

design thinking  
theory from practice

# dancing with disaster

a case for  
human-centered  
system-resilience

Swiss Chapter of the International  
Council on Systems Engineering  
Zurich, CH, 3 September 2018

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disaster pending

**forecast = 1% chance**  
you will meet a bear on your trek today

**foresight = 100% value**  
prepare yourself to meet that bear

disaster pending

are you ready to  
to meet that bear  
is your team ready

**engineered  
systems !**

**...**

**engineered  
humans ?**

# 60 years of systems-design context evolution

Creative Design  
John Arnold and GSB



1960

1970

1980

1990

2000

2014

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 Pottsdam

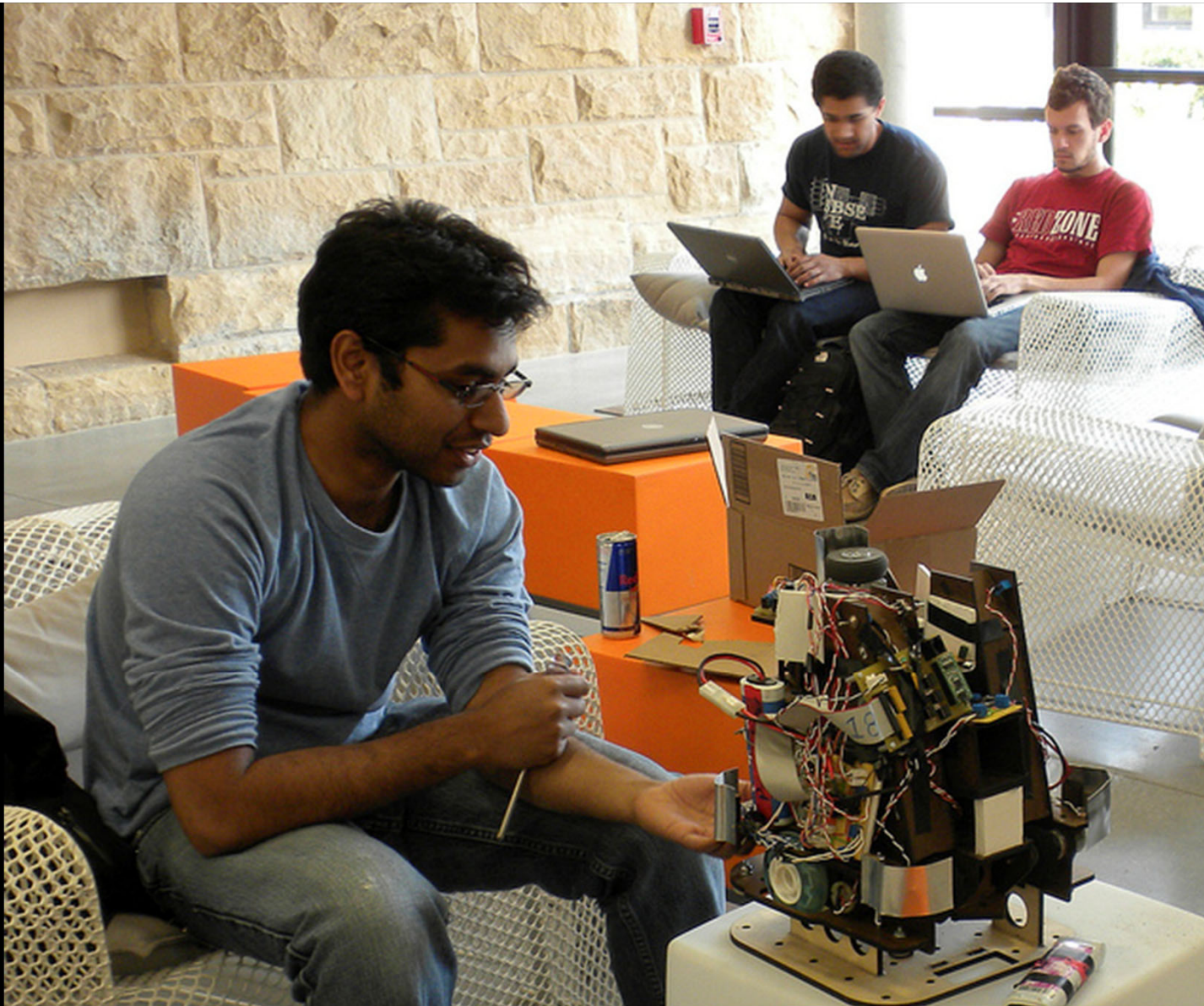
Venture Design in India, Nigeria

# validated best practices

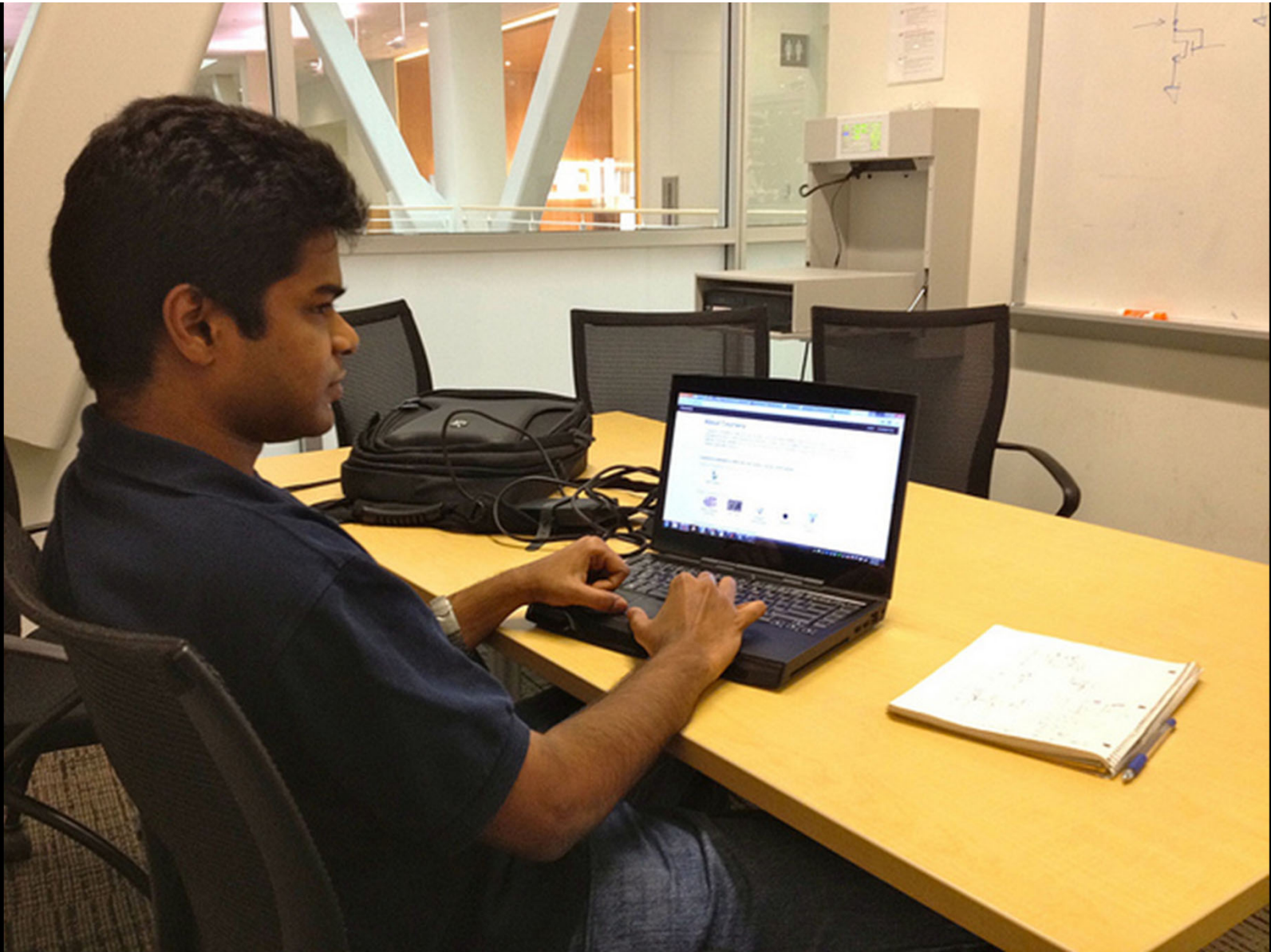
# 35 years of design research



... now including the  
Hasso Plattner Design Thinking Research Program  
**“Understanding Innovation: design thinking research”**  
Springer Vol.1-9, <https://www.springer.com/series/8802>



**smart mechatronics**



**smart software**



**smart executives**

**but not smart enough**



it is all about people



**tangible communication**



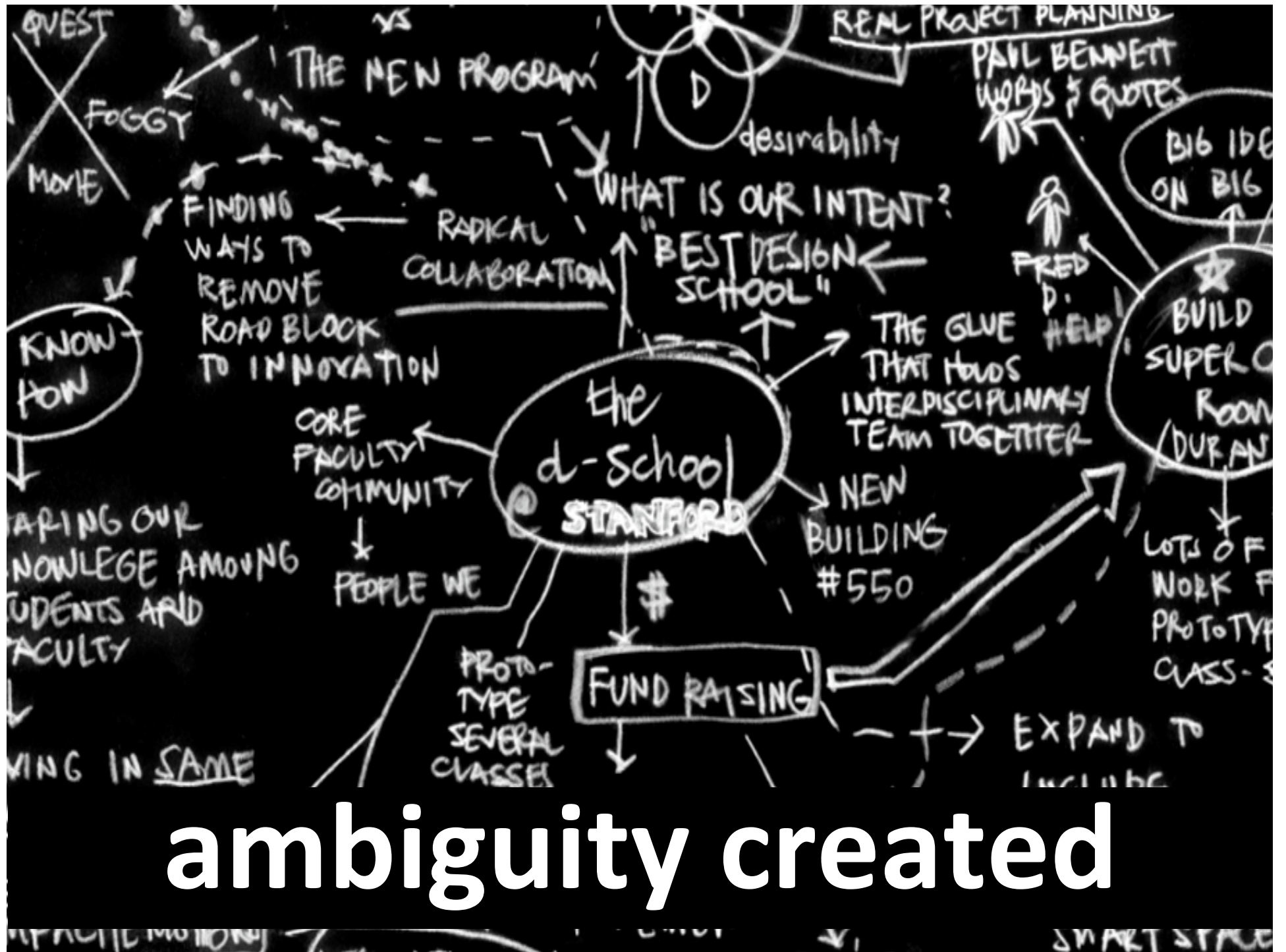
prototype storming



learning accelerated



gravity defied



ambiguity created

# building “T” people & collaborative “T” teams



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

(Suzuki'2011)



Design Thinking Behavior

“I”

shaped by  
knowledge  
in depth

In-depth knowledge

“T”

shaped by  
breadth  
in behavior



Design Thinking Behavior

Design Thinking Behavior

Design Thinking Behavior

Depth knowledge

Depth knowledge

In-depth knowledge

**“T”**  
people  
teams

# why is it so hard

Design Thinking Behavior

in-depth knowledge

to be an adaptive  
“T” person team across cultures

**FORESIGHT**  
thinking  
working  
& learning

**DESIGN**  
thinking  
working  
& learning

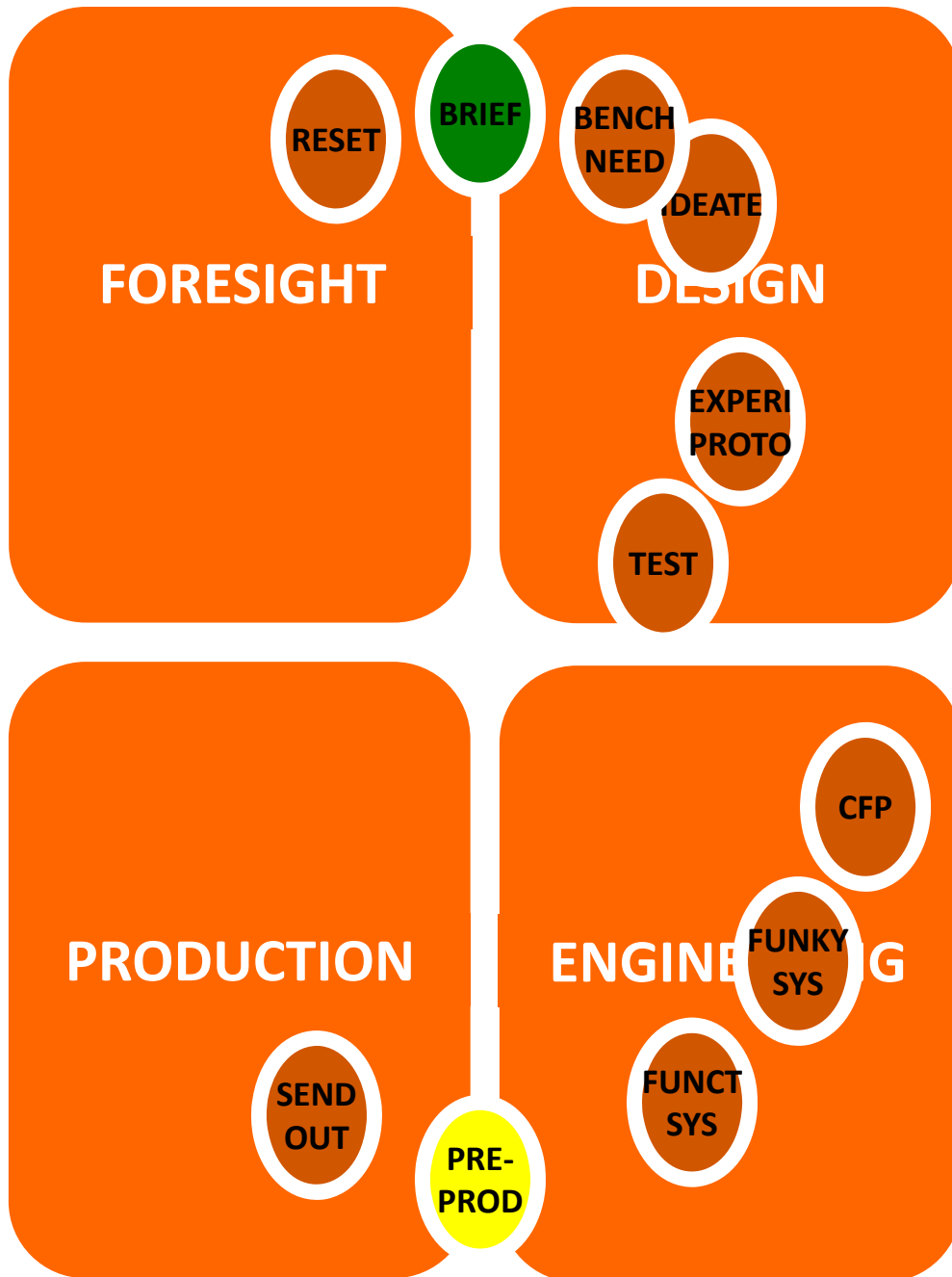
**PRODUCTION**  
thinking  
working  
& learning

**ENGINEERING**  
thinking  
working  
& learning

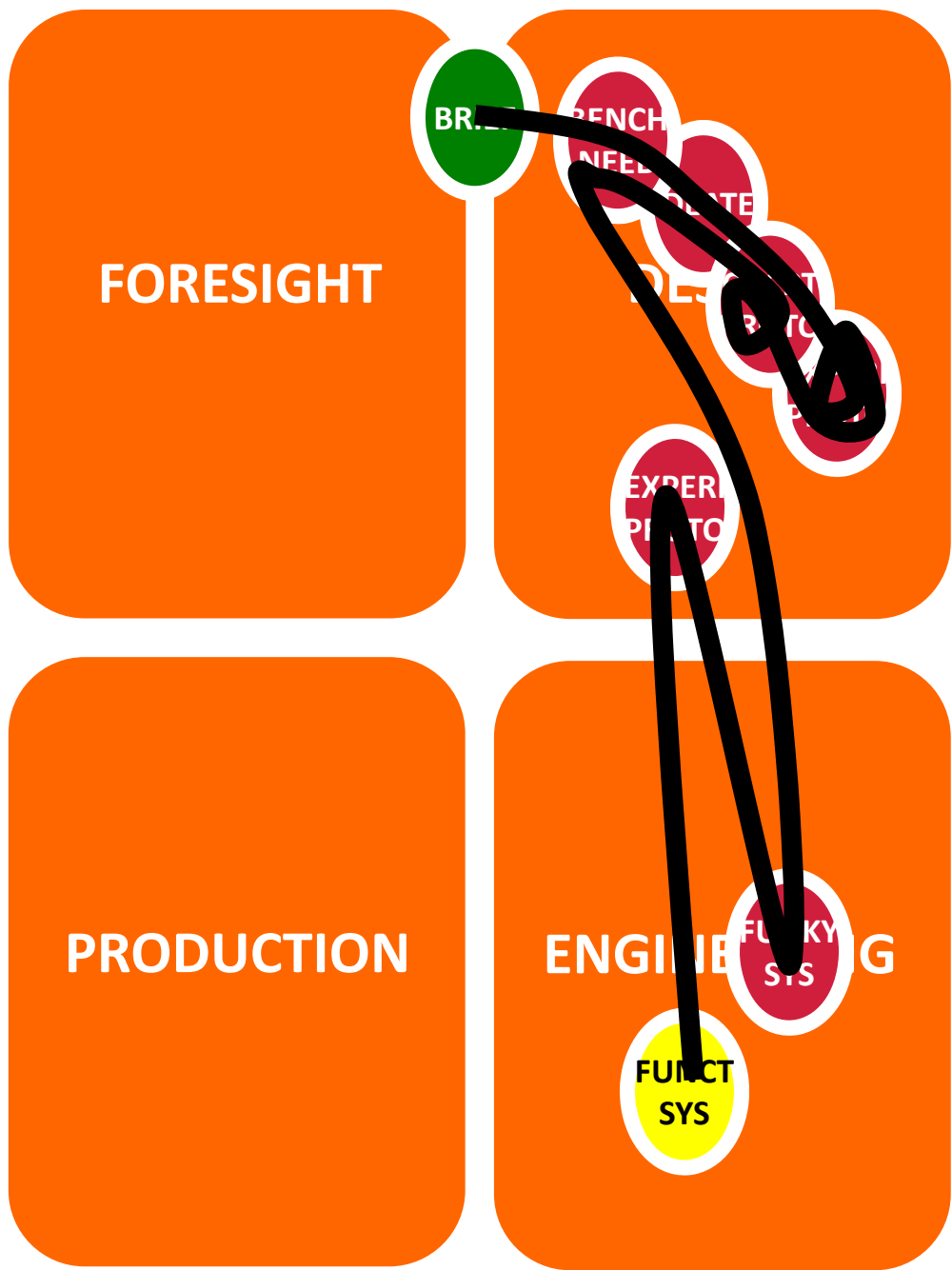
**people**

**have different  
ways of thinking,  
working, and  
learning**

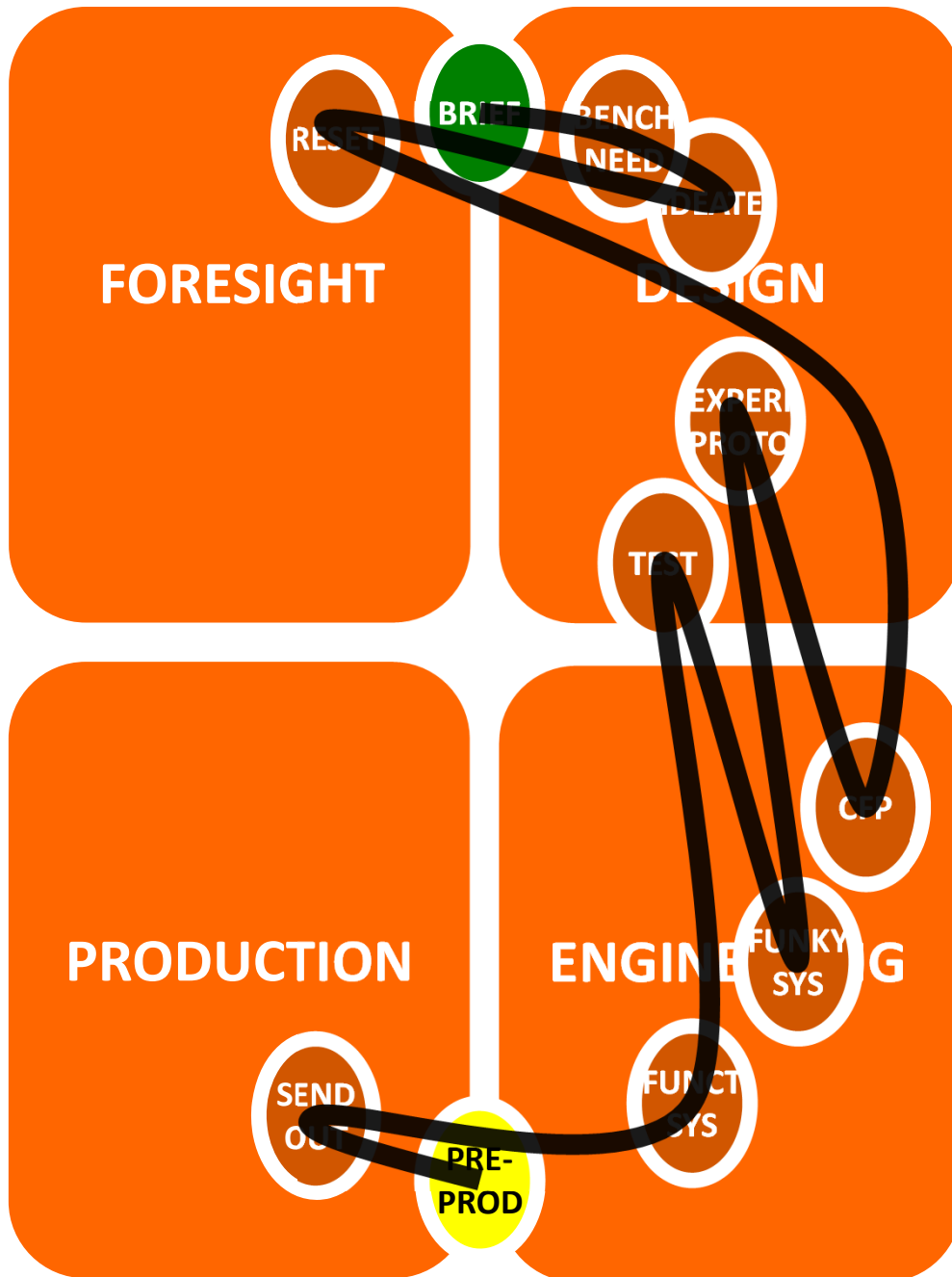
Lande 2009



way points  
along the  
passage from  
a concept to  
functional  
proof-of-concept  
hardware,  
software, and  
experience ...



team-B's  
9 month passage  
through the  
thinking and doing  
space



team-A's  
9 month  
passage  
through the  
thinking and doing  
space

A earned a **WOW**

B earned a thank you

# deliver triple **WOW**

- ◆ breakthrough product/service **design**  
**WOW**
- ◆ breakthrough **systems engineering**  
**WOW**
- ◆ breakthrough **business model**  
**WOW**

**re-designing**  
the future of  
**engineered systems**  
and  
**engineered humans**

extreme case study

need-find, conceive, build-test

**re-invent the  
construction industry**

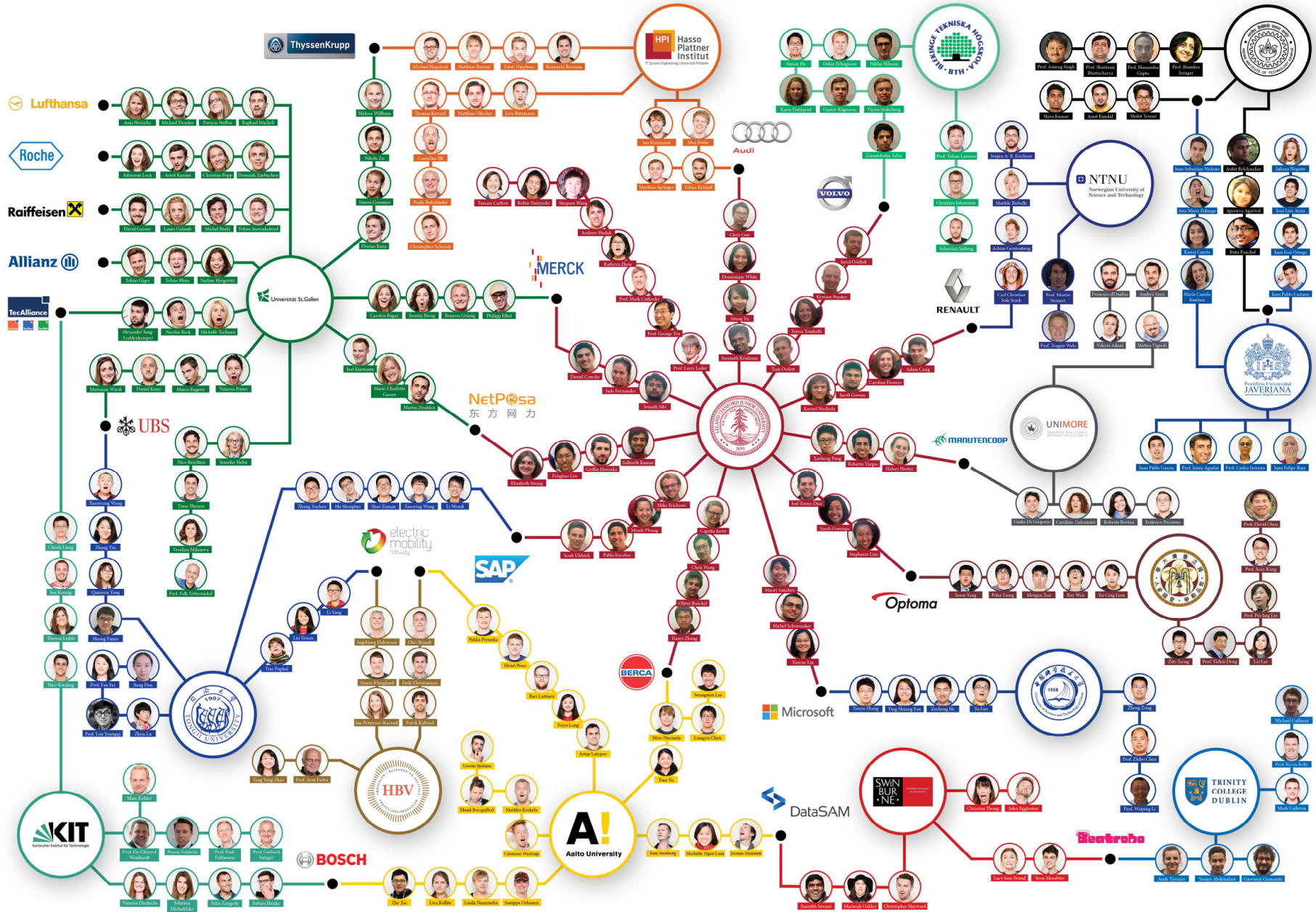
for Volvo-Construction-Engineering, SE,  
with Blekinge Tekniska Hogskola, SE

...

Stanford-ME310-2018

**cut to**  
Volvo-CE-2018 video

# our team-of-teams



# our academic teams



**UNIMORE**  
UNIVERSITÀ DEGLI STUDI DI  
MODENA E REGGIO EMILIA



**ParisTech**  
INSTITUT DES SCIENCES ET TECHNOLOGIE  
PARIS INSTITUTE OF TECHNOLOGY



**NTNU**  
Kunnskap for en bedre verden

**A?**



**KIT**  
Karlsruher Institut für Technologie



**HPI** Hasso  
Plattner  
Institut  
IT Systems Engineering | Universität Potsdam



Technische Universität München



**TKK**



BLEKINGE TEKNISKA HÖGSKOLA



Universität St.Gallen

# our corporate teams



NEW YORK TIMES BESTSELLER

"In addition to being a fascinating and colorful read, this book is an indispensable guide to organizational change." —WALTER ISAACSON, *from the foreword*

TEAM  
— OF —  
TEAMS

NEW RULES OF ENGAGEMENT  
FOR A COMPLEX WORLD

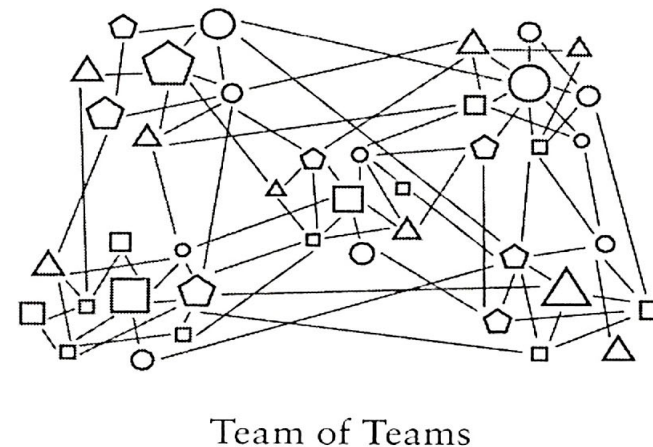
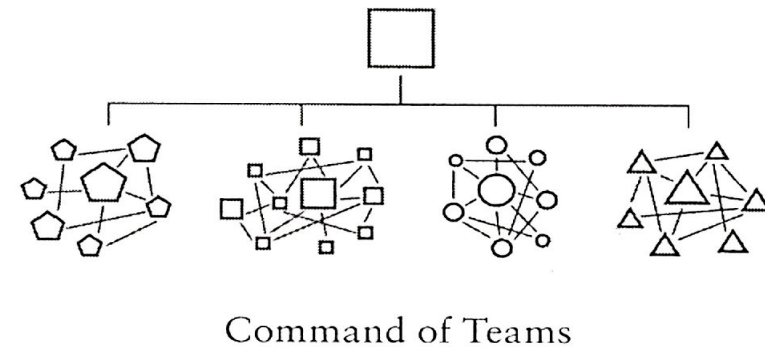
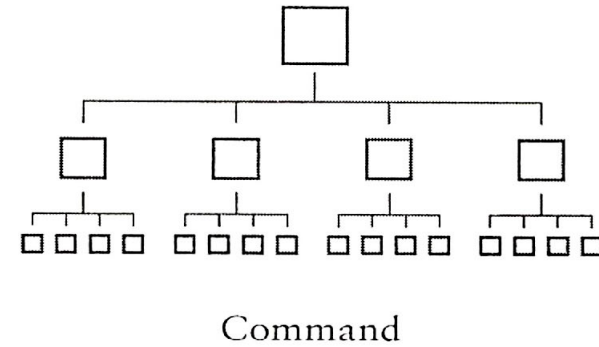
GENERAL STANLEY  
**McCHRISTAL**

U.S. Army, Retired

with Tantum Collins, David Silverman,  
and Chris Fussell

The grand challenge to 20<sup>th</sup> century organizations locked into the “Command” model is to become a **“Team of Teams”** to cope with 21<sup>st</sup> century complexity

Stanley McCrystal, Tantum Collins, David Silvermann, and Chris Fussell, “TEAM of TEAMS: new rules of engagement for a complex world” 2015



# FRAME INNOVATION

CREATE

*NEW THINKING*

BY DESIGN

**KEES DORST**

---

**OPEN**

NO BOUNDARIES

**COMPLEX**

MANY ELEMENTS AND RELATIONSHIPS

**DYNAMIC**

CHANGE OVER TIME

**NETWORKED**

ACROSS ORGANIZATIONS

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**ON THE NATURE OF CONTEMPORARY PROBLEMS**

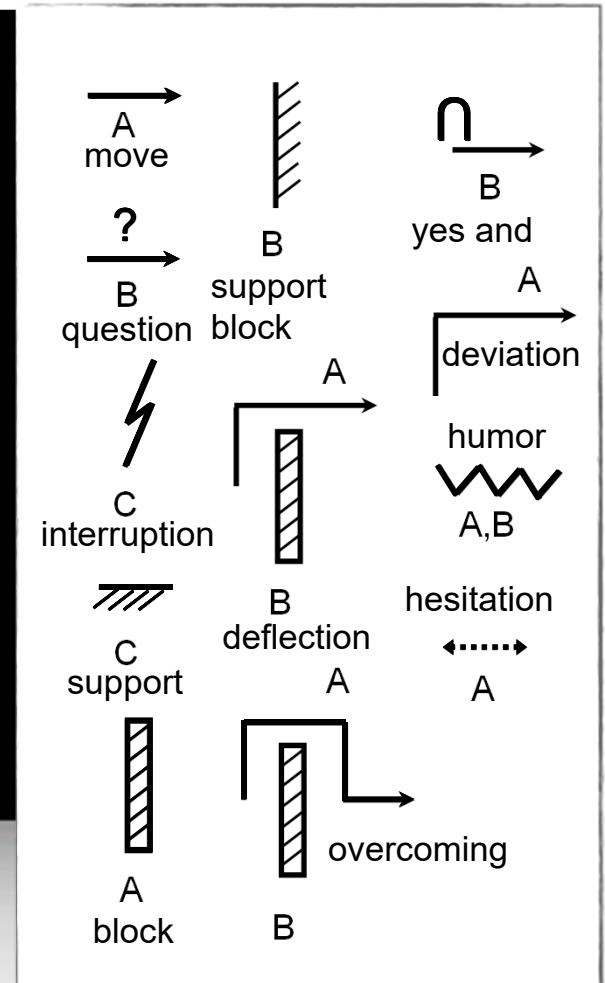
Kees Dorst, "Frame Innovation:  
creative new thinking by design" 2015

team performance  
quantified using the  
**Interaction  
Dynamics  
Notation**

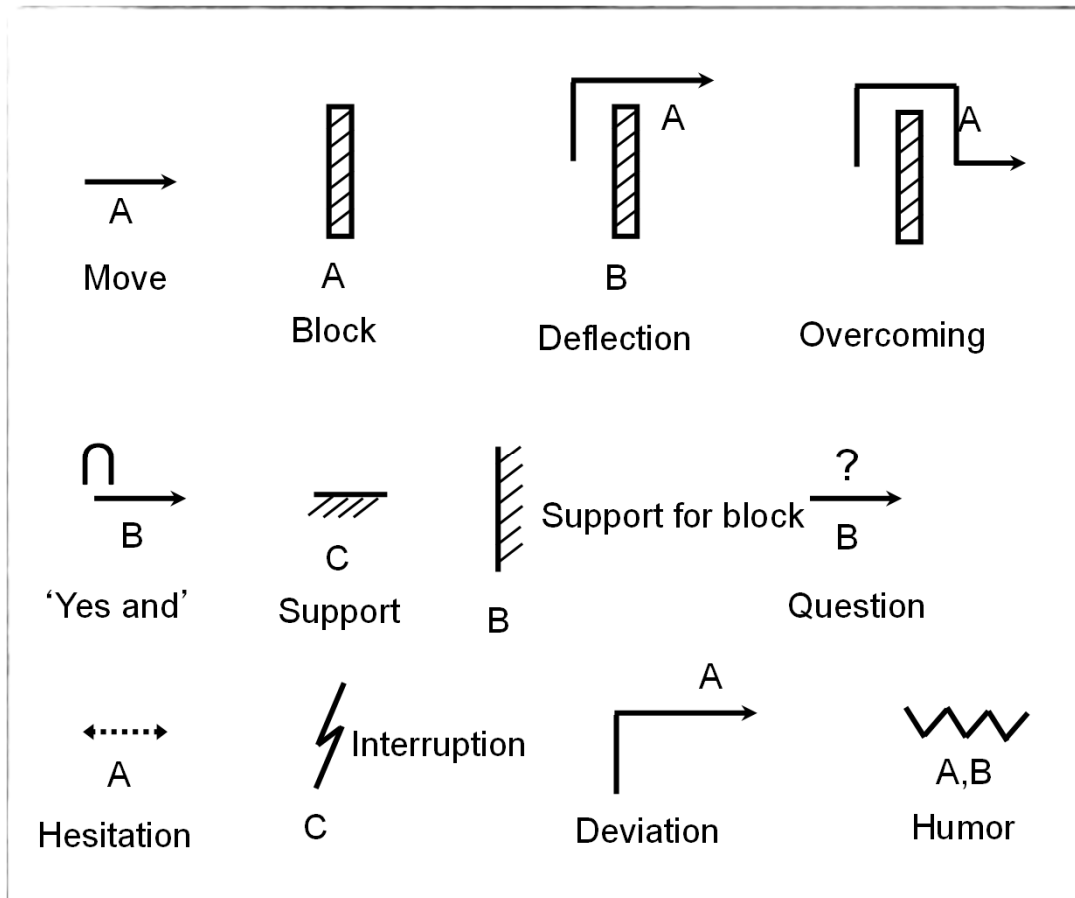
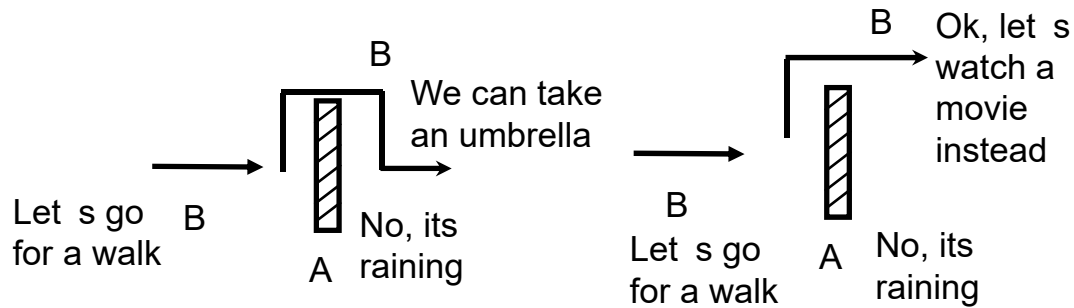
Sonalkar PhD 2012

# observing design behavior

Sonalkar PhD 2012



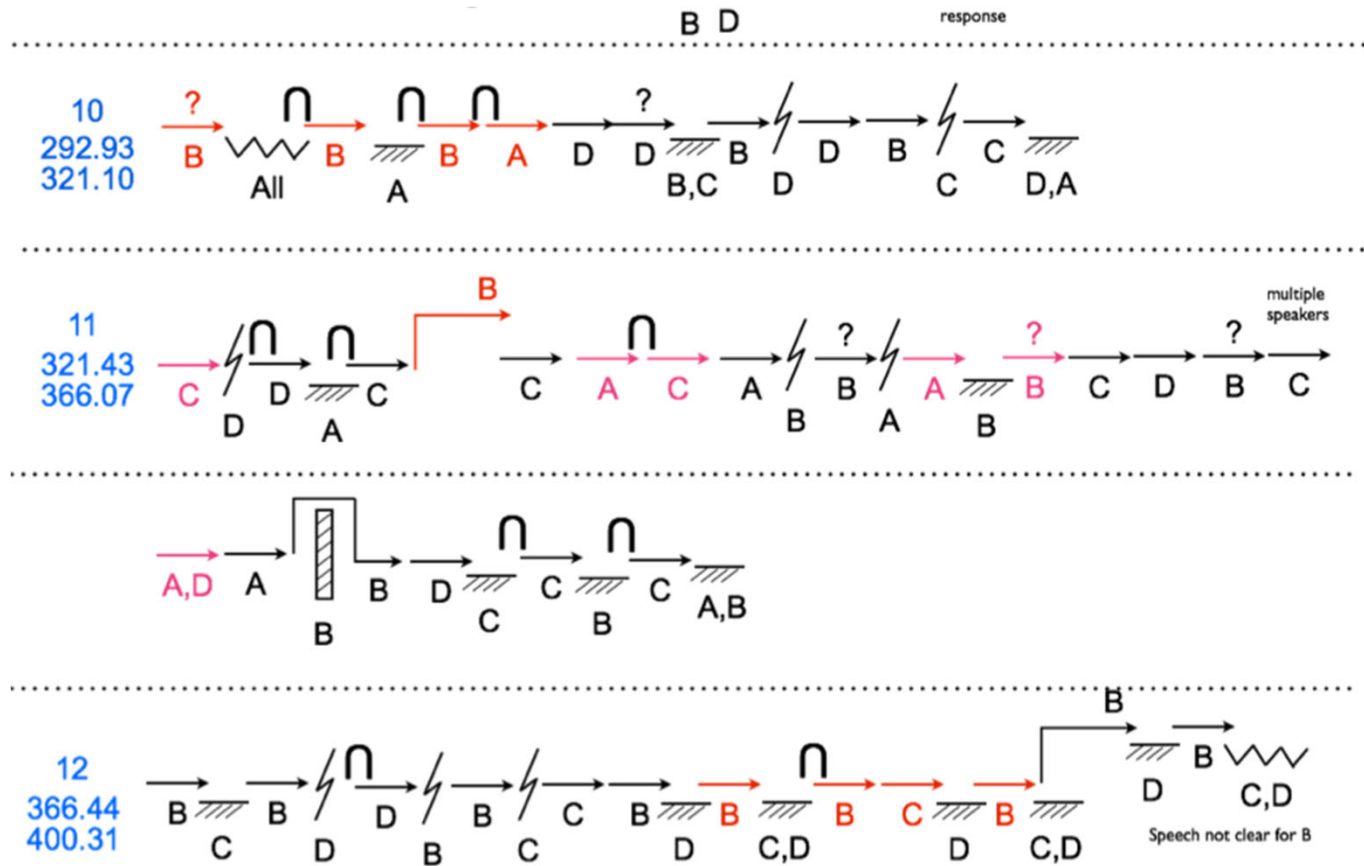
# IDN is the DNA of teams



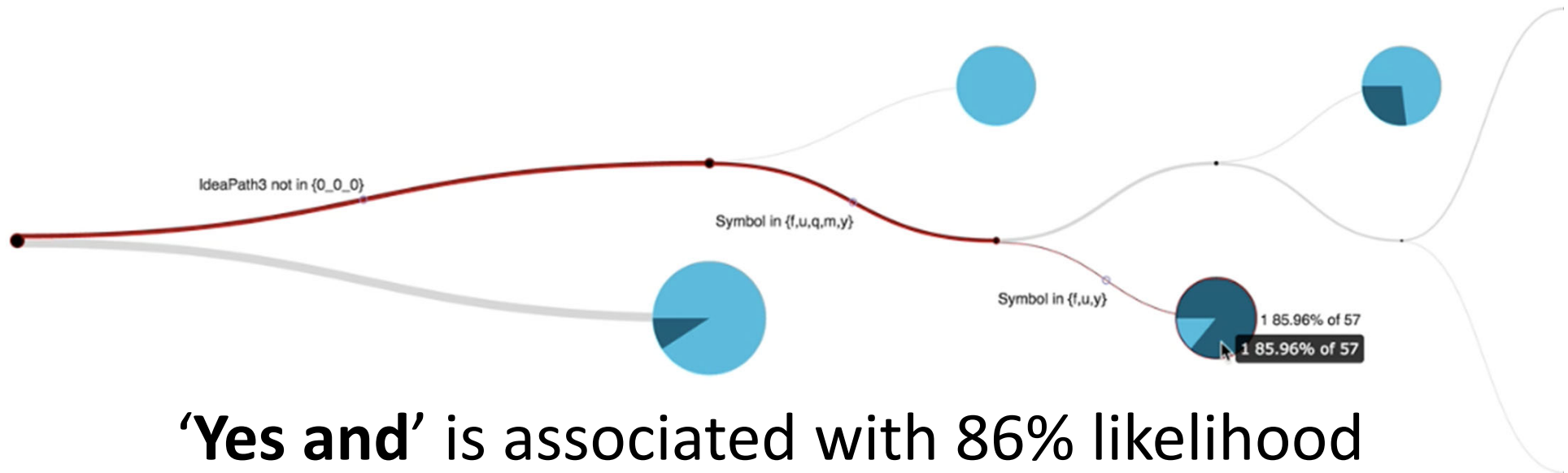
## Improvisation Principles

- Yes And. Extend the narrative by contributing to it.
- Don't block. A block is a denial of reality that has been established in a narrative.
- Make your partner look good. Support your partner in the process of narrative development rather than competing.
- Don't write the script in your head.
- Listen to the group. Maintain an awareness of others' responses in the moment and in context of the unfolding narrative.

# it is foundational **design** knowledge



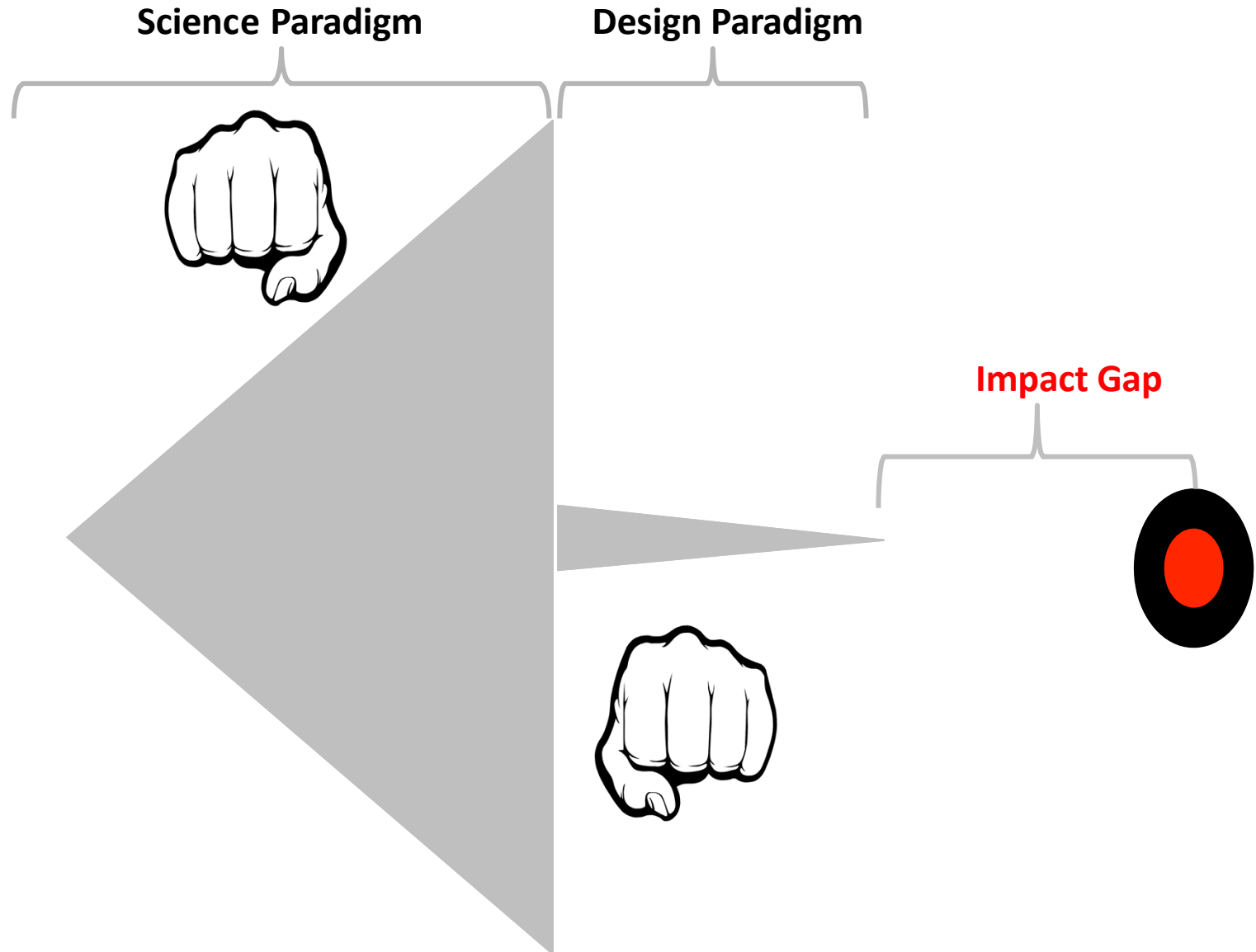
# foundational **design** knowledge + big data genetic pattern discovery



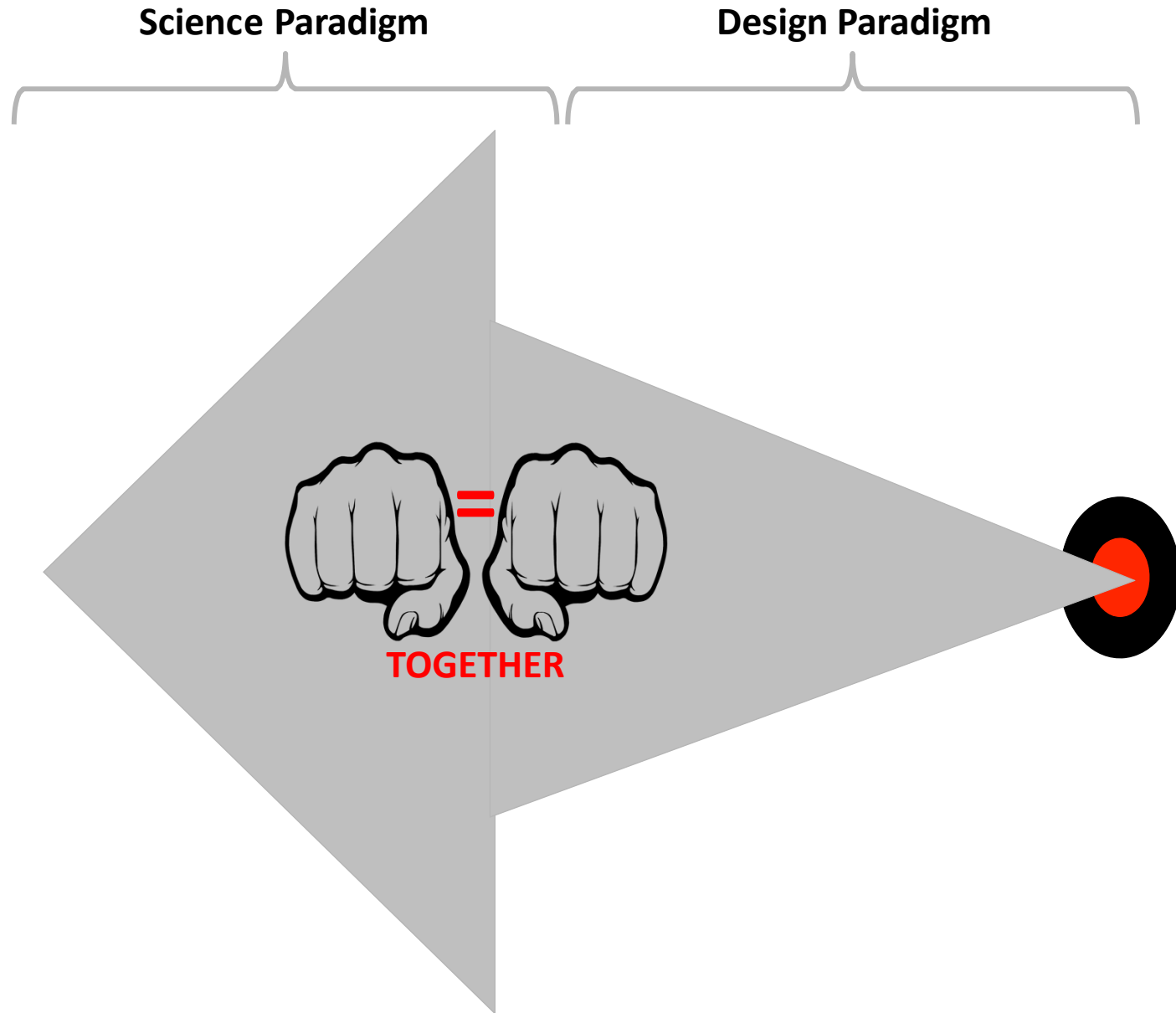
**‘Yes and’** is associated with 86% likelihood  
of a fresh-idea occurrence.

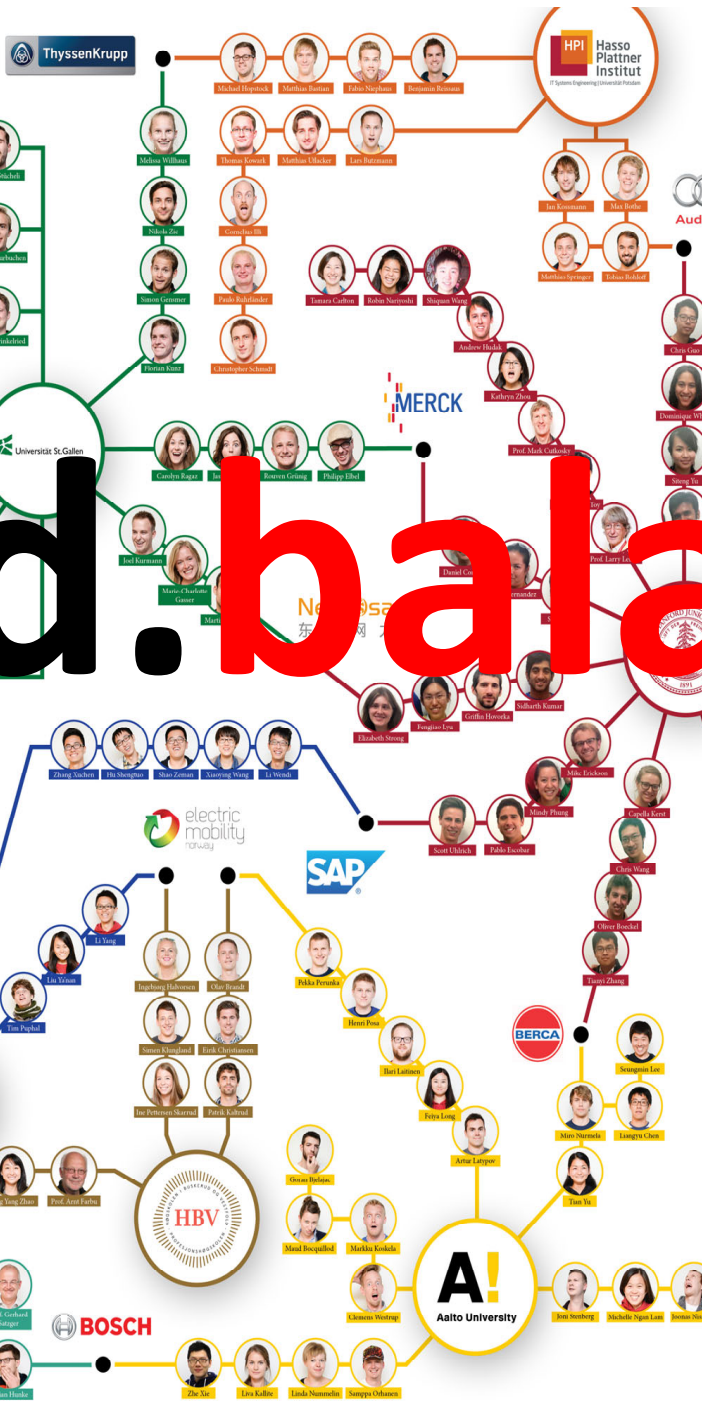
show them how to  
**take it home**

# imbalance in effort, freedom, funding and impact

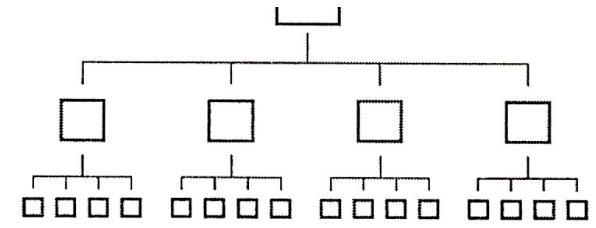


# improve the balance ... improve the impact

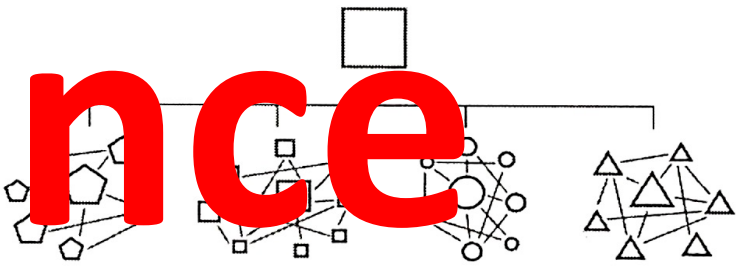




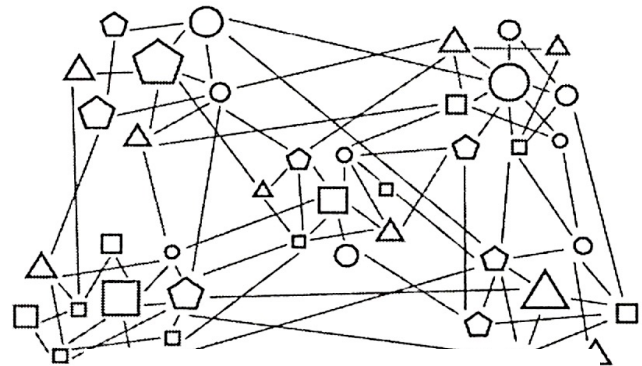
d.balanced



Command



Command of Teams



Team of Teams

# today's equation for break-through innovation

$$i = (m + e + o + s)c^x$$

**i**nnovation = **m**inds + **e**motions + **O**rganizations  
+ **S**paces during **t**eam **C**ommunication  
**even more radical, relevant, & rigorous**  
working **creatively** together

d

