOW: Invite clients to project their company into the future, identifying how they want to develop and sustain customer relationships
  - WHY: Based on customer-focused research, these predictions can help clients to define which design issues to pursue in product development

Try

- Paper Prototyping
  - HOW: Rapidly sketch, layout, and evaluate interaction design concepts for basic usability
  - WHY: This is a good way to quickly organize, articulate, and visualize interaction design concepts.

Try

- Create simulations to help empathize with people and to evaluate proposed designs
  - Behavior sampling, be your customer
  - Bodystorming, empathy tools
  - Experience prototype, informance
  - Paper prototype, role playing
  - Predict next year's headlines, scale modeling
  - Quick and dirty prototyping, try it yourself
  - Scenarios, scenario testing

Try

- Scenarios
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IDEO In Class Exercise

- Stay in your groups
- Develop a scenario of the use of your product

- Summarize on Whiteboard or Paper

Creativity and Innovation

- We've seen
  - Creativity techniques (brainstorming)
  - Design techniques (IDEOs)
  - Management of reativity 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

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 hear 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
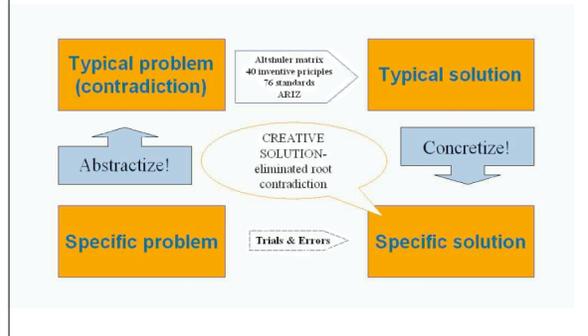
TRIZ

- 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

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
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

- 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

Components vs. variables

Components	Variables
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

Forecasting Matrix for Cylindrical Glass

Internal/External Variables	Height	Diameter	Color	Heat Conductivity	Transparency
Height					
Diameter					
Color					
Heat Conductivity					
Transparency					
Temperature					
% alcohol, sugar, …, in drink					
Type of drink, …					
Time					

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 Your Product

Internal/External Variables				

Group Activity – 15 minutes

Homework 4 – page 2

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