Unconventional Thinking in Engineering DESIGN

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Does our education and curriculum-based classroom learning focus us to think in a certain conventional way? Why is engineering design typically done with a set of predefined parameters (Engineering Specs) operating within a restricted framework (constraints) with an end-use in mind? Don't you think that restricts your imagination and ties you down with conventional thinking leading to routine engineering products? Why do we take conventional methods and wisdom for granted? How do we **untie** ourselves from conventional thinking? How to come out of design fixation problems?

Albert Einstein once said ***"You can't solve a problem with the same thinking that created it".*** Creative solutions are usually required to break away from baseline product features and introduce features that delight customers. In engineering design, creativity goes beyond consumer wants and needs; it brings added utility to a design and bridges the gap between form and function. Figure 1 shows some examples of conventional designs and creative designs. What is Creativity? What is the role of **Un**conventional **T**hinking in **E**ngineering Design (UnTiED) ideation? How about designing products even without any predefined end-use in mind and after design is done determine how the product will be useful? How fun will it be to question the status quo and design something just to quench your curiosity thirst? How exciting it will be to get design ideas inspired by wonderful creations of nature and biology? How to create engineering design ideas by seeking random connections with unusual combinations between un-related concepts? Absurdity (pattern breaking thinking) has any role in ideation? How to direct absurd ideas on the right track to discovering new ideas? How about tinkering with design ideas which are nonjudgmental and open ended? How to come up with fun product ideas by challenging assumptions with reverse thinking?

Elements of UnTiED ideation

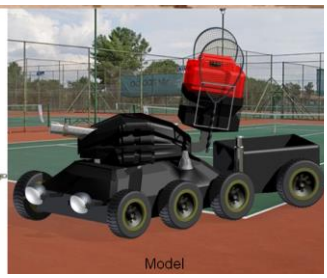
1. Design ideas by seeking random connections with unusual combinations between un-related concepts

2. Absurdity (pattern breaking thinking) and direct absurd ideas on the right track to discovering new ideas

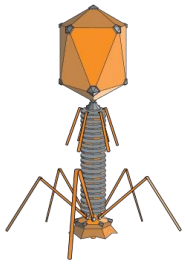
3. Tinkering with design ideas which are nonjudgmental and open ended

4. Challenging assumptions with reverse thinking

When you explore creative ideas for team project use following guidelines



- Brainstorm and come up with a list of new functions consumers may look for in your chosen product or engineering structure.
- Define what is new in system-level (ex: fishing pole) and sub-system level (ex: fishing rod guides) functionality of your product.
- Pay attention to creativity and uniqueness in the appearance (Aesthetics)
- Do not worry too much about manufacturability and/or feasibility of design.
- Use the four elements of UnTiED ideation illustrated above which include
  - seeking random connections with unusual combinations between un-related concepts (see tennis ball dispenser product)
  - Introduce absurdity (pattern breaking thinking) and direct absurd ideas on the right track to discover new ideas
  - experiment with design ideas which are nonjudgmental and open ended
  - come up with fun product ideas by challenging assumptions with reverse thinking (see under water drill)
- Use a list of key words in the next page when exploring with ideas for system and sub-system functions.



1770 Creative Project Ideas

(Use these key words and search terms in the internet for more Ideas)

Biologically Inspired Products
http://www.biomimicryinstitute.org/
http://www.biomimicryguild.com/
Bio inspired robotics

<u>Other ideas (please include any bio / nature inspired design ideas or ideas with unconventional thinking)</u>

EADS Astrium – Space Tourism
Virgin Galactic – Space Tourism
XCOR – Space Tourism
Future Aeroplanes
Future Helicopters
Future Jet Fighters
Future Rockets
MARs Exploration Vehicles
X-48B – Blended Wing Body

Bell-Agusta 609 (Tilt Rotor)
Sirkorsku X2 (Rotary wing design)
Eclipse 400 (Single Engine Personal Jet)
Piperjet (Single Engine Jet)
VMS Eve (High Altitude Aircraft) (Twin Fuselage Design)
E-2C and E-2D (Airborne Early Warning and Control Aircraft)
Orion – Crew exploration vehicle
Manned Lunar Outpost
Solar Impulse Aircraft

Future Technological Products
Future Transportation
Future Cars
Future Bikes
Future Gadgets
Future Robots
Future Trains
Near Future Inventions
Ideas and vehicles from
http://conceptships.blogspot.com/

3 wheeled fuel efficient vehicles
Hydrogen Storage Tank Concepts (Fuel of the Future)
Brain – Machine Interfaces
PW1000G Engine
GEnx-1B Engine
Snomote (Co-designed by GT Faculty)
Solar Powered Ferris wheel – California
Flexible arm Robot (Space Applications)
Robot Grippers
Robots of the Sea
CB2 Robot
Robotic Dog
Futuristic consumer products

Other Innovative Products for Inspiration