Radical Design
Creativity and Groups
Lecture 3
Selecting the Groups
The IDEO Approach

Homework discussion

- IDEO approach
- Review products

Vote

<table>
<thead>
<tr>
<th>Product</th>
<th>Votes</th>
<th>Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbe cleaning toxic waste</td>
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<tr>
<td>Breathable insulation</td>
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<td>Power efficient laptop</td>
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<td>Stereo Headphones</td>
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<td>Multi touch chairs</td>
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<tr>
<td>The internet</td>
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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

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

• 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

- **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

**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

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

<table>
<thead>
<tr>
<th>Word-Concept Association</th>
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<tbody>
<tr>
<td>HOW: Ask people to associate descriptive works within different design concepts of features in order to sow how they perceive and value the issues</td>
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<tr>
<td>WHY: Clustering users’ perceptions helps to evaluate and prioritize design features and concepts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Camera Journal</th>
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<tbody>
<tr>
<td>HOW: Ask potential users to keep a written and visual diary of their impressions, circumstances, and activities related to the product</td>
</tr>
<tr>
<td>WHY: This rich, self-conducted notation technique is useful for prompting users to reveal points of view and patterns of behavior</td>
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<table>
<thead>
<tr>
<th>Surveys and Questionnaires</th>
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<tbody>
<tr>
<td>HOW: Ask a series of targeted questions in order to ascertain particular characteristics and perceptions of users</td>
</tr>
<tr>
<td>WHY: This a quick way to elicit answers from a large number of people</td>
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<table>
<thead>
<tr>
<th>Five Whys?</th>
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<tbody>
<tr>
<td>HOW: Ask “Why?” questions in response to five consecutive answers</td>
</tr>
<tr>
<td>WHY: This exercise forces people to examine and express the underlying reasons for their behavior and attitudes</td>
</tr>
</tbody>
</table>
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.

- **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**
  - **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.

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 reactivity 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 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

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
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

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

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

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.altiriz.org/index.php?option=com_content&task=view&id=12&Itemid=26
3. 40 Inventive Principles with examples

Check out also for reference the TRIZ homepage
http://www.osaka-gu.ac.jp/php/nakaqawa/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

<table>
<thead>
<tr>
<th>Components</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes</td>
<td>Color, sharpness of vision, time</td>
</tr>
<tr>
<td>Sugar in a cake</td>
<td>Weight of sugar added in mix, sweetness of cake, time</td>
</tr>
<tr>
<td>Handle and head of hammer</td>
<td>Length, thickness, height and weight of hammer, time</td>
</tr>
<tr>
<td>Screws</td>
<td>Number of, length and thickness, size of screw head, number of threads, time</td>
</tr>
<tr>
<td>Alcoholic drink</td>
<td>Percentage, color of drink, time</td>
</tr>
<tr>
<td>Hat</td>
<td>Size, color, water-repellence, time</td>
</tr>
<tr>
<td>Drinking glass</td>
<td>Material, color, shape, size, transparency, time</td>
</tr>
</tbody>
</table>
Forecasting Matrix for Cylindrical Glass

<table>
<thead>
<tr>
<th>Internal/External Variables</th>
<th>Height</th>
<th>Diameter</th>
<th>Color</th>
<th>Heat Conductivity</th>
<th>Transparency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
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<td>Diameter</td>
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<td>Heat Conductivity</td>
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<tr>
<td>Transparency</td>
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<tr>
<td>Temperature</td>
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<tr>
<td>% alcohol, sugar, ... in drink</td>
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<tr>
<td>Type of drink, ...</td>
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<td></td>
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</tr>
<tr>
<td>Time</td>
<td></td>
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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

<table>
<thead>
<tr>
<th>Internal/External Variables</th>
<th>Height</th>
<th>Diameter</th>
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</tr>
</thead>
</table>

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)