Product Design

Lecture 4
February 21 2009

Creative, Innovative, Radical Products
How do we attain these?

Outline

• Groups - homework discussion
• Constraints
• The CREATE Project Classification
• IDEO in context
• The template approach
  – Class performance matrix exercises
• Discussion of next homework
• Curt Rawley - 3/25 class
• Ben Fry - 4/1 colloquium and class
HW Discussion/Presentations

Flexible Display
Constraints 1

• “Necessity is the Mother of Invention”
  – a cliché, but true
• “Great art likes chains”
  – attributed to Igor Stravinsky
• “Whom the gods wish to destroy, they give unlimited resources”
  – Twyla Tharp
• Sometimes less is more

Constraints 2

• “Design depends largely on constraints...Here is one of the few effective keys to the design problem -- the ability of the designer to recognize as many of the constraints as possible -- his willingness and enthusiasm for working within these constraints.”

• “Design addresses itself to the need.”
  -- Charles Eames
Constraints 3

- Cost
- Size
- Reliability
- Durability
- Time to market
- Interface w/ other parts
- Need
- Standards
- Environmental impact
- Social impact
- Ethics
- ???

Creativity as a field of study

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

- They all believed that in order to ignite the creative spark all we have to do is break away from existing thought frameworks and search diligently for the non-conventional while suspending judgment and criticism
Creativity as a field of study 2

- http://www.diegm.uniud.it/create/index.htm
- http://www.m1creativity.co.uk/

Also see the class web page – additional documents

CREATE Project
CREATE Project

- Project that compared and analyzed various methodologies (16) and techniques (more than 200) used in creativity
- Resulted in the development of a “methodology articulated in 5 phases and 6 techniques”

http://www.diegm.uniud.it/create/

- I use the handbook as a key reference point
Classification Criteria

- **Class A techniques**
  - lots of information
  - good structure
  - ease of use

- **Class B techniques**
  - few references
  - complex structure
  - difficulty of use
  - effective only with experts

- **Class C techniques**
  - hardly successful in business contexts
  - lack of references
  - difficult to use
  - not applicable to business processes

- **Class D techniques**
  - no references

Examples from the Create Project

- Lots of examples for each phase and technique
- Most detailed is the Motorcycle
- See CREATE_KMEurope2004.pdf (and the DERBI.pdf file)
  - Substitute component (replacement template)
  - Six hat evaluation
  - (in green hat, provocation occurred)
Cost Reduction Action

• Goal
  – Try to find new product or process features that lead to considerable cost saving
  – Priority is to modifications to already existing products
Phase 0 - Predisposition

• Mainly concerned with creating internal conditions enhancing organizational creativity
  – Deals with pointing out business objectives
  – Creative training, team building, forming creative groups
  – Identification of creative catalysts and facilitators

Predisposition Techniques

• Active crisis generation (A)
  – Overextension crisis
  – Perspective crisis
  – Amplifying difficult situations

• Creative task sheet (B)
  – provide creative ideas in relation to a well defined topic by a deadline
  – task described without too much details, specifying however the nature (a suggestion, a solution, further alternatives, a new concept, etc.)
  – Can provide suggestions on creative techniques that could be used
  – Can suggest a specific provocation which may not be used

• Neuro-Linguistic Programming (A)

• Creative training (B)

CREATE
Phase 1 – External Mapping

• Discover new or unexpressed needs and desires
• Explore competitors strategies
• Exploit new opportunities and competences
• Evaluate economic consequences derived from eventual changes in the competitive environment with specific references to market share, prices, income, …

External Mapping Techniques

• Attribute-value chain (A) CREATE
  – The attribute-value chain measures the meanings that products have for consumers
• It is based on theory that
  – Products and personality can be correlated
  – Products are bought for what they do for consumers
  – Products and services characterized by a set of attributes
  – Each brand or product has a certain performance on each of these attributes
• The consumer ascribes an overall value to a specific product based on how the product is perceived to perform on the various attributes and based on how important these attributes are

• External diagnosis (A)
• Unexpected and contradictory events research (A)
Phase 2 – Internal Mapping

- Exploit potential of the enterprise (environment)
- Explore internal processes and products which can be improved
- Explore internally perceived external opportunities and threats
Internal Mapping Techniques

- SWOT (Strengths Weaknesses Threats Opportunities) analysis (A)
  - Analyze competition context and product strategies for the impact
    - of the main internal factors (organizational structure, culture, competences, partnership networks, etc.)
    - of the main external factors (i.e.: technology level in the sector, competitors’ position, etc.) in order to develop a competitive strategy

- Internal planning competition (A)
  - Goal is to involve bottom level employees that have peripheral knowledge
    - Promotes ideas “from below” and develops all cognitive resources within your organization
    - Employees are free to identify and join creative activities that are commercially interesting
    - Employees are directly involved in the generation of creative and cost-effective plans and can therefore combine their personal ambitions with a full understanding of the upcoming trends

- Creative targets list (A)
  - Summarizes those areas where attention should be focused and the topics require a creative approach

Phase 3 – Creative Process

- Use the external and internal environmental discoveries to produce ideas both individually and in a collective context
Creative Process Techniques

- Context modifying
- Mind map
- Creative template
- Brainstorming
- Morphological analysis
- Provocation and movement
- Synectics
- Creative challenge

The Creativity Templates

- The Attribute Dependency Template
- The Replacement Template
- The Displacement Template
- The Component Control Template
The Attribute Dependency Template

- Identify two independent variables (i.e. change in one does not cause change in the other) and create a new dependency between them
- The connection is a functional dependency between the two independent variables and is created at a point at which it is needed
- The key is to locate the variables that will be part of an attribute dependency and assess the feasibility and profitability of the new idea
- This is a heuristic which facilitates the process
  - Need to be flexible and be open to extensions to the method
  - Used most often for marketing and evolving new from old

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>
Examples

- Lighthouse of Alexandria (extol Alexandria and King Ptolemy II, light way to port)
  - 286-246BC, one of the seven wonders of the world
  - 134 meter tall
  - Architect Sastratus of Cnidus
  - Variables: credit and time
- Antenna pole (light weight, north pole)
  - Variables: strength and snow
- Domino’s pizza and competitor (competitive products)
  - Variables: price and (time | temperature)
- Baby bottles (new product)
  - Variables: temperature and color

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 it is in 0 mode (no dependency) or in 1 mode (dependency exists)
Operational Prescription for a Forecasting Matrix 2

5. Examine the evolution of the matrix (degenerated or saturated) and decide whether to continue

6. Choose 3 (could be 2) elements and try to add a dependency (change to 1 mode)

7. For each element in which a dependency is successfully added, assess the feasibility of change from a practical point of view

Operational Prescription for a Forecasting Matrix 3

8. Search for a new benefit or significance for the market derived from the addition of a dependency.

   Function Follows Form

   Do not overlook new market segments that may derive from this addition of a dependency

9. Based on a success measure, continue based on some scanning strategy (by columns and rows or choose 3 additional elements)
### Internal and External Variables

<table>
<thead>
<tr>
<th>INTERNAL VARIABLES</th>
<th>EXTERNAL VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>External temperature</td>
</tr>
<tr>
<td>Line</td>
<td>Visibility</td>
</tr>
<tr>
<td>Wheel dimension</td>
<td>Driver’s age</td>
</tr>
<tr>
<td>Dimension/Weight</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td></td>
</tr>
<tr>
<td>Feeding type</td>
<td></td>
</tr>
<tr>
<td>Decorations</td>
<td></td>
</tr>
</tbody>
</table>

#### External Variable: Visibility

- **Looking for Dependencies**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>IS IT POSSIBLE TO ADD A NEW DEPENDENCE BY USING THIS VARIABLE?</th>
<th>MOTIVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour/Decoration</td>
<td>YES</td>
<td>Make driving safer in case of bad weather</td>
</tr>
<tr>
<td>Wheel dimension</td>
<td>YES</td>
<td>Not interesting variable</td>
</tr>
</tbody>
</table>

Color/Visibility – A good idea would be to use a special paint or lighting device in order to improve scooter visibility in adverse conditions
Internal & External Variables 2

### External Variable: External Temperature

Looking for Dependencies

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>IS IT POSSIBLE TO ADD A NEW DEPENDENCE BY USING THIS VARIABLE?</th>
<th>MOTIVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line</td>
<td>YES</td>
<td>Make the trip more comfortable</td>
</tr>
<tr>
<td>Feeding type</td>
<td>YES</td>
<td>Reduce polluting emissions in summer</td>
</tr>
</tbody>
</table>

Line/External Temperature – A good idea would be to add a mobile dome that comes out from the frame and shields the drive in case of bad weather
### Internal & External Variables 3

<table>
<thead>
<tr>
<th>INTERNAL &amp; EXTERNAL VARIABLES</th>
<th>INTERNAL VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>X 0 0 1 1 0 1 1</td>
</tr>
<tr>
<td>Line</td>
<td>0 X 1 1 0 0 0 0</td>
</tr>
<tr>
<td>Wheel dimension</td>
<td>0 1 X 1 0 0 0 0</td>
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<td>Dimension/Weight</td>
<td>1 1 1 X 1 0 1 0</td>
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</tr>
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<td>Colour</td>
<td>0 0 0 0 0 0 X 0 1</td>
</tr>
<tr>
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<td>1 0 0 1 0 0 X 0</td>
</tr>
<tr>
<td>Decorations</td>
<td>1 0 0 0 0 1 0 X</td>
</tr>
<tr>
<td>External temperature</td>
<td>0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Visibility</td>
<td>0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Driver’s age</td>
<td>0 0 0 0 0 1 0 1</td>
</tr>
</tbody>
</table>

### Internal Variable: Price

#### Looking for Dependencies

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>IS IT POSSIBLE TO ADD A NEW DEPENDENCE BY USING THIS VARIABLE?</th>
<th>MOTIVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>NO</td>
<td>Price is already depending on power and engine</td>
</tr>
<tr>
<td>Driver’s age</td>
<td>YES</td>
<td>We push sales of this model among very young customers</td>
</tr>
</tbody>
</table>

Age/Price – We want to link the scooter’s price with the driver’s age in order to attract a younger market target.
The Replacement Template

• The replacement of a resource or component existing in the system or in its immediate environment in order to fulfill a necessary role

The Replacement Template 2

• Examples
  – Edison’s legendary gate which forced his guests to activate his private water pump
  – A keyboard of a portable computer which transforms mechanical energy (from the user’s fingers) to charge the battery
  – The Wirefree device which uses the loudspeakers from the car’s radio system to improve the quality of the cellular phone
  – Antenna pole in which the ice that accumulated in the environment is used to increase its sturdiness
The Replacement Template 3

• Examples
  – SETI using internet-connected idle PCs to help search for extraterrestrial intelligence
  – Doors in cars
    • hinges use to open in the direction of exit of the passengers making it easy to get in and out
    • now for safety hinges open the other way using the air current to apply pressure in order to prevent door from opening widely
  – Russian theaters with no curtains using projectors at special angles during scenery changes

Operational Prescription for the Replacement Template

1. Make a list of internal components (over which the manufacturer has control)
2. Make a list of external components (over which the manufacturer has no control)
3. Construct a product configuration, mapping all the desired control links between the listed components
4. Locate the essential components, mark them and write their function in all the links
### Operational Prescription for the Replacement Template 2

5. Choose one essential component, exclude it from the configuration, but leave the function it had fulfilled.

6. Scan the nearby environmental components and make a list of components having characteristics or functions similar to those of the excluded component.

7. Connect each component from the new list to the function missing a component and describe a physical model of the new configuration.

### Operational Prescription for the Replacement Template 3

8. Search for a new market benefit derived from the replacement.

**Function Follows Form**

Do not overlook any new market share that may result from the added dimension.

9. If a new market share does arise, decide whether to continue linking other environmental components to the missing link, or exclude other essential components.
Cost Reduction Action

• Use the Creativity Templates to substitute a component in order to save money

Replace Template

• Is it possible to replace the metal pedals
Replacement Template

• Is it possible to replace the metal pedals with other ones made of plastic?

Group Exercise:
Forecasting Matrix for The Jewelry Group

<table>
<thead>
<tr>
<th>Internal/External Variables</th>
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Group Activity – 15 minutes
Group Exercise:
Forecasting Matrix for The Personal Data Object

<table>
<thead>
<tr>
<th>Internal/External Variables</th>
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Group Activity – 15 minutes

Provocation and Movement

• DeBono technique to challenge traditional thinking and avoid conflicts while constructively criticizing ideas and exploring new opportunities

• Provocation is an important lateral thinking technique that helps to generate original starting points for creative thinking

• CONS
  – When using the technique all members of the group/audience should know about how the Provocation is supposed to work and accept it
  – It might be difficult to give up on established thinking patterns
Similar to Lateral Thinking

• We think by recognizing patterns and reacting to them
• These reactions come from our past experiences and logical extensions to those experiences
• We often do not think outside these patterns
• While we may know the answer as part of a different type of problem, the structure of our brains makes it difficult for us to link this in

• “Provocation and Movement” is one of the tools we use to make links between these patterns

Process

• We use it by making deliberately stupid or unusual statements (Provocations), in which something we take for granted about the situation is not true
• Statements need to be stupid to shock our minds out of existing ways of thinking
• Once we have made a provocative statement, we then suspend judgment and use that statement to generate ideas
• This is the Movement part of the technique
• Provocations give us original starting points for creative thinking (Movement)
Po = Provocation Operation

- Edward de Bono has developed and popularized use of Provocation and Movement with the word 'Po'
- He suggests that when we make a Provocative statement in public, then we label it as such with 'Po'
  - e.g. “Po: the earth is flat”
- This does rely on all members of the group/audience knowing about Provocation
- As with other lateral thinking techniques, Provocation and Movement does not always produce good or relevant ideas
- However ideas generated using Provocation and Movement are likely to be fresh and original

Following slides are from the CREATE Project
QuickTime™ and a decompressor are needed to see this picture.

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Class Exercise:
Cylindrical Glass - Po Exercise
Phase 5 - Evaluation

• Select the best ideas
• Evaluate with respect to each enterprise’s requirements (your goals as a group)

Evaluation Techniques

• Six thinking hats (A)
• Screening matrix (A)
  – estimate concurrent solutions using previously defined criteria
  – estimate solutions using a range of values for every criterion
  – sum the criteria weights to get the maximum solution
  – Criteria include advantages, feasibility, resources, adequacy, vital and fatal factors, flexibility and risk

• The angel’s advocate (A)
  – This technique consists of three steps:
    • Rephrase the idea in order to test its comprehension and show respect to its proponent
    • Indicate positive values through the formula “What I like of your idea is…” rather than hastily provided judgments like: “I like your idea because…”
    – ask questions about unclear aspects in order to better understand the idea and also to help the proponent describe it in depth
Cost Reduction Action: Evaluation

*Brake and gear pedals in plastic material*

**The WHITE HAT: all the analytical data**
- After a few calculations, this replacement on the whole range of motorcycles would save more than 280,000 €/year

**The RED HAT: emotions**
- Afraid to break the brakes!
- Plastic is a ‘poor’ material

---

Cost Reduction Action: Evaluation

*Brake and gear pedals in plastic material*

**The BLACK HAT: what’s wrong with it?**
- The brake is a safety element: it must never break
- No one ever did this before: why?

**The YELLOW HAT: positive aspects**
- Heavy cost reduction
- The pedal should break less frequently in case of falling
- Wide range of suppliers once plastic material has been identified
Cost Reduction Action: Evaluation

Brake and gear pedals in plastic material

The GREEN HAT: new further ideas
- Paint the pedal (PROVOCATION)
- Extend this technology to other similar metal parts (like footboard, stands, etc.)

The BLUE HAT: final overview
- This is a very promising idea
- The material replacement depends on the innovation and research capability of their technological partners

Summary

1. The CREATE Project is a classification of the complete ideation session or process
2. There are others
3. Note the difference between various techniques, tools, processes, concepts, …
4. These are simply strong suggestions based on experience
5. Some of these suggestions have foundations and have been validated
6. Some have not
Back to the Creativity Templates

• The Function Follows Form principle is manifested in the sequence of
  – first proposing new configurations for a product, and
  – then inferring the benefits, aesthetic values and other market parameters in order to create a new product idea

The Other 2 Creativity Templates

• The Attribute Dependency Template
• The Replacement Template
• The Displacement Template
• The Component Control Template
The Displacement Template

• The removal of an intrinsic component from the configuration including its functions, in a way that causes a qualitative change in the configuration

The Displacement Template 2

• Example
  – Pizza delivery (reduce time using temperature). Delivery by car, use car exhaust for heat/cooking. Problems (customer perception, implementation, …)
The Displacement Template 3

• Example
  – Pizza delivery (reduce time using temperature). Delivery by car, use car exhaust for heat/cooking. Problems (customer perception, implementation, …)

The Displacement Template 2

• Example
  – Cake mix (1970s) for home baking
  – Add water and bake (great taste)
  – Marketing efforts failed
  – Extensive market research showed they wanted a personal touch, a home-made taste
  – It was decided that a bit of the final product form could be “eliminated” – thus they decided to remove the eggs from the cake
  – Cake sales soared
The Displacement Template 4

• Example
  – Vacuum seals – freshness is preserved by removing the air from products
  – The Mango cellular phone - receive only phone from Motorola (low bills, great to get in touch with kids, …)
  – The Sony Walkman recording was unreliable so they focused on playback

The Displacement Template 5

• Example
  – Vacuum seals – freshness is preserved by removing the air from products
  – The Mango cellular phone - receive only phone from Motorola (low bills, great to get in touch with kids, …)
  – The Sony Walkman recording was unreliable so they focused on playback
Displacement is NOT Unbundling

- No new benefit is created by unbundling
- In displacement there is a new benefit connected with the characteristics of the product
- Examples
  - Suntan lotion – less protection to give a better suntan in winter
  - Decaffeinated coffee
  - Fingerless gloves
  - Calendar without days, for multi-annual use
  - Soapless soap

Operational Prescription for the Displacement Template

1. Make a list of internal components (over which the manufacturer has control)
2. Make a list of external components (over which the manufacturer has no control)
3. Construct a product configuration, mapping all the desirable control connections between all listed components
4. Locate the essential components, mark them and list the functions they fulfill in all their connections
Operational Prescription for the Displacement Template 2

5. Choose an essential component and exclude it from the configuration, along with the function it fulfilled

6. Search for a market benefit resulting from the displacement you effected

   Function Follows Form

7. Try to find new market niches that may derive benefits from the removal

The Component Control Template

- Make a new link between a component in the internal environment and a component in the external environment

- An external component is one which comes in contact with the product at a certain point in time, but is not controlled by the manufacturer
Operational Prescription for The Component Control Template 2

- Example
  - Dandruff shampoo

Operational Prescription for The Component Control Template 3

- Example
  - Dandruff shampoo
Operational Prescription for The Component Control Template 4

• Example
  – Dandruff shampoo

![Diagram]

Operational Prescription for The Component Control Template

1. Make a list of internal components (over which the manufacturer has control)
2. Construct a product configuration: mark all the control links existing between the identified internal components
3. Make a list of environmental components that come in physical contact with the product configuration
4. Scan the environmental components one by one, trying to locate for each a negative connection (existing or potential) with the product configuration

Since the number of environmental components in contact with the product is limited, systematic mapping may cover all possibilities of Component Control
Templates in Advertising

- Pictorial Analogy
- Extreme Situation
- Consequences
- Competition
- Interactive Experiment
- Dimensionality Alteration

Empirical Evidence (again)

- Goldenberg, Mazursky and Solomon derived 6 major creativity templates from a sample of 200 highly rated ads
- 89% could be explained by templates
- Comparing 200 award winning ads and 200 non-winning ads found the two groups differ systematically:
  - 50% of the award winning ones could be explained by the templates
  - 2.5% of the non-award winning ones could be explained by the templates
The Pictorial Analogy Template (The Replacement Version)

- Consider product space
- Consider symbol Space
- Match these via a mapping (link operator)
- Replace symbol based on some concepts

The Extreme Situation Template

- Consider space of alternative options
- Consider space of situations
- Alternative options do not have to be realistic
- The linking operator links one element from the situation space to that of the alternative option space
### Extreme Situation Template (The Absurd Version)

- **Situation set**
  - Sleeping
  - Burglar breaking in during quite evening
  - Nobody at home

- **Specific example of quiet evening space**
  - Family watching TV
  - Family conversation
  - Lady reading a book

- **Alternative options set**
  - Dog
  - Security guard
  - Alarm system

- **Specific example of dog space**
  - Barking
  - Leash
  - Dog food

### The Consequences Template (The Extreme Consequence Version)

- **Consider a space of situations**
- **Consider a set of consequences**
Homework - Due March 4, 2009

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

2. Identify the components and both internal and external variables of your product

3. Build a forecasting matrix for your product

4. See if you can find connections between variables that appear interesting and could potentially evolve your product

5. For each variable you may use IDEO or TRIZ techniques and briefly identify which you used, whether it worked, and results

6. Prepare a less than 1 minute marketing presentation to venture capitalists

7. Prepare a less than 1 minute presentation to environmentalists
Example Techniques

Brainstorming

Osborne 1957 (at Disney Studios)
assumptions
1. People are naturally creative
2. Synergies (more people is better)
3. Deferred judgment
4. Quantity leads to quality
Brainstorming 2

• Advantages
  – Group effectiveness
  – Group experience
  – Lots of organizational benefits
    • Support of common organization memory
    • Diversification of ability

• Efficient teamwork is controlled brainstorming
  – Most meetings involve efficient discussions, examining various alternatives, assisting each other in solving problems (group work as opposed to brainstorming)

Brainstorming 3

• Disadvantages
  – Fear assessment (apprehension of negative social feedback and criticism)
  – Production blocking (one person speaking while others listen)
  – Deferred judgment creates a chaotic world (lack of direction)
  – Free riding (agree for personal reasons)
Electronic Brainstorming (EBS)

- Each member sits at own desk, electronically connected to others
- Generate ideas on their own and send to general pool while continuing their own thoughts and generating more ideas on theme
- When ready to investigate others’ ideas, download from pool
- These generate new ideas or user can evolve their own further

Electronic Brainstorming (EBS) 2

- This is like a virtual neuron storm
  - Under user control
  - Privacy
  - Control of timing
  - Outsiders can steer, review, add new instructions, guidelines,…
- Allows for concurrent discussions in real time
- Empirical findings reflect success absolutely and relative to regular brainstorming (more rated higher quality ideas)
- Size of group can be large to harness very large diverse groups
- However, lacks social encounter (an important side effect of conventional brainstorming)
Constrained Brainstorming

- Well managed and constrained brainstorming is very powerful
- Even complete freedom of expression does not lead to anarchy
- This implies that brainstorming should be conducted to generate solutions to well-defined problems, with clear set of criteria for success
  - Define the problem at hand
  - Define goals of the encounter beforehand

Lateral Thinking

- Popularized by Edward de Bono (1970)
- Structural thinking is dig deep
- Lateral thinking is search for a new spot
- Use provocative paths to force considering different options for solution
  - Inverting the situation
  - Altering the situation to make it provocative
  - Consider interesting directions simply because they are interesting (even where no benefit is seen)
Lateral Thinking 2

- The group does not take primacy
- The decision about the process, the thinking path, to be followed is more important

Mind Mapping

- Free association and flow of thoughts
- Draw a circle at the center of a page and write a short description of the problem
- Draw new circles around the page representing associations (not solutions) to the problem linked to the first circle
- Each new circle is now the origin for a new bundle of associations (all linked together)
- The problem solver can then explore the space
- There are software tools
Random simulation

- Complementary to mind mapping
- Posits that a remote analogy can sometimes stimulate a chain reaction of new thoughts and liberate a fixation
- Choose a random object (most often a word) and focus thoughts on how that object (word) could be part of a solution to the problem
- Used mainly in writing and the arts

S.W.O.T. Analysis

- A methodology from marketing research

- Used to define a strategy focusing on internal strengths and weaknesses and to external opportunities and threats