dancing with ambiguity
the case for human-centered systems engineering

Swiss Chapter of the International Council on Systems Engineering
Zurich, CH, 8 September 2015

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http://cdr.stanford.edu
context is always knowledge worth having. my context
our context

1,035,968 BCE
60 years in the making

Creative Design
John Arnold and GSB

Product Design Program with Fine Arts Department

Robotic Systems Design with Computer Science and Aero

Team-Based Systems Design (310) with Industry Partners

Smart Product Design (218) with EE and CS

Center for Design Research (CDR) with Industry Partners

Manufacturing Systems Design with GSB and MS&E

Micro Electro Mechanical Systems Design (MEMS) with EE

Human Computer Interaction Design with CS

Learning Design & Technology with Education

Learning Lab with Wallenbergs of Sweden

ME310-global & SUGAR across the world

BioDesign with Biology & Medicine

Foresight Engineering with Industry Partners

Hasso Plattner Institute of Design with HPI Potsdam

Venture Design in India, Nigeria

validated best practices
30 years of design research

... now including the
Hasso Plattner Design Thinking Research Program
and “Understanding Innovation”
Design Thinking Research series, vol.1-6
As of November 2011, the application has been downloaded over 11 million times.

Instagram still has fewer than ten employees, but CEO Kevin Systrom and co-founder Mike Krieger are dreaming big. They report that Stanford Engineering

Stanford Engineering alumni have generated

2.2 million new jobs
and
$1.6 trillion annual revenues worldwide.

10,900 companies created by Stanford Engineering alumni over the decades.
silicon valley eco-system
today we go opportunity hunting
mission

build talent
to create break-through
new product, service,
and business

relationships
hypothesis

the shortest path to better products, services & relationships is through better teams of teams and their dynamics.
value-proposition

create a place where
design research shapes practice
& practice shapes research
d.innovation
while most engineering education is about the facts, figures, and physics of what we know

design innovation is about the intentions, actions, and values that guide how we use what we know
smart systems
software systems
free online classes enrolled 335,000 world wide in 2013
executive boot-camp
addressed by IDEO co-founder, Prof. David Kelley
hunting is all about people
tangible communication
prototype storming
defying gravity
creating ambiguity
building “T” people & “T” teams

in the moment, should I be an “I” shaped or “T” shaped person

(Suzuki’2011)
Design Thinking Behavior

“T” shaped by breadth in behavior

“l” shaped by knowledge in depth
Design Thinking Behavior

In-depth knowledge

“T”

people teams
In-depth knowledge why is it so hard to be an adaptive "T" person

Design Thinking Behavior
people have different ways of thinking, working, and learning

Lande 2009
way points along the passage from a concept to functional proof-of-concept hardware, software, and experience …
team-B’s 8 month passage through the thinking and doing space
team-A’s 8 month passage through the thinking and doing space

A earned a **WOW**

B earned a thank you
precision innovation
the 1\textsuperscript{st} law
never go hunting alone
respect an ancient dictum
this is not hunting
image via Malte Jung, PhD 2012
introducing Stanford’s formula-1 simulator for extreme design innovation

... it is our laboratory
so who is in the lab
graduate design teams
teaching team coaches
professional coaches

Munich Team

Stanford Team

Teaching Team

Project Coach

Teaching Team
culture coaches

- Munich Team
  - Culture Coach
  - Teaching Team

- Stanford Team
  - Project Coach
  - Culture Coach
  - Teaching Team
corporate sponsors
re-inventing the future every 30 weeks

Autumn
explore the problem space

Winter
explore the solution space

Spring
deliver the functional product

Corporate Projects Start

- paper bike challenge
- benchmark prototype
- dark horse prototype
- FUNKY system prototype
- FUNCTIONAL system prototype

Presentation & Documentation

- critical function/experience prototype

whatever it takes to get it done
310-global teamwork

university learning PROCESS CONTENT delivered by industry

Student Teams

Group Liaisons

Corporate Staff & Mgmt

Instructors

Teaching Assistants

coaches
global team of teams
d.space

... where you work defines

• how you work
• who you work with
• what you do, and
• what you create
tangible access
stand-up action
video conference
improvisation
keep them creative
past learning experiences at hand
prototyping tools
accelerate learning