creative design methods

prof. barry kudrowitz, phd

college of design

university of minnesota

sarah alfalah (TA/grader)
krystianna johnson (TA/grader)
sarah prescott (TA)

umnproductdesign
MIT - MS mech. engineering    2006
UCF - BS mech. engineering    2004
UCF - BS mech. engineering    2004
MIT - MS mech. engineering    2006
MIT - PhD mech. engineering   2010
UCF - BS mech. engineering   2004
Toy product Design

MIT - PhD mech. engineering 2010
MIT - MS mech. engineering 2006
UCF - BS mech. engineering 2004
TU Delft - industrial design 2006
UCF - BS mech. engineering 2004
MIT - MS mech. engineering 2006
MIT - PhD mech. engineering 2010
UMN - Assistant Professor of Product Design
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product (or industrial) design

blends elements of design, engineering, business, and humanities
to invent our future
with innovative objects, systems and services
Bachelor of Science in Product Design

- Manufacturing and materials
- Intellectual property (patents)
- Entrepreneurship, branding, marketing
- Human factors (ethnography, problem finding)
- Concept visualization
- Idea generation
- Human values (usability, desirability)
- Business (viability)
- Technology (feasibility)

- Engineering design and CAD
- Form and model making

- Engineering design and CAD
discovery
invention
innovation
**discover:** to find unexpectedly or in the course of a search

gravity,
moons of jupiter,
fire,
DNA structure,
photosynthesis,
microorganisms
...
...

“Discovery consists in seeing what everyone else has seen and thinking what no one else has thought.”
-Albert Szent-Gyorgyi

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Science/research
invent: to create something that has not existed before

transistors, printing press, steam engine, water wheel, gun powder, plastic, ...
...
innovate: novel application or combination of ideas and technology into marketable products or services

dip n' dots, wii, model t, zip car, walkman, ipod...

the guy who invented the wheel was an idiot. the guy who invented the other three, he was a genius. - sid caesar

All innovations start from inventions, but not all inventions become innovations.
**discovery**

- elemental fluorine
  - 1886 - Henri Moissan

**invention**

- PTFE (polytetrafluoroethylene)
  - "teflon"
  - 1938 - Roy Plunkett

**innovation**

- non-stick pan
  - 1954 - Marc Gregoire

**Innovation:**

novel application or combination of ideas and technology into marketable products or services

-luecke & katz, 2003
smaller, more storage

incremental technological innovation

radical innovation

2000

incremental

aesthetic or “meaning” innovation

radical innovation

obsoleted!
MAYA: Most Advanced Yet Acceptable

hung & chen, 2012
MAYA  Most Advanced Yet Acceptable
KAI Inventory
Kirton Adaption-Innovation

adaptors
problem solvers
systematic
efficient and effective

innovators
agents for change
blue sky
high failure rate
KAI Inventory
Kirton Adaption-Innovation

**adaptors**
- problem solvers
- systematic
- efficient and effective
- creative within the box

**innovators**
- agents for change
- blue sky
- high failure rate
- outside the box
KAI Inventory
Kirton Adaption-Innovation

**Adaptors**
- problem solvers
- systematic
- efficient and effective
- creative within the box
- incremental innovators
- do it better

**Bridgers**

**Innovators**
- agents for change
- blue sky
- high failure rate
- outside the box
- radical innovators
- do it different

Kirton Adaption-Innovation (KAI) Inventory
what is creativity?
consensual definition
“appropriate observers independently agree it is creative (Amabile, 1982).”
novelty based definition
multi-attribute definition
(novel + useful, practical, value, applicable, feasible, relevant, significant, effective, etc)

![Creative vs Useful Average Scores](image)

![Creative vs Novel Average Scores](image)

kudrowitz & wallace, 2010

☑️ NOVEL ☑️ CREATIVE
☐ USEFUL
☐ PRACTICAL

\[ R^2 = 0.10788 \]
\[ R^2 = 0.77969 \]
what is creativity?

consensual definition
“appropriate observers independently agree it is creative (Amabile, 1982).”

novelty based definition

multi-attribute definition
(novel + useful, practical, value, applicable, feasible, relevant, significant, effective, etc)

✔️ NOVEL ✔️ CREATIVE
what is creativity?

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“appropriate observers independently agree it is creative (Amabile, 1982).

novelty based definition

multi-attribute definition
(novel + useful, practical, value, applicable, feasible, relevant, significant, effective, etc)

- NOVEL
- RELEVANT

random ≠ creative

hey team,
let’s come up with creative toaster ideas!
-CEO of toaster inc.
what is innovative?

novel application or combination of ideas and technology into marketable products or services

\[
\begin{align*}
\text{not novel} & \quad \text{valuable} & \quad \text{feasible} \\
\text{novel} & \quad \text{not valuable} & \quad \text{feasible} \\
\text{novel} & \quad \text{valuable} & \quad \text{not feasible} \\
\end{align*}
\]

\[= \text{novel} + \text{valuable} + \text{feasible}\]
creative vs. innovative

**CREATIVITY**

- Novel
- Relevant

Serve while hot

**INNOVATION**

- Novel
- Valuable
- Feasible

Bake and serve
the factors of creativity

- cognitive, conative, and environmental - Lubart et al. 2009
- domain skills, creative skills, and task motivation - Amiable 1983

- intelligence, knowledge, logic, technical skills
- personality, openness, flexibility, mood
- prompt/problem, curiosity/interest, intrinsic motivation
- physical space, people involved, resources

ayyoub momen
Clothes dryers use more energy than any other appliance. All dryers in the USA use more energy than the state of Massachusetts!

“is there a better way to dry clothes?”

“can we use something like an ultrasonic humidifier to evaporate water on clothes?”

ultrasonic vibration is a means of evaporation

“I know how to evaluate if this is possible and I have the resources to do so”
land and jarman, 1998

creative thinking and age

percentage of age group having “genius” scores in divergent thinking

<table>
<thead>
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<th>Age Group</th>
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</tr>
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<td>98%</td>
</tr>
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<td>32%</td>
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<td>(200,000) adults</td>
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1600 children
Land and Jarman, 1998

Creative thinking and age

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Age 3-5: 1600 children

The creative adult is the child who survived. - Ursula K. Le Guin

```
"All children are born artists, the problem is to remain an artist as we grow up." – Pablo Picasso
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We are all capable of being creative.

“We are educating people out of their creativity”

-Sir Ken Robinson 2006
land and jarman, 1998

creative thinking and age

percentage of age group having “genius” scores in divergent thinking

- age 3-5: 98% (1600 children)
- age 7-10: 32%
- age 14-15: 10%
- (200,000) adults: 2%

be logical, follow rules, don’t make mistakes, one correct answer, SATs, play is frivolous, don’t be ambiguous
Since 1990, creativity scores in America have consistently and significantly inched downward. The decline is “most serious” for younger children. All around us are matters of national and international importance that are crying out for creative solutions, from saving the Gulf of Mexico, to bringing peace to Afghanistan to delivering health care."

Bronson and Merryman, Newsweek, 2010

What was once central to corporations — the left-brain, digitized analytical work associated with knowledge— is fast being shipped off to lower-paid, highly trained chinese and indians, increasingly, the new core competence is creativity — the right-brain stuff that smart companies are now harnessing to generate top-line growth. the game is changing... It’s about creativity, imagination and above all, innovation.

Bruce Nussbaum, BusinessWeek 2005
Asia, abundance, automation

Imagination is more important than knowledge
- Albert Einstein

Average Software Engineer Salary

(salary.com, payscale.com, 2011)
“The United States spends more on trash bags than ninety other countries spend on everything... It’s no longer enough to create a product that is reasonably priced and adequately functional. It must also be beautiful, unique and meaningful. Today we’re all in the art business.” -Pink, 2005
machines now do some things better than human beings... computers are faster, stronger, they don’t fatigue, better at calculations, don’t choke under pressure, don’t worry what people think of them -pink, 2005

“Anyone who can be replaced by a machine deserves to be.”
~Dennis Gunton
can we be more creative?

Average = 2.6 X

Individual participants

david wallace, monica rush, barry kudrowitz, 2009
creative thinking strategies
which shape is different from all the others?

A)

B)

C)

D)

E)

MORE THAN ONE RIGHT ANSWER
(look for the next best solution)

-von Oech
creative thinking strategies

**CHALLENGE ASSUMPTIONS**

“Kobayashi Maru” - if you can’t win, rethink the rules
creative thinking strategies

using one stroke turn the Roman numeral 7 into an 8

\[ \text{VIII} \]
creative thinking strategies

using one stroke turn the Roman numeral 9 into an 6

SIX

(shifting perspective from Roman Numerals to Latin characters)
creative thinking strategies

LATERAL THINKING
(shifting perspective, multiple viewpoints, reframing the problem, don’t get fixated)

using one stroke turn the Roman numeral 9 into an 6

IX6

(shifting perspective from Roman Numerals to mathematics)
where good ideas come from

the adjacent possible (pushing the edge)
liquid networks (making connections)
the slow hunch (no eureka moments)
serendipity (accidental connections)
error (stepping stones)
exaptation (repurposing and crossing disciplines)
platforms (building on existing knowledge)
adjacent possible
same time by different people
"adjacent possible"

radical innovation

science fiction, cartoons, comic books, wizardry, and dreams
liquid networks

“a city that was ten times larger than its neighbor is 17 times more innovative .. a metropolis that is 50x bigger was 130x more innovative... a resident in a town of five million was 3x more creative than the average resident of town of hundred thousand”

“the most productive tool for generating good ideas remains a circle of humans at a table, talking shop. the lab meeting creates an environment where new combinations can occur, where information can spill over from one project to another.”

- johnson 2010
exaptation (the medici effect)

“when different fields of expertise converge in some space, it is not so much thinking outside the box, as it is allowing the mind to move through multiple boxes.. to borrow tools from one discipline to solve problems in another” - Johnson 2010

george de mestral, 1941
error & serendipity
charles kettering and engine knock

mayflower

alexander fleming and penicillin
wilson greatbatch and the pacemaker

louis daguerre and photography
error

we learn what doesn’t work.

“Mistakes are a part of being human. Appreciate your mistakes for what they are: precious life lessons that can only be learned the hard way. Unless it's a fatal mistake, which, at least, others can learn from.”
- Al Franken, 2002

“being right keeps you in place. being wrong forces you to explore.” - johnson 2010

“the best way to succeed is to double your failure rate” - Thomas J Watson, IBM founder

“Fail often to succeed sooner” - IDEO saying

alexander fleming and penicillin
wilson greatbatch and the pacemaker

louis daguerre and photography
In a study of 2036 scientists throughout history, Dean Keith Simonton found that the most respected produced not only more great works, but also more “bad” ones. Geniuses produce. Period. - michalko, 2001
teams assigned sept 12
creativity counselors

- rory
- joe
- audrey
- genet
- cassie
- kenya
- cici
- jieun
- sophie
- ben
- ashley
- andrew
- nina
- max
- alex
- sarah

7 students/team
1 CC/team
16 teams

TAs grade assignments
Creativity Counselors run critiques & team activities
class format

tuesday/thursday 3:35-5:30

70% - BiWeekly Assignments (blog posts)
10% - Class Participation (being there and on time - attendance policy)
15% - Peer Reviews (blog comments)
5% - Creativity Challenges (online)

sign in today!

lecture slides posted weekly

http://product.design.umn.edu/courses/pdes2701/
Pdes 2701 creative design methods
an intro to early stage product development

Class Details
PDES 2701:
3:35-5:30 in Rapson 56 both
Tuesdays and Thursdays

Team Discussions
After every assignment is due, there
will be a Thursday Team Discussion
during class time. You will be on a
team of 7 students with a Creativity
Counselor. On team discussion days,
you will each have 5-10 minutes to
present your work to your team orally
and visually. The Creativity
Counselors will provide feedback and
also engage the entire team in a
group critique session. Your
presentation should be on your
process as well as your results. Your
presentation should include visuals
from your assignment as posted on
your blog. Creativity Counselors are
all volunteers and they are not
grading you. They are there to
provide feedback and facilitate
discussion. The Teaching Assistants

Weekly Schedule
Module 1 - Creativity

Tues, September 5
Lecture Slides: Course Intro &
Theories of Creativity and Innovation

Thurs, September 7
Lecture Slides: Creativity Assessment
Methods

Tues, September 12
Theme/Project Introduction

Thurs, September 14
Discussion Session: Team Intro,
Review Process and Assess Designs

Assignment —
1) Get a design notebook.
2) Blog Entry 1: Creative
Experimentation
3) Begin Reading A Whole New Mind
and The Creativity Crisis

Module 2 - Play and Humor

Tues, September 19
Lecture Slides: Play, Humor and
Association Based Tools
class format

week 1-2: creativity intro
week 3-4: play, humor, associations
week 5-6: design research, problem finding
week 7-8: blue sky ideation
week 9-10: market research
week 11-12: concept refinement
week 13-14: concept pitching

explore many realms
focus on problem/theme
ideate
converge on top concepts

lectures build on each other...
with one overarching themed project
class format

and some optional...

required design notebook:
documenting every idea you have, assignments, doodles in class, site visits notes, anything related to the project.

choose a notebook that you can make large drawings in and can cleanly scan pages.

required design notebook:
“a public hunch database makes every passing idea visible to everyone else in the organization, not just management. Other employees can comment or expand on those ideas, connecting them with their own hunches about new products or priorities or internal organizational changes.” -Johnson, 2010

https://medium.com
class format
class format
class format
class format
class format
class format
class format

if you did it correctly, you should get your blog page if you type in:

https://medium.com/@yourx500

*make sure you have a recent clear headshot*
class format

- title your story as instructed in class so we know we are grading the correct story

- when you make changes or add new content, keep it all in the same story post and do not create separate stories for each assignment

- the most recent story will show up first on your blog page

- see tutorial on blog posts linked on website

- outline+timeline due day after assigned

each assignment is a new “Story” on your blog
class format

comment on two other student blogs/week (names provided) in the format of three paragraphs: “I like… I wish… what if…” see peer review PDF link on website to know who to review
class format

<table>
<thead>
<tr>
<th></th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week n</td>
<td>Lecture/</td>
<td>New Assignment</td>
<td>Blog Outline &amp;</td>
<td></td>
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<td></td>
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<td></td>
<td>Creativity Challenge</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>Due @ 10pm</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Week n+1</td>
<td>Industry Perspectives</td>
<td>Blog Assignment Due @ 10pm</td>
<td>Team Discussion</td>
<td></td>
<td>Peer Reviews Due @ 10pm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 credit studio class, 2 week long assignments = 18 hours per assignment
Don’t wait until the last days to start the assignments
class format

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<td>Peer Reviews Due</td>
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</table>

Team discussions days are critique sessions and teamwork for the crit, be prepared to present your assignment from your blog to your team for 5 minutes. Use the team monitor to present from your blog. Creativity counselors will lead a feedback session to help you improve. Creativity counselors are not grading your blogs; they are volunteers to give you feedback.
class format
dates!

<table>
<thead>
<tr>
<th>Blog</th>
<th>Theme</th>
<th>Assigned</th>
<th>Due</th>
<th>Peer Rev Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>design process</td>
<td>9/5</td>
<td>9/13</td>
<td>9/15</td>
</tr>
<tr>
<td>2</td>
<td>humor and mind maps</td>
<td>9/19</td>
<td>9/27</td>
<td>9/29</td>
</tr>
<tr>
<td>3</td>
<td>design research</td>
<td>10/3</td>
<td>10/11</td>
<td>10/13</td>
</tr>
<tr>
<td>4</td>
<td>blue sky idea generation</td>
<td>10/17</td>
<td>10/25</td>
<td>10/27</td>
</tr>
<tr>
<td>5</td>
<td>market research</td>
<td>10/31</td>
<td>11/8</td>
<td>11/10</td>
</tr>
<tr>
<td>6</td>
<td>idea refinement</td>
<td>11/14</td>
<td>11/29</td>
<td>12/1</td>
</tr>
<tr>
<td>7</td>
<td>pitching ideas</td>
<td>12/5</td>
<td>12/11</td>
<td>x</td>
</tr>
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note: assignments 3, 4, and 5 require talking to people
blog 7 is part video submission

Tuesday Wednesday Friday
assignment 1

create a new cookie
creative in flavor, form, texture, cooking process, presentation and/or etc

martha stewart's cookies
assignment 1

create a new cookie
creative in flavor, form, texture, cooking process, presentation and/or etc

experiment
iterate
incremental or radical
make mistakes
try many alternatives
make novel combinations
test with friends
document your process
document the recipe
take photos
must be edible
Assignment 1

Create a new cookie
creative in flavor, form, texture, cooking process, presentation and/or etc

Outline + timeline due tomorrow
Final blog post due 9/13
Peer review due 9/15

Post title: cookies

Martha Stewart's cookies
assignment 1

create a new cookie
creative in flavor, form, texture, cooking process, presentation and/or etc

dozens of the same cookies due 9/14 in class

cut 6 into small pieces (so 24 people can try it) allergies?

keep 6 whole for photos and to sell at bake sale! (2 cookies must fit into sandwich ziplock and each bag is sold for $1. Bags stored at room temp over night)
assignment 1

innovate a new cookie
creative in flavor, form, texture, cooking process, presentation and/or etc

remember innovation is: novel + value + feasible (i.e. still is a cookie in some way and people want to eat it)

copying a recipe is not creative. can start with a platform (i.e. a baseline cookie ratio) can consult a flavor thesaurus

random does not imply creative
assignment 1

innovate a new cookie
creative in flavor, form, texture, cooking process, presentation and/or etc

grant achatz
flavor bouncing:
http://www.youtube.com/watch?v=XvhjBXYDdu4
How do you grade creativity?

assignment 1

be creative while doing the assignment but not creative with the rules of the assignment (we are trying to teach you a process)

half points will be given for partially complete sections

does not have to be in this order so it is simple for us to find and give you points

<table>
<thead>
<tr>
<th>Outline/Timeline Check</th>
<th>1 point if completed on time</th>
</tr>
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</table>
| Final Idea + Recipe    | 1 = Clear explanation of final idea with the name of the cookie, a note on why you feel it is creative, a well photographed image of the cookie, the recipe  
0 = No documentation of final idea, missing final image, or description |
| Idea Generation        | 1 = Quality documentation of idea generation process: a short statement on your idea generation process including your inspirations and which ideas you decided to test, and a listing of different ideas (at least 10) as an image or images from your notebook.  
0 = No record of idea generation. |
| Idea 1 Test            | 1 = Quality documentation of testing one direction with clear photographs, a textual description of your evaluation of this idea and what you learned.  
0 = Did not document testing an idea |
| Idea 2 Test            | 1 = Quality documentation of testing a very different idea with clear photographs, a textual description of your evaluation and what you learned. You are welcome to and encouraged to test more than two concepts.  
0 = Did not document testing a second idea |
| Iteration              | 1 = Quality documentation of improving a specific idea through iteration, manipulation, and/or modification. This should include clear photographs of the changes and a textual description of the process and evaluation.  
0 = Did not document iteration |
| Peer Evaluated Present/Content | Scaled out of 1 (in class) |
| Peer Evaluated Creativity | Scaled out of 2 (in class) |
| Peer Evaluated Taste | Scaled out of 1 (in class) |
questions!