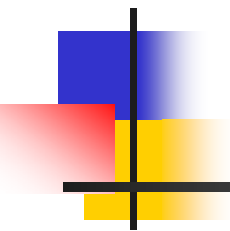


ENGG 1803 - Creativity & Design



John Currie

Creativity is shared
imagination of the individual
novel memory



Baillie & DeWulf 1999

Creativity as shared imagination



Sharing through communication
novel ideas with an audience who
interpret a person's intention in
their imaginations.



Creativity is at the heart of innovation

With accepted application of the
product of creativity, either
commercial &/or social, innovation
occurs.



Creativity is:

- The expression of problem solving & decision making
- Cognitive processes - individual & group
- Leadership to allow permission
- Fostered through supportive environments, organisations, processes & techniques over time
- Individual, organisational, cultural, historical



Conditions for creativity:

- Individual personality characteristics
- Creative potential of the individual
- Environmental factors -
supporting/hindering, positive/negative
- Motivations - intrinsic, extrinsic



Positive individual personality characteristics:

- Individual psychological characteristics thought to be associated with creativity include -
- Independence of attitude and behaviour, dominance, introversion, openness to stimuli, wide interests, self acceptance, intuition, curious and questioning nature



Negative individual personality characteristics:

- Emotional barriers include -
- Lack of confidence
- Fear of failure
- Fear of criticism
- Human barrier - “I’m only human”
- Intolerance of the unknown



Creative Potential:

- Relies on successful communication
- Paradox - good communication relies on common knowledge, but creativity lies in solving problems outside common knowledge
- Creative potential relies in overcoming differences in perception & awareness to develop shared imagination



Organisational environment:

- Supportive - conscious development of creative culture - appropriate processes, practices & permission
- Unsupportive - overly concerned with costs (time, \$), tradition, rules, 'taboos', competition, 'blindness' to innovation



Motivation:

- Intrinsic - self motivation, curiosity driven - 'wonder & discovery', 'playful & humorous
- Extrinsic - appropriate resources & time, encouragement, recognition, rewards, good project management, supportive organisation climate



Creativity process:

- Preparation - defining/redefining the issue
- Generation - new possibilities beyond constraints of previous thinking
- Incubation - development of ideas & creative approaches over time
- Verification - analysis of options, decision making, action planning, implementation, evaluation



Creative Techniques:

- Many techniques exist to ‘free’ thinking and the imagination including -
- Mind mapping - visual associations of issue elements
- Brainstorming - spontaneous group idea generation
- SCAMPER - substitute, combine, adapt, modify, purposes (other), eliminate, rearrange
- TRIZ - theory of inventive problem solving
- Lateral thinking - ‘6 Thinking Hats’



Creativity in Design:

- Creativity - the constant search for □ methods to allow successful solutions to technical problem solving
- Design - physical expression of creative technical problem solving



Engineering Design Method:

- Synthesis
- Analysis
- Communication
- Implementation



Engineering Design Process:

- Feasibility Study
- Preliminary Design
- Detailed design



Synthesis:

- Need identification
- Problem definition
- Assemble design / project team
- Identify problem constraints
- Establish success criteria
- Creatively search for solutions



Analysis:

- Investigate potential solutions
- Choose desired solution
- Document solution
- Communicate solution
- Repeat as necessary through steps of design process - feasibility, preliminary, detailed designs



Implement:

- Construct solution via detailed design documentation
- Test design & verify criteria
- Modify & adjust as necessary
- Re-test and re-verify
- Evaluate designed product & design process
- Learn lessons for future use



Problem / Project constraints:

- Budget
- Time
- Personnel
- Legal
- Material properties
- Material availability
- Component strategy - generic vs custom
- Market competition
- Manufacturability



Success Criteria:

- Aesthetics
- Performance - reliability, serviceability
- Quality
- Human Factors
- Cost
- Safety



Success Criteria (cont.):

- Operating environment
- System compatibility
- Environmental impacts
- Logistics
- Availability



Search for Design Solutions:

The creative process in action!!!