

VALUING DESIGN

Alice M. Agogino
Mechanical Engineering
UC Berkeley



“Everywhere you look today
design has taken on new meaning.
Design (is critical) to business.
The trick for all business people today
is to **learn to think like designers.**”

- Fast Company magazine, 1999

Metrics for Valuing Design

- Usage
- Performance Ratings (J.D. Power, Consumer Reports)
- Expert Evaluation (IDEA/ Business Week, Consumer Electronics awards)
- Creativity (novelty, variety)
- Financial (stock performance, revenues, sales)
- Process (multidisciplinary team work, human-centered design)
- Societal Impact (environmental, emerging regions)





Nicholas
Kirkwood
Ankle Boots



Nest:
Gizmodo –
most popular
of 2013

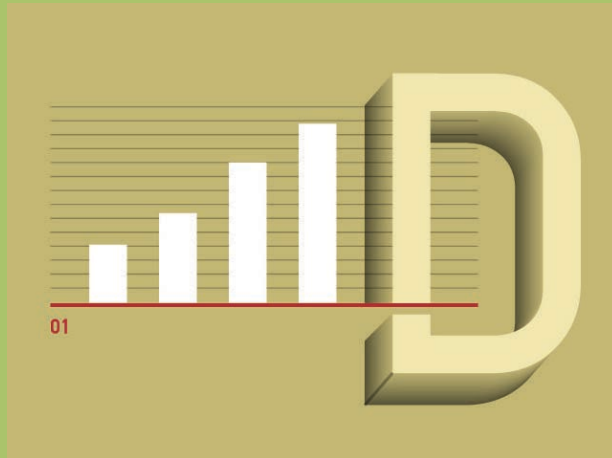


USAGE



USAGE

Forbes Top Brands, 2015 – <http://www.forbes.com/powerful-brands/>



PERFORMANCE RATINGS

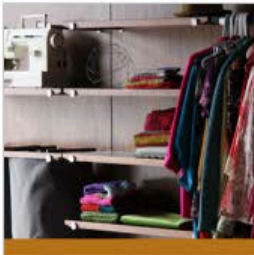


EXPERT RATINGS OF DESIGNS



IDEA 2013 **GALLERY** PREMIUM LISTING

FIRMS



Henrybuilt Opencase Wall System



Arione Gen II - Designing the Ultimate Bike Saddle



SodaCaps



VESTA "pressure vacuum sintering furnace..."



2nd GENERATION PORTABLE GENERATOR



BeneView T1



Vertigo™ Hybrid Guitar Case



Portable Battery Charger
Ripple Series 3000/5000/...



Sablier the concave watch



Scotch-Brite™ Bird Sponge

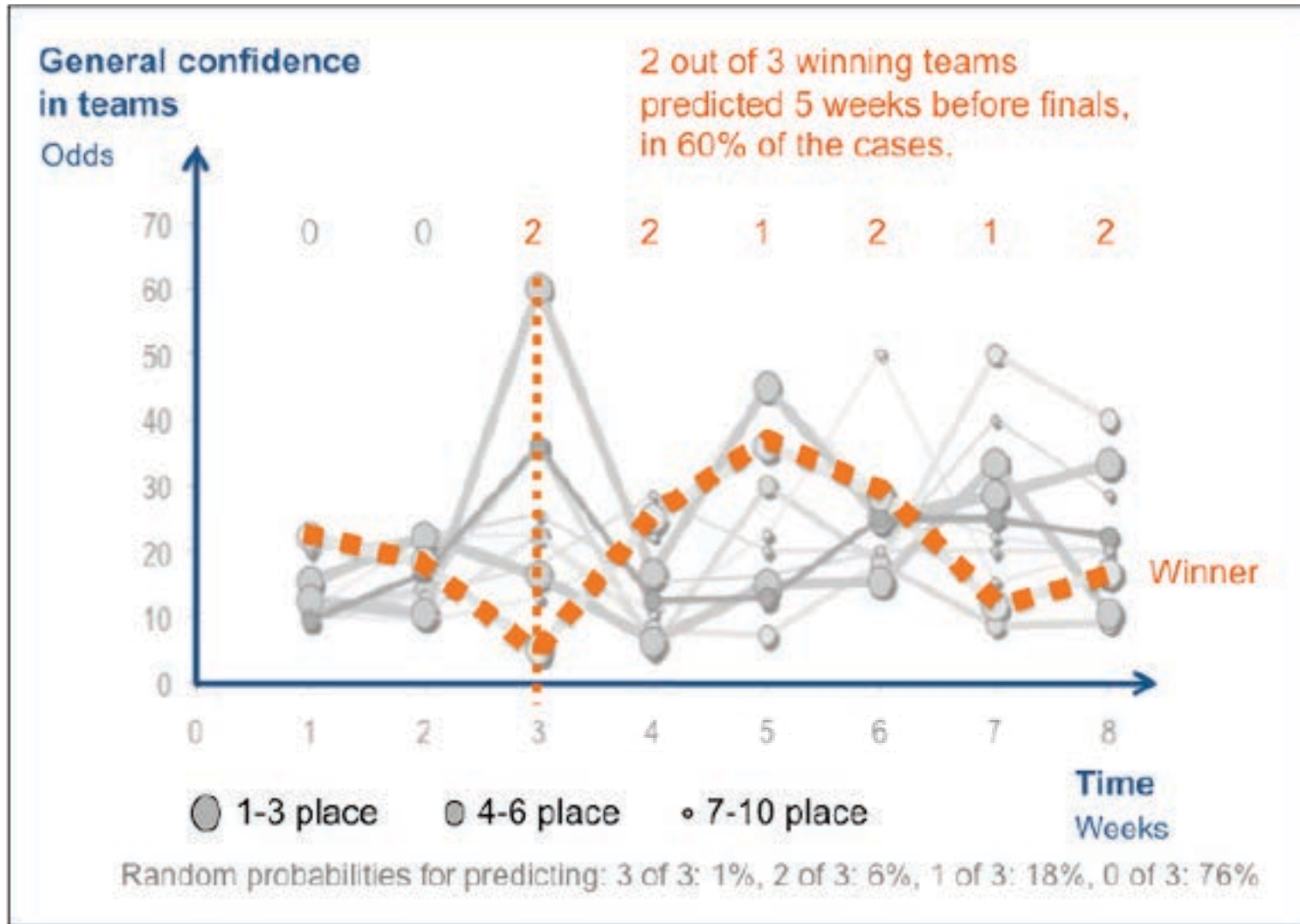


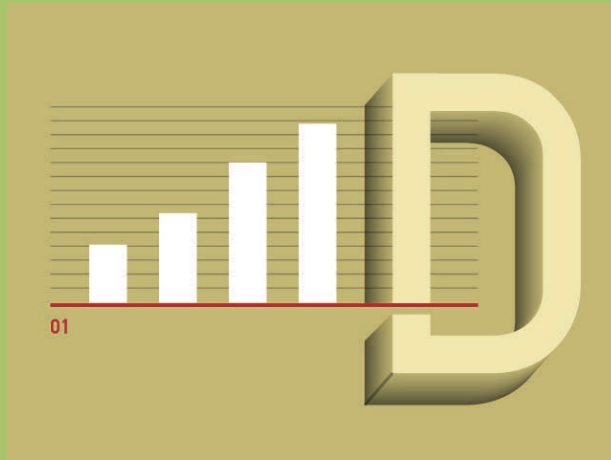
BOX Dispenser of
SCOTCH® Magic™ Tape



Post-it® Big Pad

Prediction Markets for Breakthrough Innovations

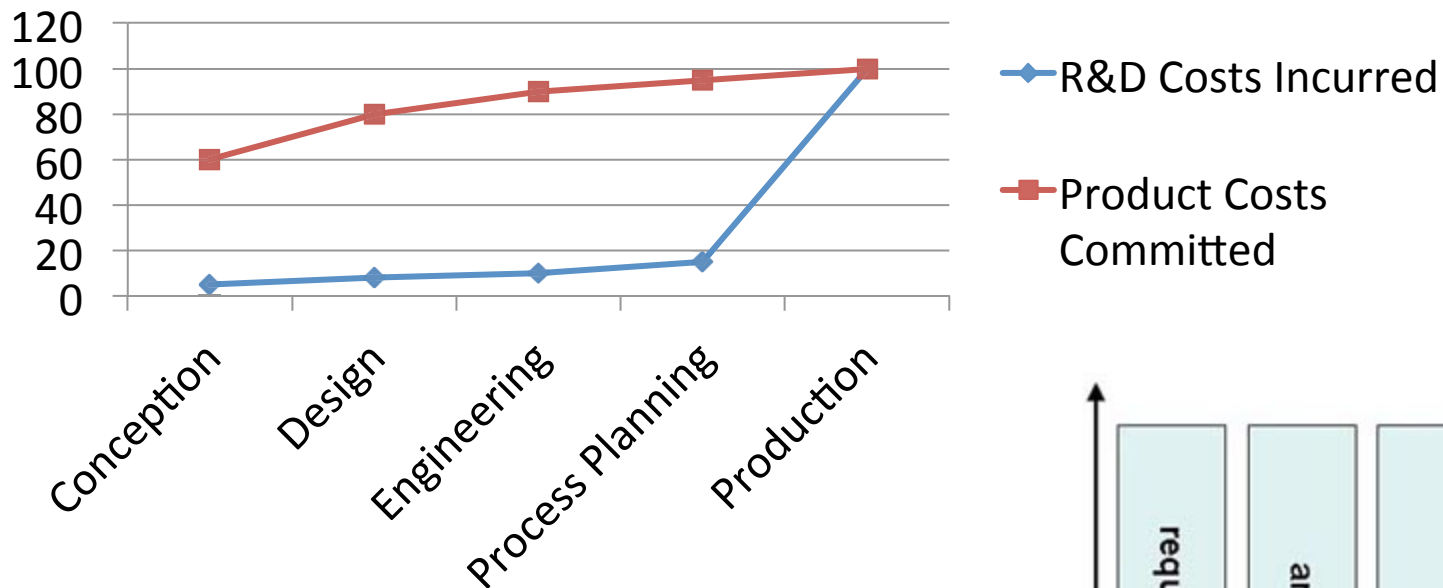




42.45	40.18	27.08	+0.46	2.09%
21.15	26.07	22.47		
22.59	21.71	22.47	-1.26	-5.12%
23.97	22.74	23.37	+12.40	3.27%
391.70	377.43	391.55	+0.74	0.78%
95.67	93.96	95.61	+0.42	1.69%
25.32	24.74	25.22	+0.30	1.22%
24.89	24.35	24.82		

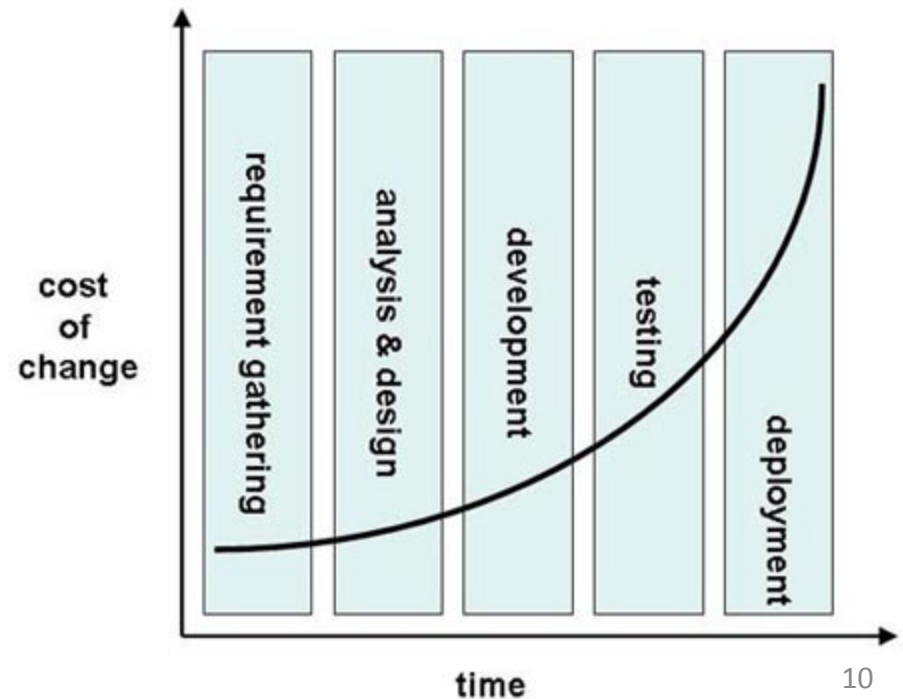
DESIGN PROCESS AND FINANCIAL IMPACT

Early Phases of the Design Process Impact Product Cost



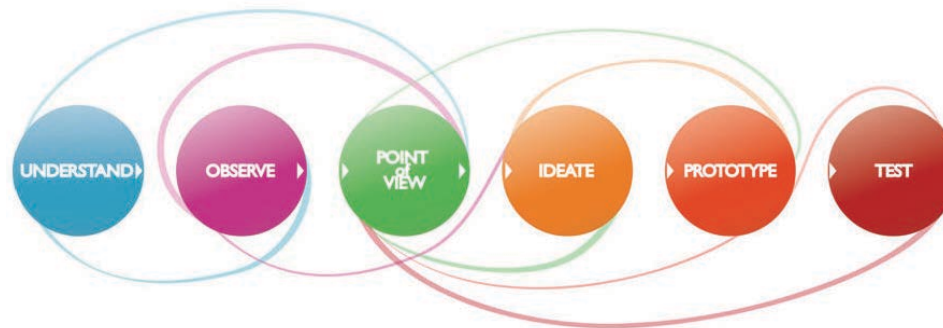
Late changes
are costly

[IQcontent, 2008](#)

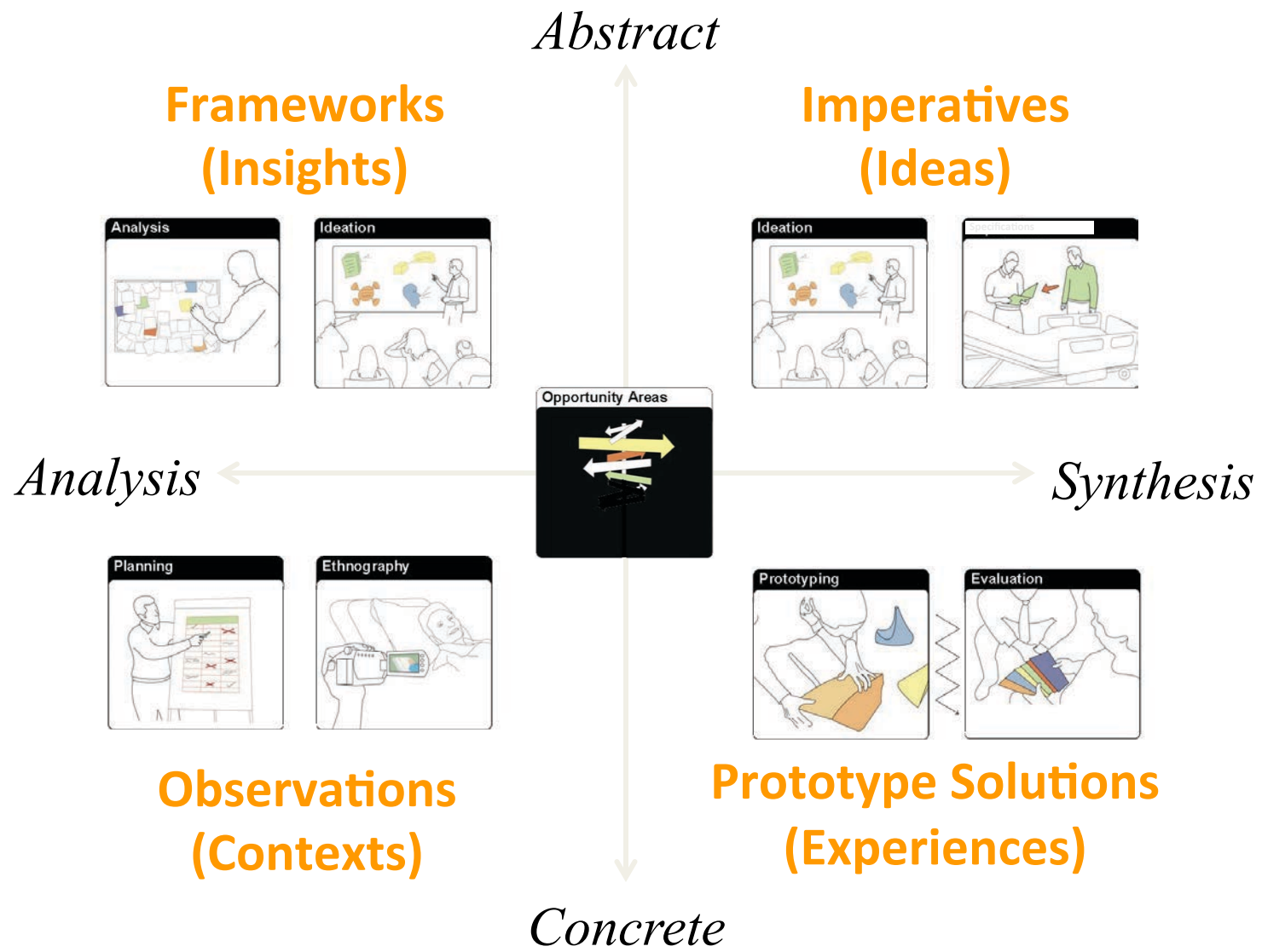


ISO Standard for Human-Centered Design

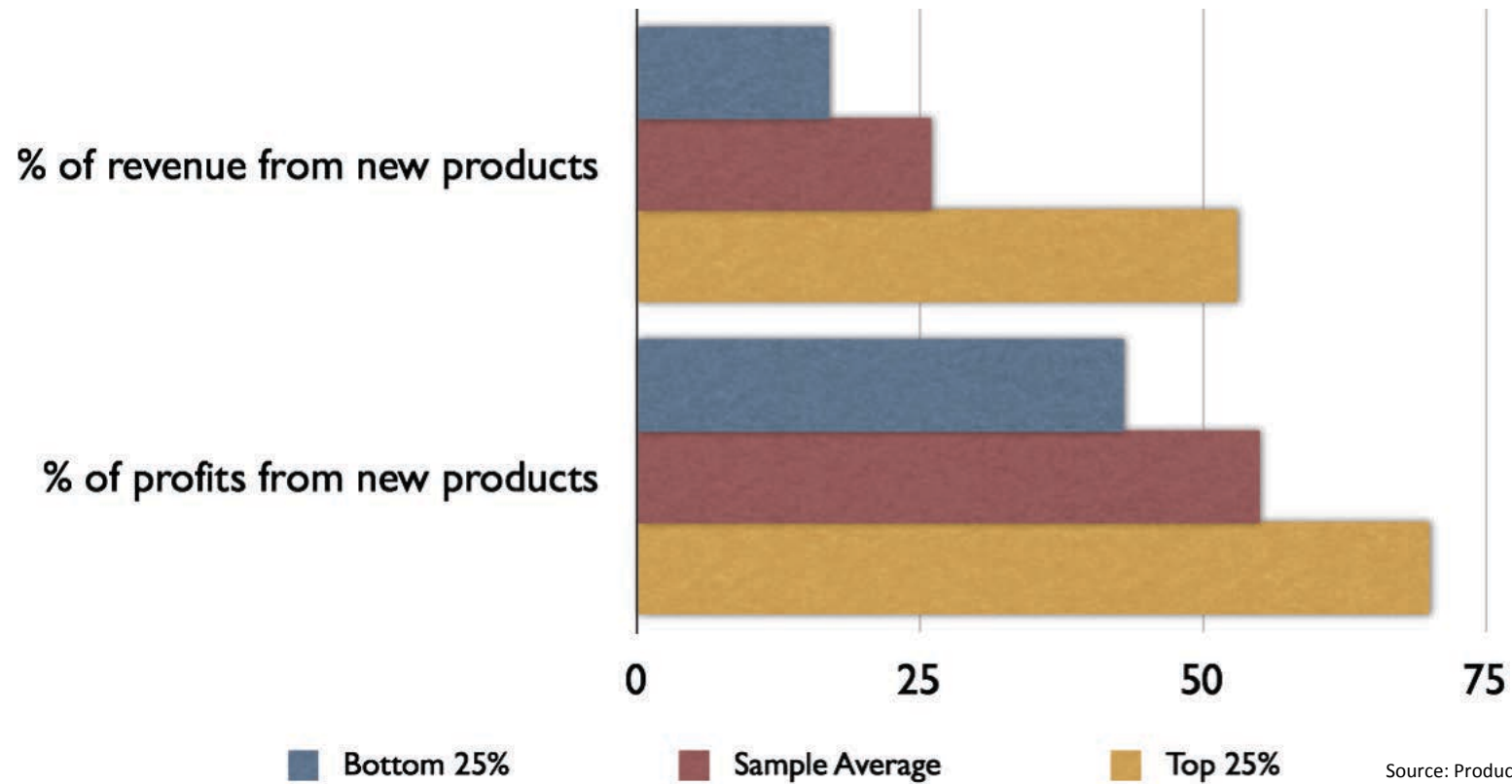
- Design is based upon an explicit understanding of users, tasks & environments,
- Users are involved through design and development,
- Design is driven and refined by human-centered design evaluation,
- The process is iterative,
- The design addresses the whole user experience, and
- The design team included multidisciplinary skills and perspective.



Design Thinking – UC Berkeley

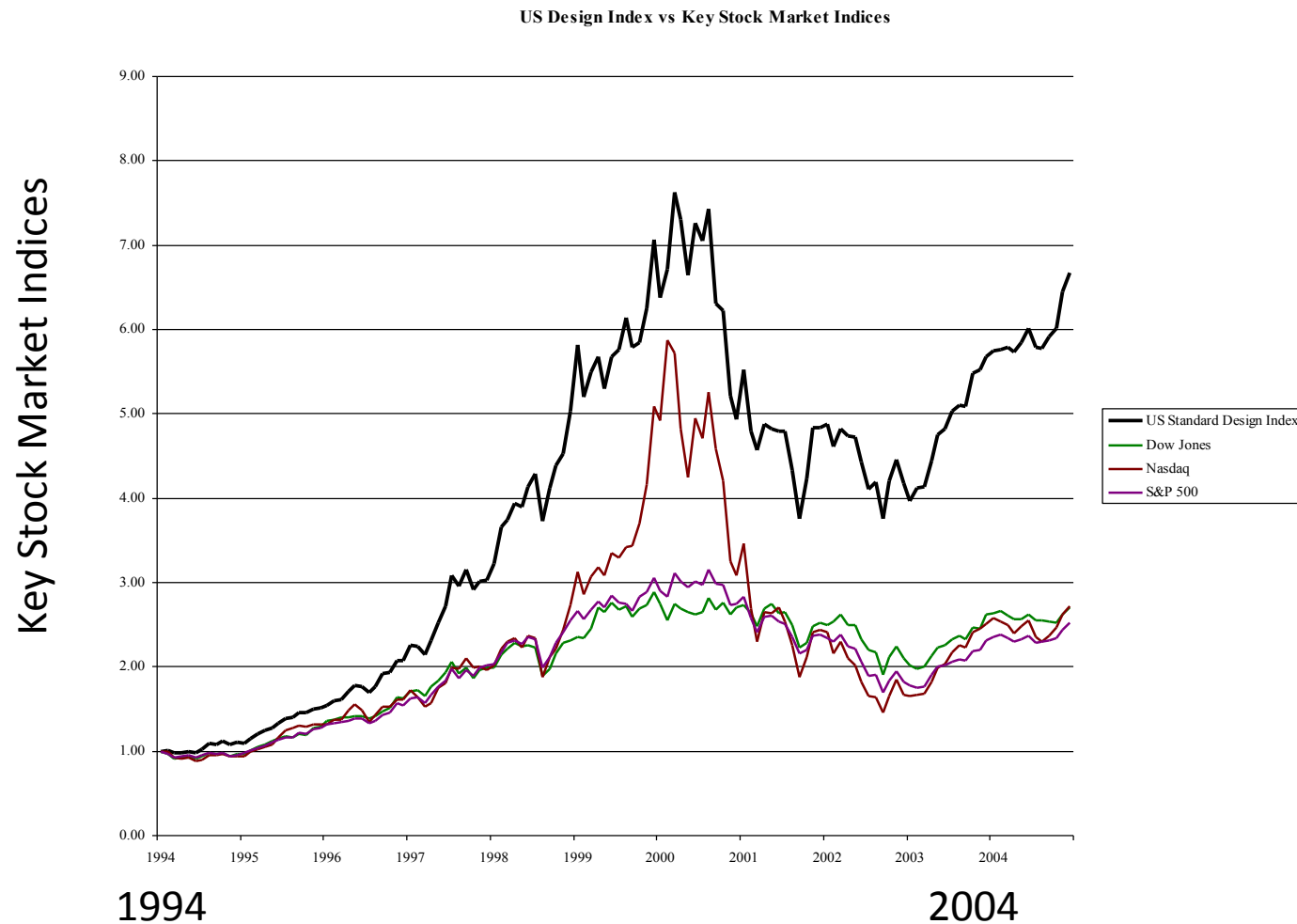


Benefits of a Well-Managed Product Development Process



Source: Product Development Institute, Inc.

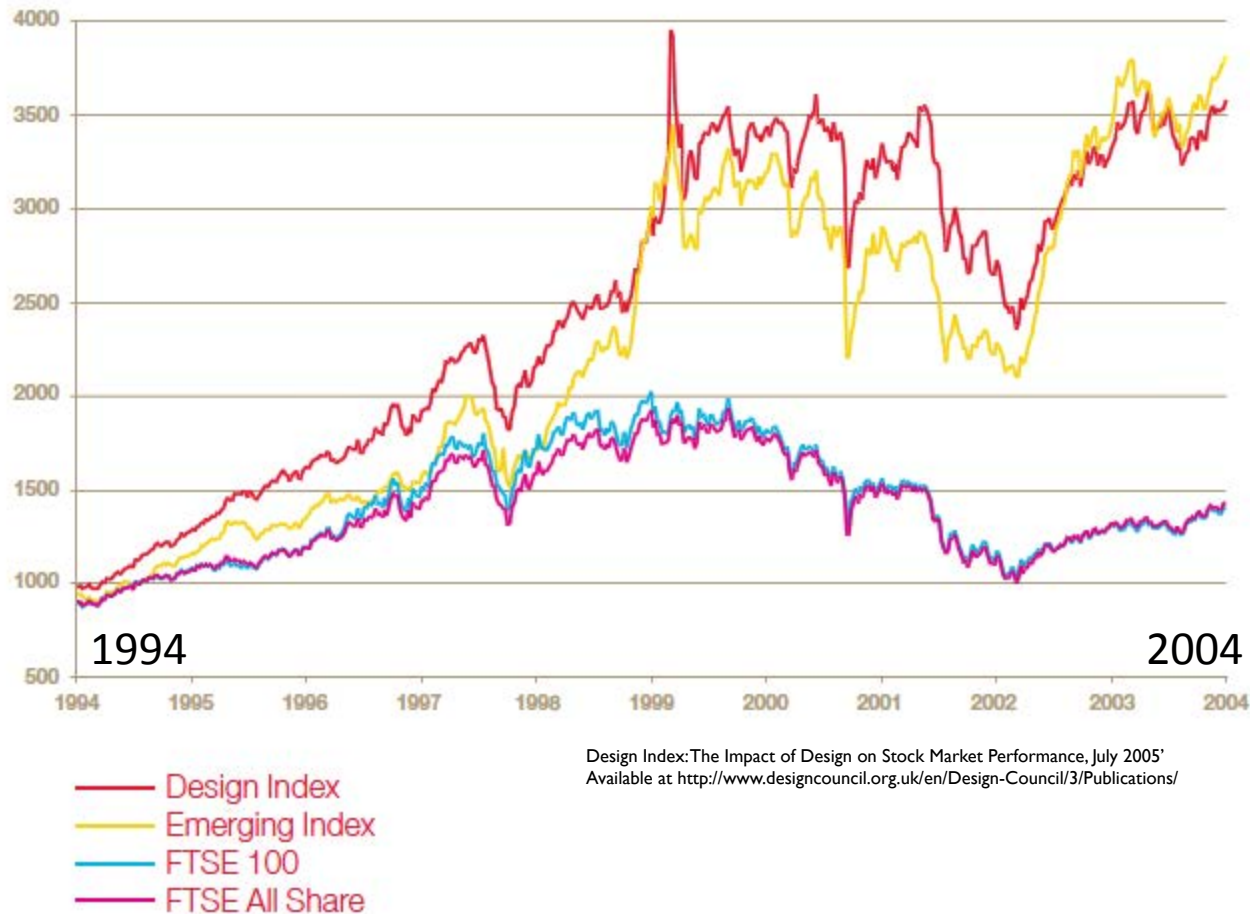
Evidence from the Corporate Design Foundation



BusinessWeek IDEA Design Award winners outperform those who didn't win in stock performance

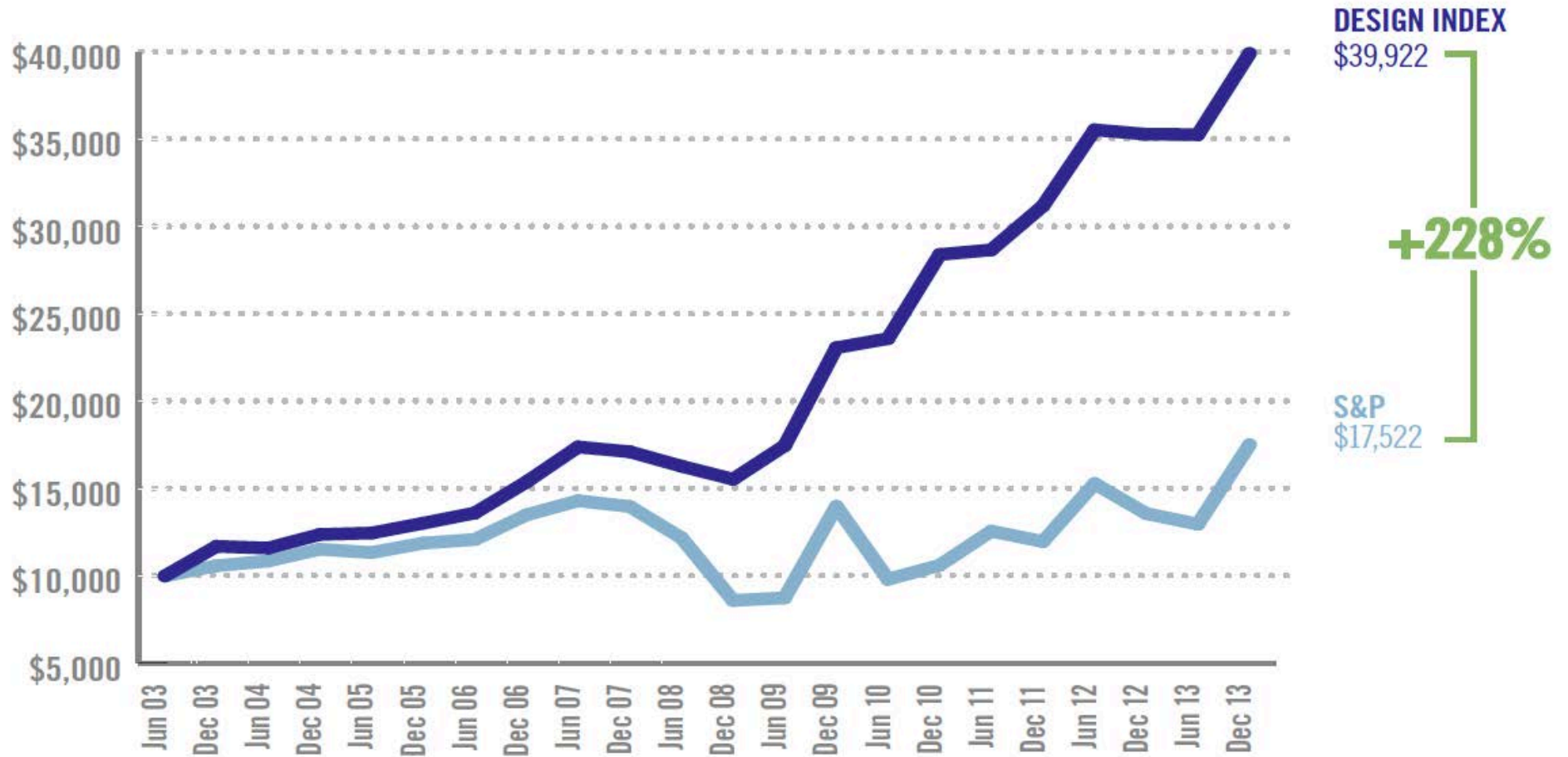
Evidence from the UK Design Council

Chart 1: Ten-year performance 1995-2004



Firms with “design portfolios” outperform those without them in the stock market

Design Value Index



[What is the Real Value of Design](#), Jeneanne Rae, *Motiv Strategies & Design Management Institute*, 2014

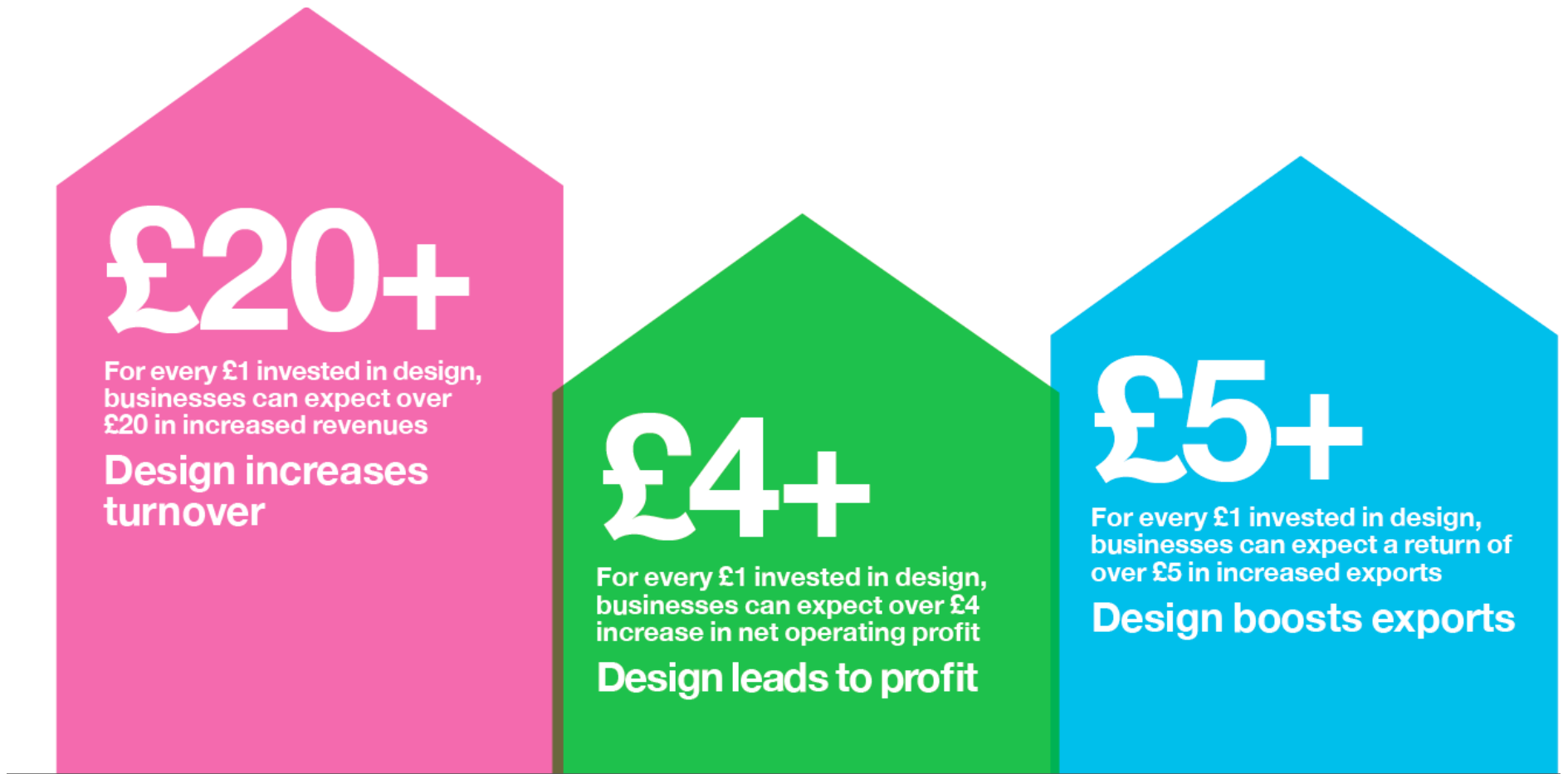
Design Value Index Selection Criteria

1. Publicly trades in the U.S. for 10+ years
2. Scale of integrated design organization & deployment as catalyst for change
3. Growth in design-related investments
4. Design is embedded within the organization
5. Design leadership at all levels
6. Senior-level commitment to design as an innovative resource for positive change

Portfolio of Design-Centric Organizations: Design Value Index

- Apple
- Coca-Cola
- Ford
- Herman-Miller
- IBM
- Intuit
- Newell-Rubbermaid
- Nike
- Procter & Gamble
- Starbucks
- Starwood
- Steelcase
- Target
- Walt Disney
- Whirlpool

Design Increases Revenues, Profit & Exports in the U.K.



[Design Delivers for Business](#), Design Council U.K., 2012

SOCIETAL & ENVIRONMENTAL IMPACT

Oehlberg, Lora A., A.M. Agogino and S. Beckman (2009). "Framing Sustainability in Human-Centered Product Design," *Proceedings of the ASME 2009 International Design Engineering Technical Conference*.

Cobb, C., A.M. Agogino, S. Beckman and L. Speer, "Enabling and Characterizing Twenty-First Century Skills in New Product Development Teams," *Proceedings of Mudd 2007*. Archival in the *International Journal of Engineering Education*, Vol. 24 (2), February, 2008, pp. 420-433.

Engineering Ethics: What Does Your Professor Say?

"What we design? For whom do we design? How we manufacture? What resources we use? What will be the impact on society and the environment? These are all ethical and social justice questions that are important in product design."

Alice Agogino, Professor
Mechanical Engineering
Minner Fellow

UC BERKELEY
**ENGINEERING
ETHICS WEEK**
PROFESSIONAL AND SOCIAL RESPONSIBILITY
Monday, April 7 - Friday, April 11



Berkeley
Engineering

coe.berkeley.edu/ethicsweek

Restoked:

ReSurf the board. Replenish the Earth



Ron Stoner
surfermag.com

New Business Models: WearPact



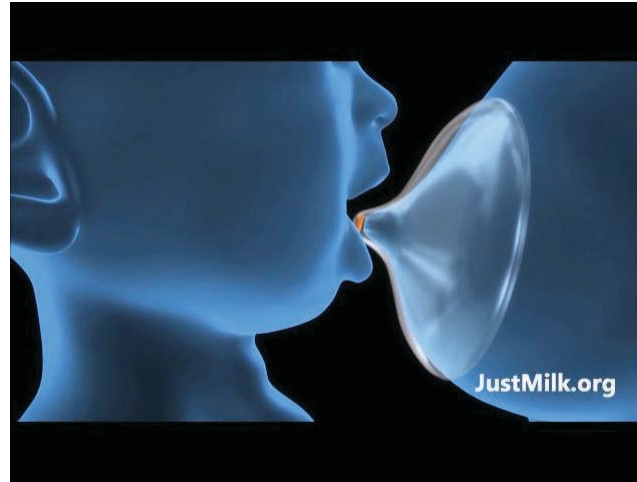
A socially responsible underwear business that combines students' passion for the environment with new business models

www.wearpact.com

COMMUNITY CO-DESIGN PROJECTS



[Darfur Stove](#)



[JustMilk](#)



[Zimba](#)



[Seguro](#): Pesticide Protection



[CARES: Community Assessment of Renewable Energy & Sustainability](#)

L. Oehberg, R. Shelby and A. M. Agogino (2009). "Sustainable Product Design: Designing for Diversity in Engineering Education," *Int. J. of Engineering Education*, No. 2 of Vol. 26, 2010, pp. 489-498.

Pinoleville Pomo Nation (PPN) Innovation Workshop

Top Needs

- Learn and Use Traditional Techniques (Cultural Values)
 - Round Shape
 - Natural Materials
- Energy Conservation
- Water Conservation
- Privacy
- Exercise
- Storage
- Safety
- Comfort
- Lower Energy Costs
- Space



Pomo-Inspired Housing







Co-Designed



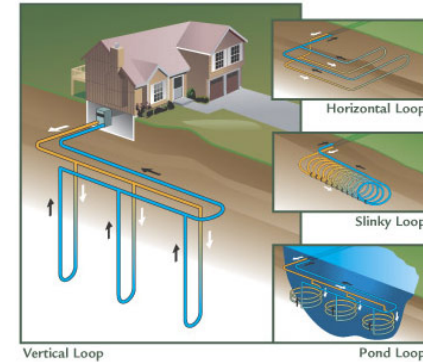
Co-Built

Co-Evaluated for
Impact



Renewable Energy & Water Solutions

- Geothermal heat pumps
- Solar electric
- Solar thermal
- Energy conservations
- Water harvesting
- Micro-hydroelectric
- Wind

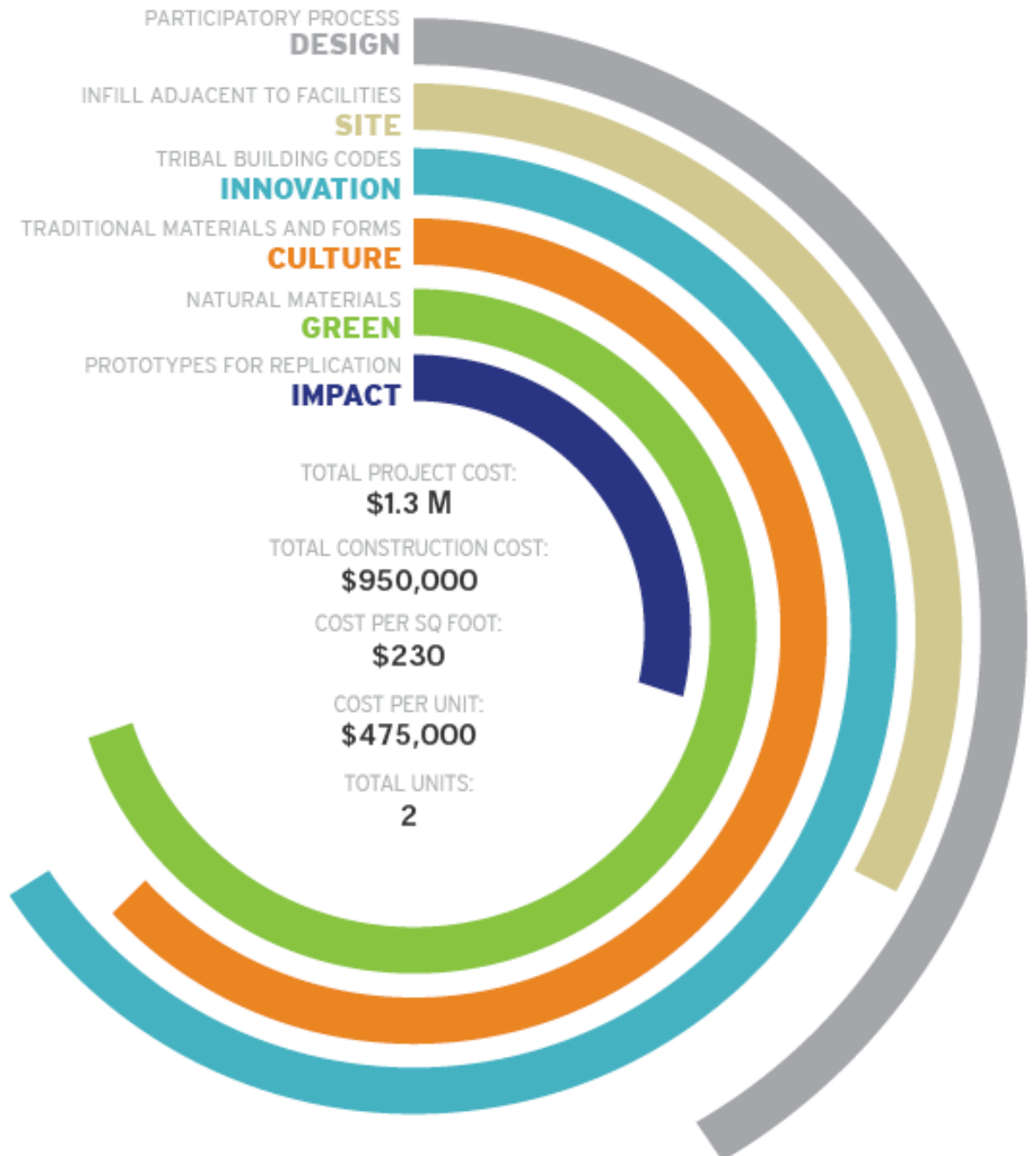


- Electric Vehicle Green Corridor on Pomo Tribal Lands

T. C. Schultz, R. Shelby, and A.M. Agogino (2010). "The Co-Design of Water and Energy Efficient Sustainable Housing with the Pinoleville Pomo Nation", *Proceedings of the ASME International Sustainability Conferences*, May 17-22, 2010, Phoenix, Arizona.

Renewable energy-
efficient systems were
co-designed and built
by tribal citizens

Rainwater catchment
and grey-water
systems reduce
vulnerability to water
shortages



Impact

- Empowered the PPN to make informed decisions about renewable energy options
- Capacity building in green technologies
- Students were able to develop professional design and communication skills
- HUD funding secured to build culturally inspired sustainable homes and buildings: **~\$1.2 Million in 2009**
- DOE funding secured to perform renewable energy feasibility studies: **~\$120,000**



Tribal CARES Partners

- Pinoleville Nation Tribal Council and Members, UC Berkeley Students
- Funding: HUD, DoE, EPA, CITRIS, California Energy Commission



Ryan Shelby, Ph.D. Dissertation: *Co-Designing Sustainable Communities: The Identification and Incorporation of Social Performance Metrics in Native American Sustainable Housing and Renewable Energy System Design*, Spring 2013.



Shelby, R., Y. Perez and A.M., Agogino, "Partnering with the Pinoleville Pomo Nation: Co-Design Methodology Case Study for Creating Sustainable, Culturally Inspired Renewable Energy Systems and Infrastructures," *Special Issue of Sustainability: Changing the Energy Systems to Renewable Energy Self-Sufficiency*, 4 (5), 2012, pp. 794-818.

Luce Foundation Video



- [Sustainability in Products & Practice: http://vimeo.com/35283830](http://vimeo.com/35283830)

Pinoleville Pomo Nation

- Rising heating and cooling costs
- HUD-financed housing
- Did not reflect cultural and traditional values
- Drought conditions

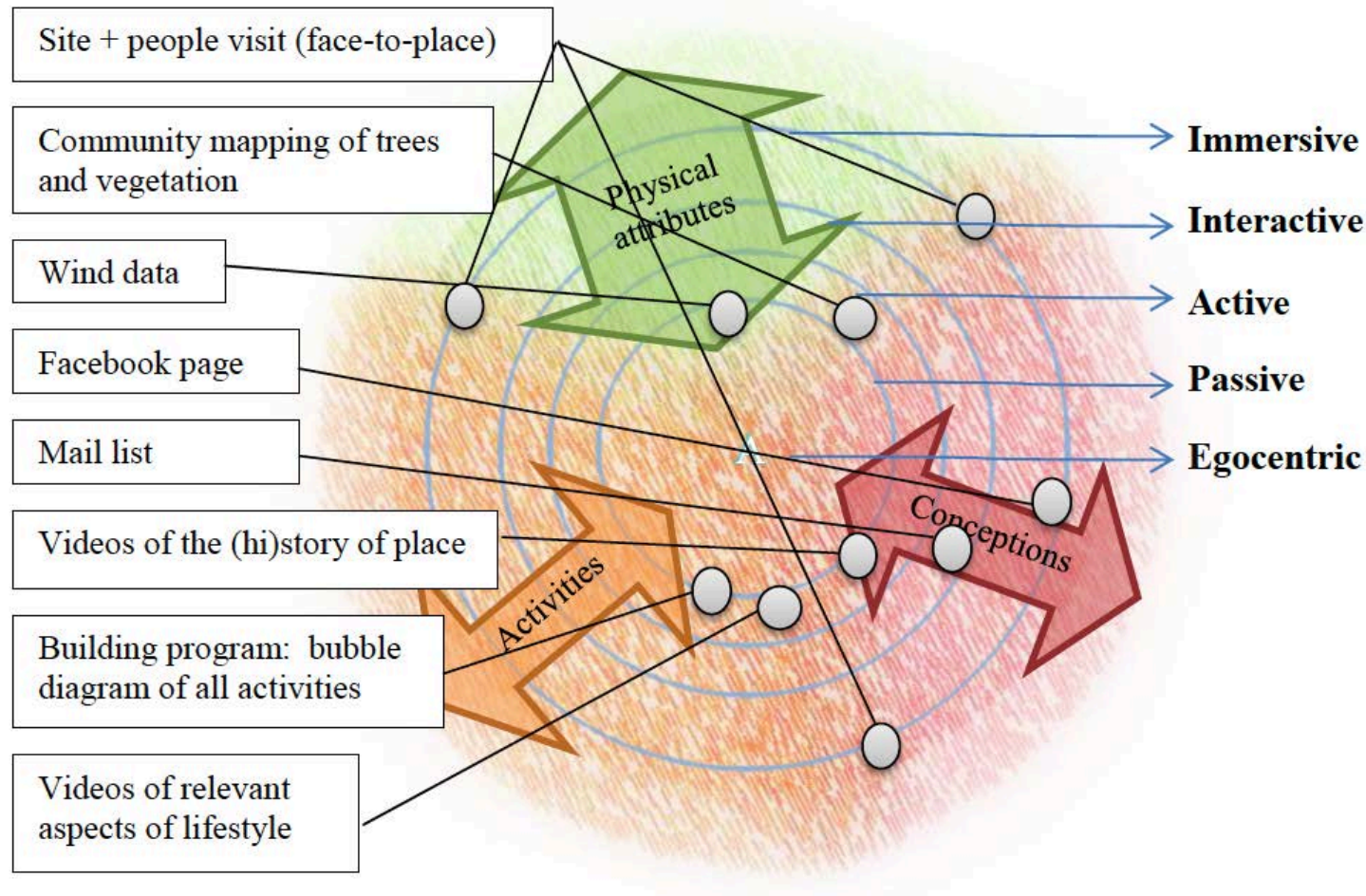


DEVELOPMENT AS FREEDOM: AMARTYA SEN

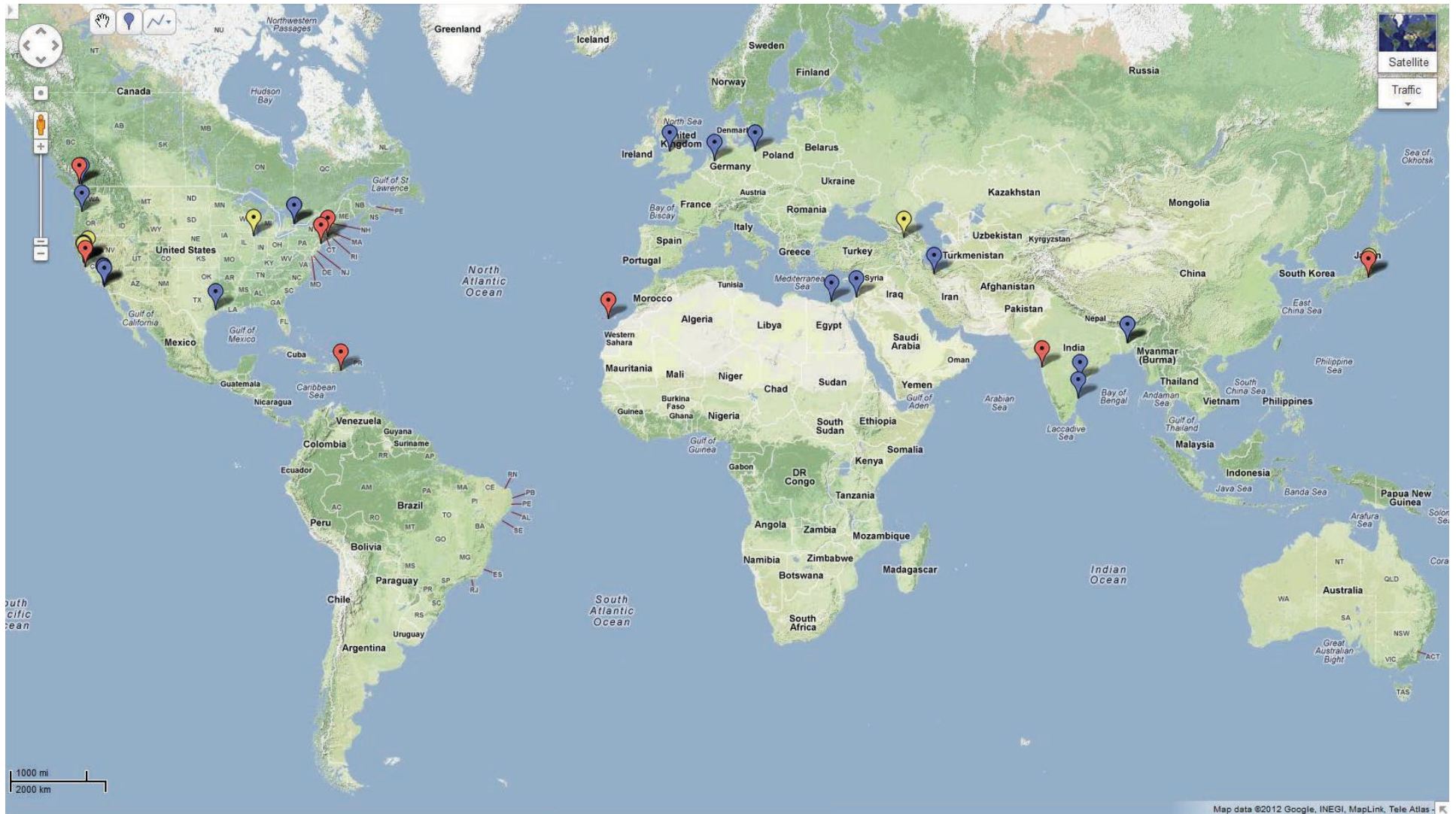


DESIGN AS FREEDOM:
CROWDSOURCING DESIGN

Comprehending Place in ParticiPlace Crowd Sourcing Design



Locations of Designers for Living Cultural Center Competition (37 team registered, 17 submitted)



Living Cultural Center Entries

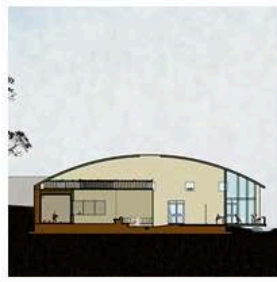
Amirhesam Mohtasebi
British Columbia, Canada



Studio MTB
California, USA



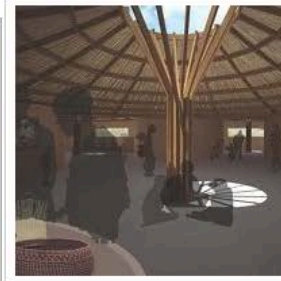
Daniel Probst
California, USA



Elba Dinorah Gil, Santo Domingo, Chi Tai Yu, Tommy Rodríguez
Dominican Republic



Emily Kwok, Hien Vuong, Gwen Fuertes
California, USA



Gabriel Kaprielian, Liz Kee, Marisha Farnsworth, Jonghoon Im
California, USA



Kengo Sato
Tokyo, Japan



Kenji Takagi
Kanagawa, Japan



Kadi Franson, Nathan Pundt, Leah Nichols
California, USA



Manuel José Rodríguez Hernández, Natalia Vera Rodríguez, Tiago Sanches de Castro Coelho
Las Palmas, Spain



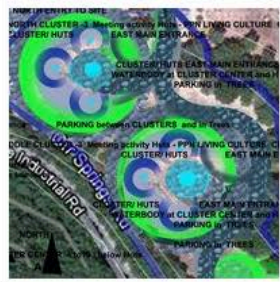
Max Edwards, Ben Golze, David Heinzerling
California, USA



Ray Everett
Connecticut, USA



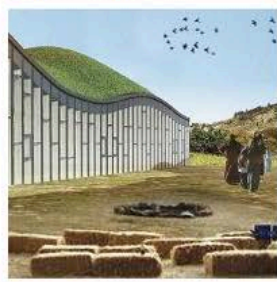
Sanjay Ektate
Maharashtra, India



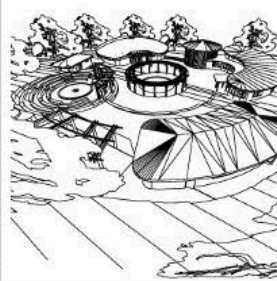
Shunsuke Nakano
New York, USA



Tengiz Alavardashvili
Tbilisi, Georgia



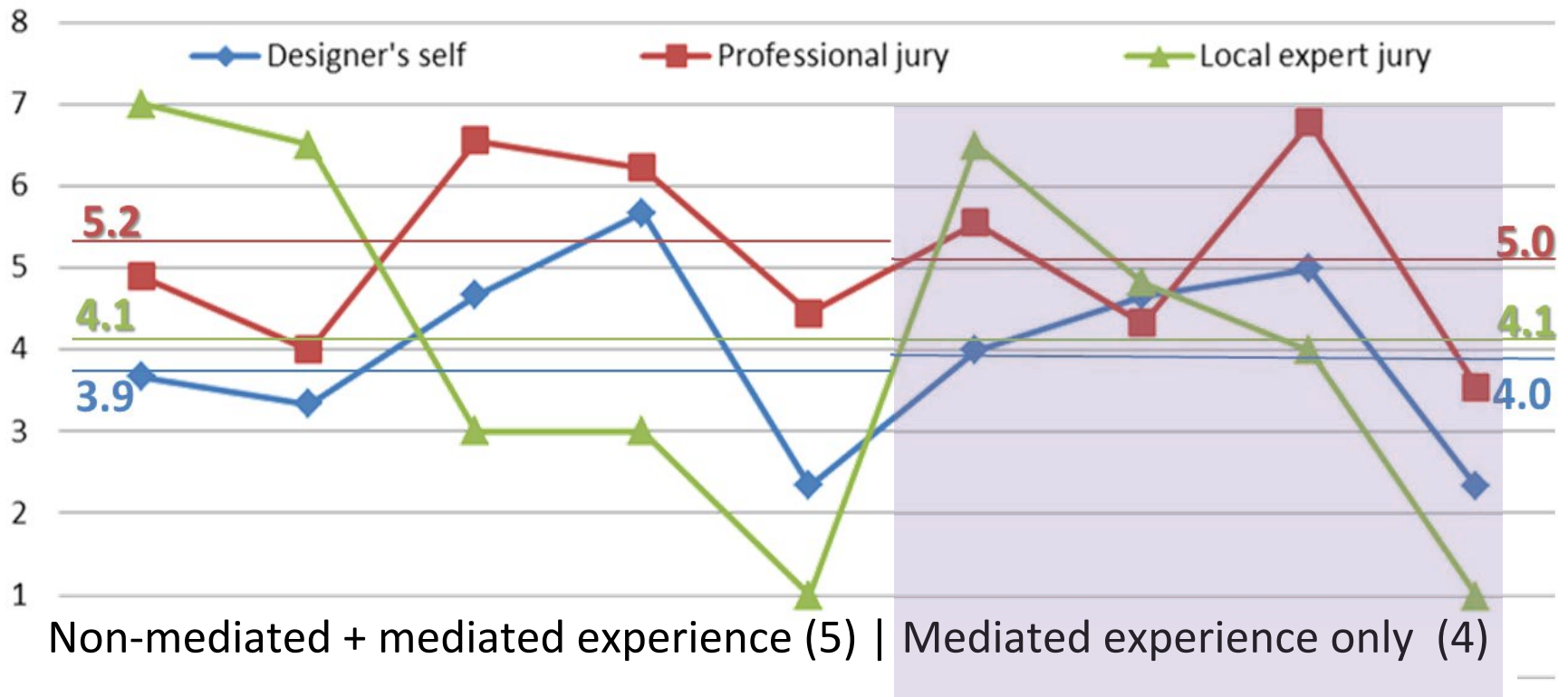
Thamby Kumaran, Hara Kumaran
California, USA



Elements Architectural Group
Illinois, USA



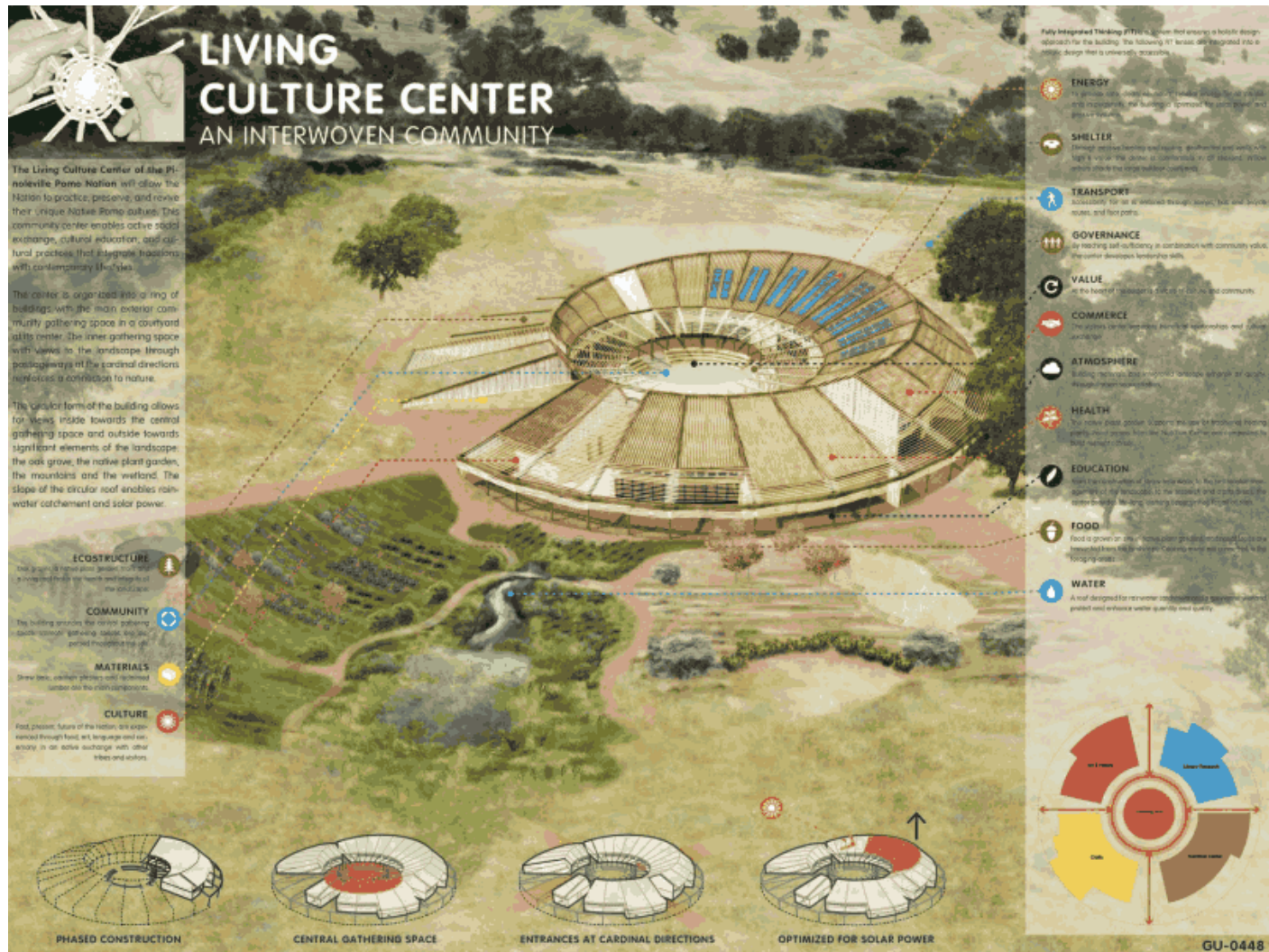
Design Experts versus Customers



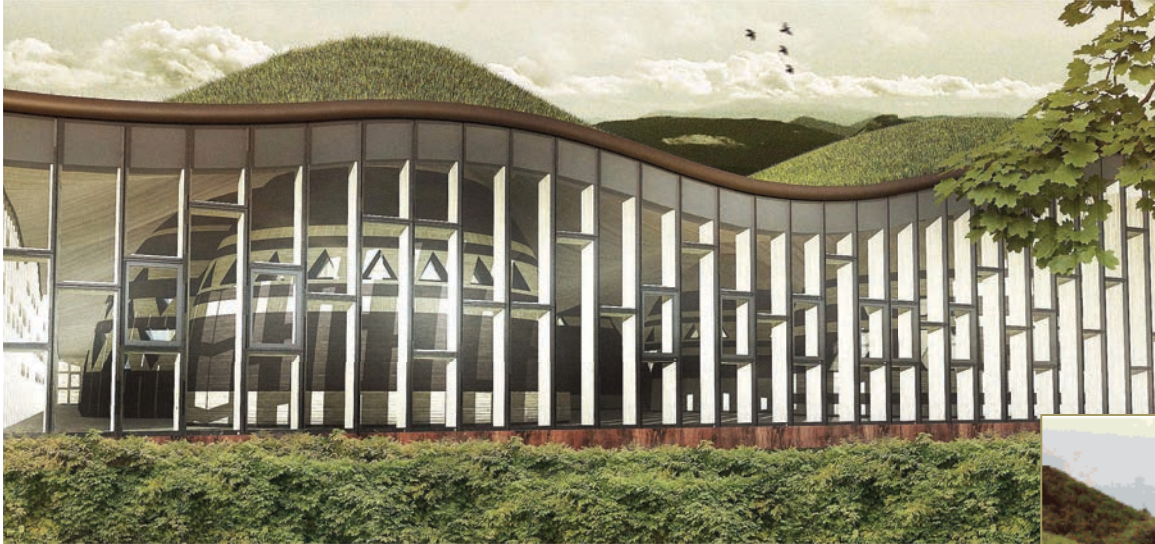
Y. Perez & A. M. Agogino (2014). "Information & Communication Technologies as a Bridge between Global Designers and Local Users", *Transdisciplinary Design 2014* (in press)

Living Cultural Center Pinoleville

Pomo Nation – 1st Place – Interwoven Communities



PPN Gave High Rating to Entry from Georgia (Country)




PPN Did Not Value Novelty, but Experts Did





Expert building designers did not rate this high as it looked too much like the California Academy of Science


Research in Crowd Sourcing Design with Open IDEO



Where people design better, together

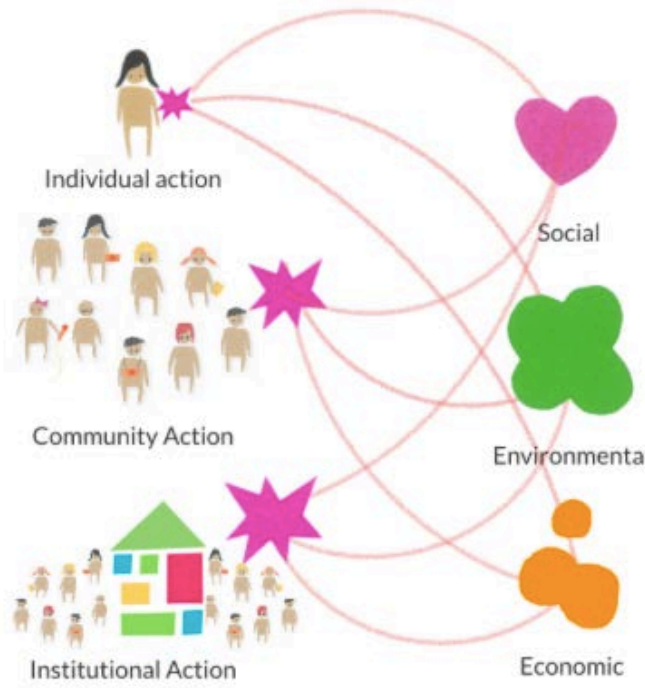


FEATURED CHALLENGE

Sponsored by Coca-Cola Enterprises 

How might we establish better recycling habits at home?

Recycling is so contribute to seems to be a around the w incorporate b



Individual action

Community Action

Institutional Action

Social

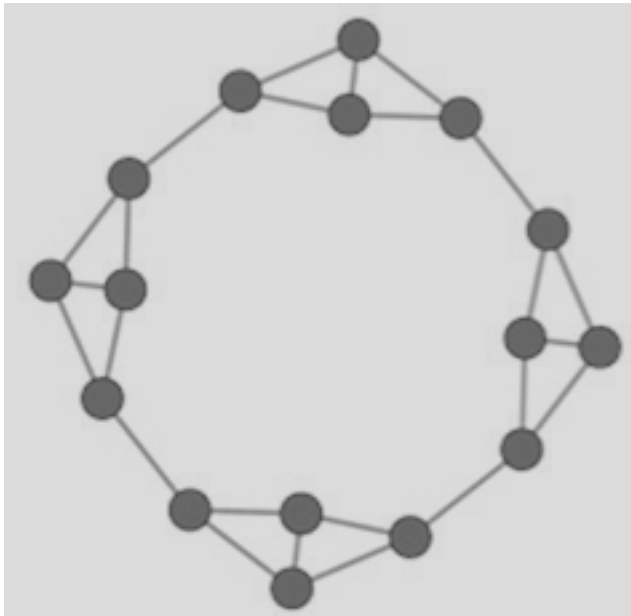
Environmental

Economic

- Mindset Change
- Awareness
- Learning
- Wellbeing
- Health
- Efficiency
- Policy Change
- Fundraising
- Sustainability
- Research

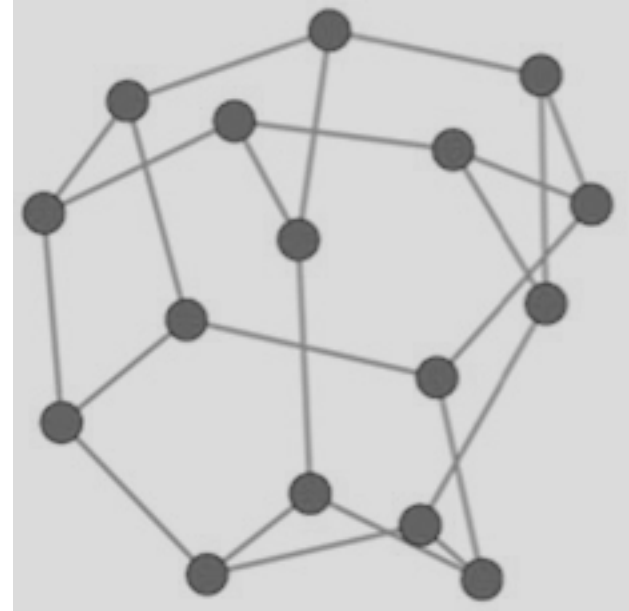
- 24 challenges
- ~60,000 registered
- ~5,000 design participants

Poor for Idea
Generation



Max. Clustering

Good for Idea
Generation

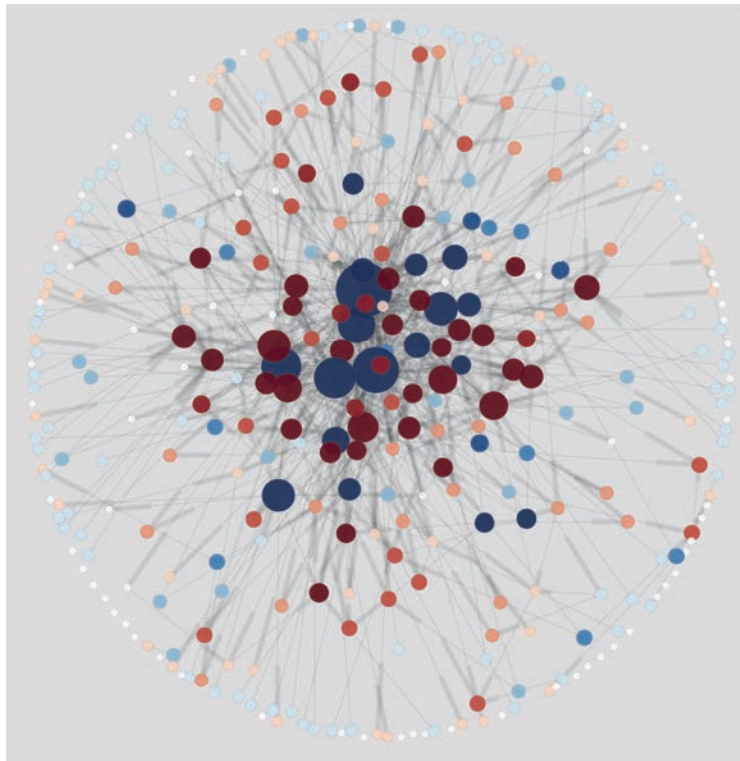


Min. Clustering

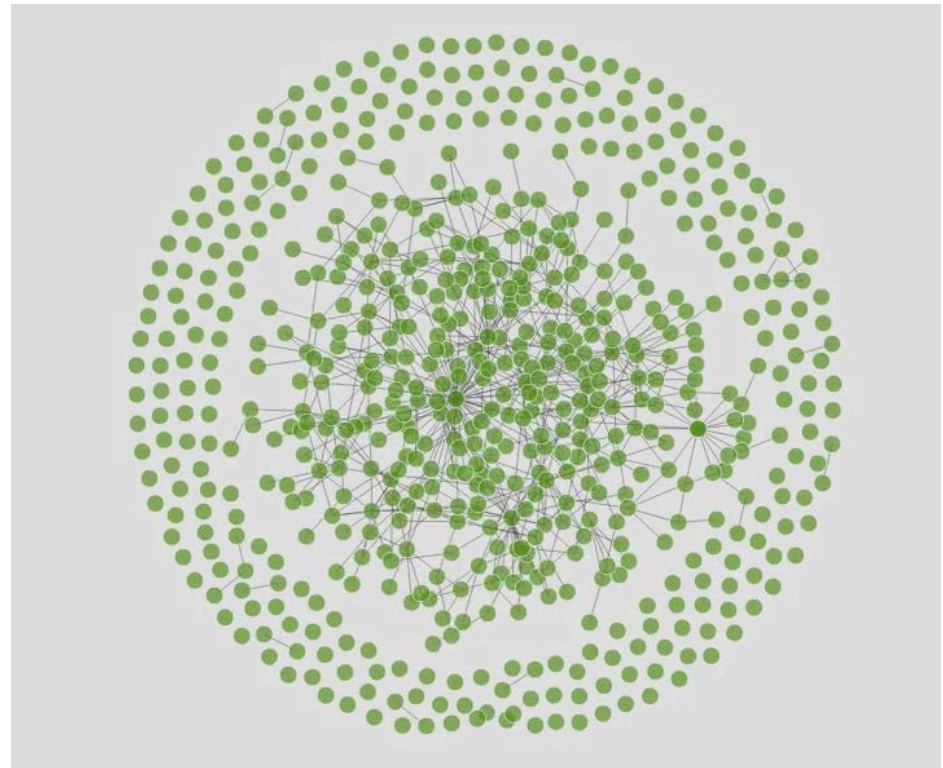
Winter Mason and Duncan J. Watts (2011). "Collaborative learning in networks"
Proceedings of the National Academy of Science, 109 (3), 2011, pp. 764-769.

Open IDEO as a Social Network

Connected core that communicates frequently (large circles). Blue nodes give more comments than get, red less.

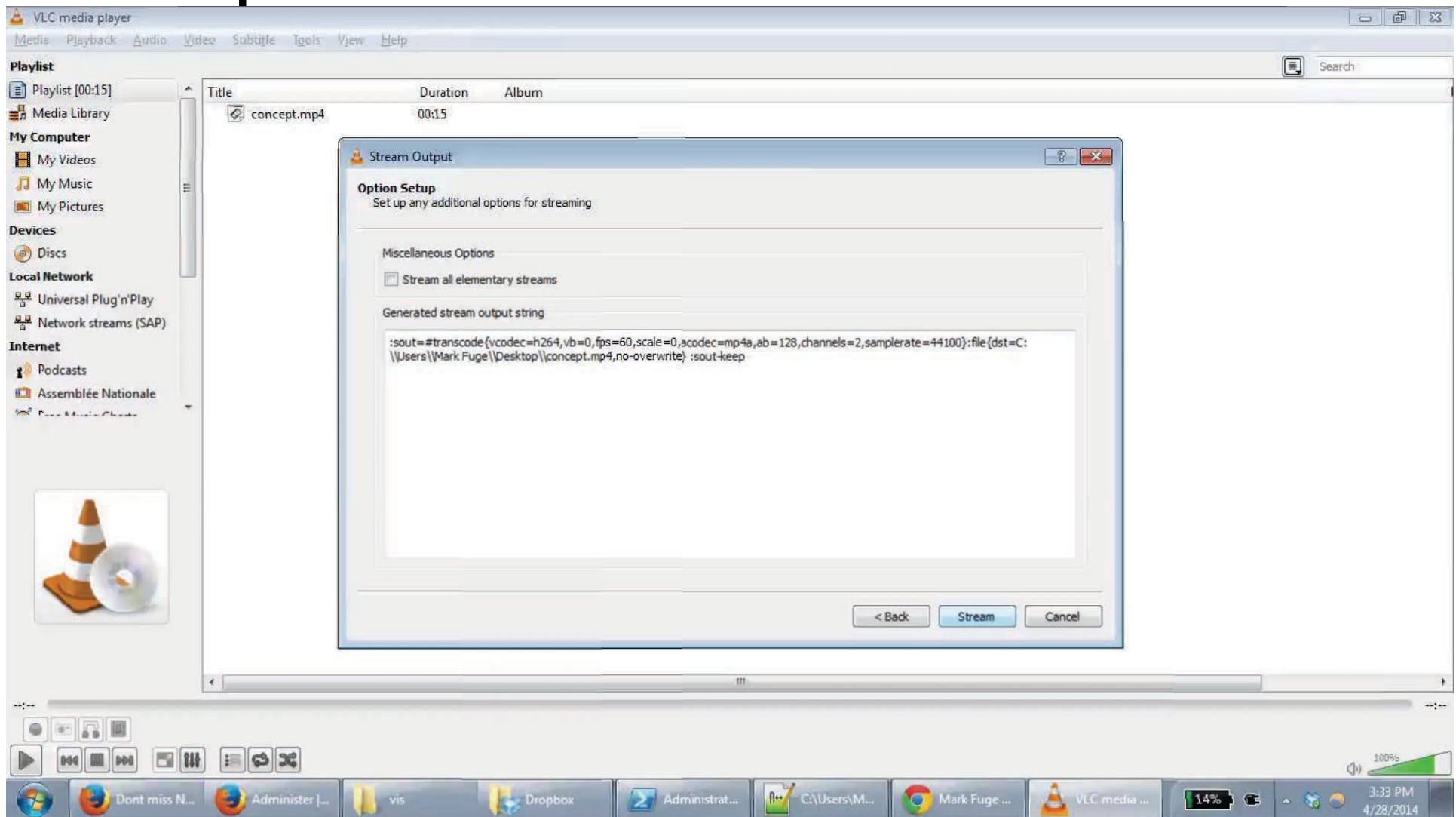


Building on the Ideas of others. No strong correlation between a user's position and winning.



M. Fuge, K. Tee, A.M. Agogino and N. Maton (2014). "Network Analysis of Collaborative Design Networks: A Case Study of Open IDEO", *ASME J. of Computing & Info. Science in Engineering*, **14** (2). 44

Open IDEO as a Social Network



M. Fuge, K. Tee, A.M. Agogino and N. Maton (2014). "Network Analysis of Collaborative Design Networks: A Case Study of Open IDEO", *ASME J. of Computing & Info. Science in Engineering*, **14** (2). 45

Design Research: Open IDEO

- Research Question:

Is there a correlation between Human-Centered Design process characteristics and successful designs in Open IDEO?

- 4 Challenges and 76 Concepts Analyzed

- 38 “winners”

- 38 randomly selected non-winning concepts for comparisons

ISO Standard for Human-Centered Design

- Design is based upon an explicit understanding of users, tasks & environments,
- Users are involved through design and development,
- Design is driven and refined by human-centered design evaluation,
- The process is iterative,
- The design addresses the whole user experience, and
- The design team included multidisciplinary skills and perspective.



HEAR



CREATE



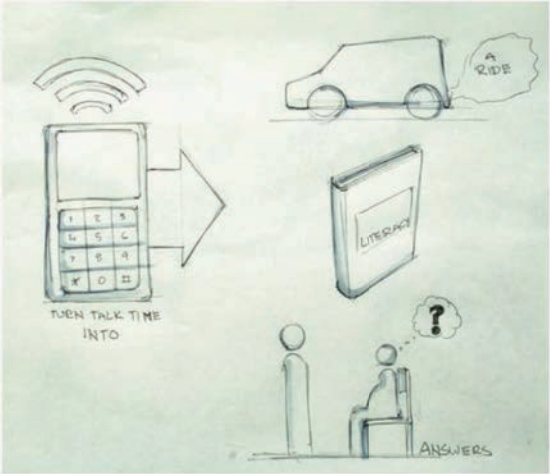
DELIVER

Example Challenge: How might we improve maternal health with mobile technologies for low-income countries?

IDEA BACK TO LIST 75 OF 176

Exchange: Minutes for service a)

Community members can exchange talk time on their phone bills for time helping out pregnant women.



Exchange: Minutes for service

This is how it works for members of these low-income communities:

You can either rent a phone from a kiosk (in a communal space) or use one you already have. For the amount of time you talk you can either pay the bill or donate in kind your time and skills to help out pregnant women. There are many different ways you can help. You can share your own personal experiences with pregnancy (child birthing, nutrition, exercise, etc.). You can use resources at your disposal (car

Submitted by: b)


March 12, 2011, 01:07AM

637 views
4 comments
5 applause

Applaud this

+ Build on this c)

BUILT UPON THIS



- a) Concept description
- b) Submitter description
- c) Links to previous submissions that were used for inspiration

Challenges

1. Affordable Learning
2. Human Sanitation
3. Maternal Health Care
4. Social Businesses

Research: 4 Open IDEO Challenges

Challenge	# Inspirations	# Concepts	# Winners
How might we increase the availability of affordable learning tools and & services for students in the developing world?	269	104	9
How can we improve sanitation and better manage human waste in low-income urban communities?	122	68	9
How might we improve maternal health with mobile technologies for low-income countries?	278	176	10
How might we use social business to improve health in low-income communities?	290	97	10
Total	698	445	38

Results



HCD Metrics	Winners (38)	Non-Winners (38)	p (t-test) ¹ or Pearson's Chi-Squared) ²
Hear: How many Inspirations served as the foundation for each concept?	5.34	1.68	0.035 ¹
Create: How many ideas?	2.18	1.42	0.008 ¹
Deliver: Did they actively elicit feedback on the prototype outside of using comments?	19.7%	1.3%	0.001 ²
Deliver: Did they answer comments on their prototype?	39.5%	22.4%	0.024 ²

P. Gordon, M. Fuge and A. M. Agogino, "Design for Development Online: A Human-Centered Design Analysis of Open IDEO".

College of Engineering
University of California, Berkeley
Fall 2015
Volume 8

CellScope in Cameroon
Safe treatment for river blindness

Fortifying breast milk
Global delivery device

BerkeleyENGINEER

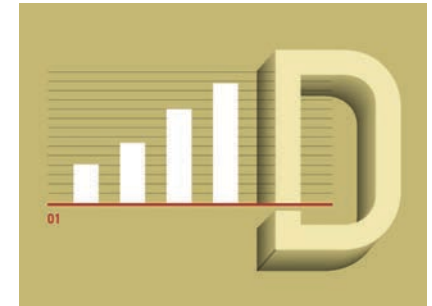


SOPHIE'S SUPER HAND

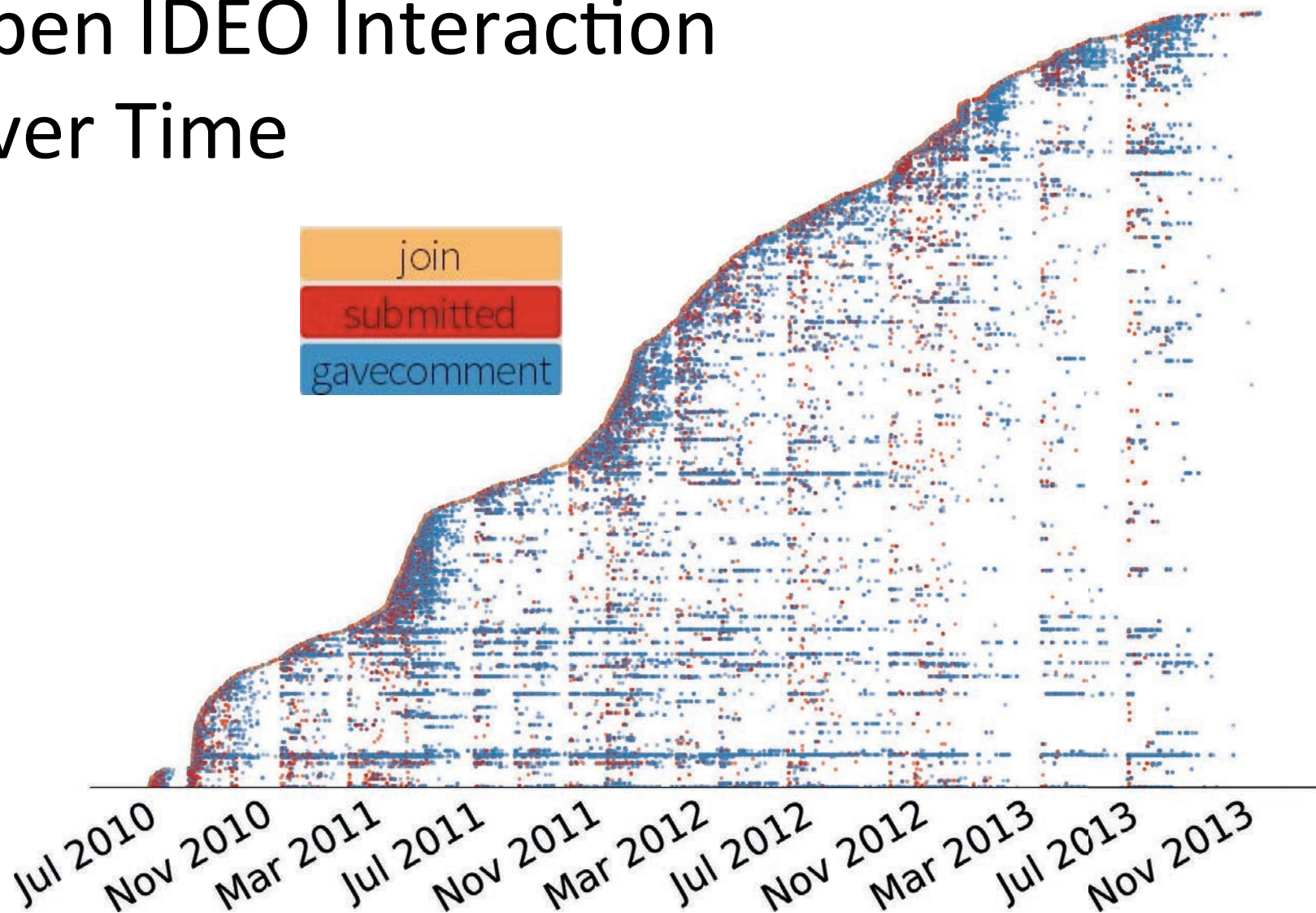
Fabricating custom prosthetics

Discussion: Metrics for Valuing Design

- Usage
- Performance Ratings (J.D. Power, Consumer Reports)
- Expert Evaluation (IDEA/ Business Week, Consumer Electronics awards)
- Creativity (novelty, variety)
- Financial (stock performance, revenues, sales)
- Process (multidisciplinary team work, human-centered design)
- Societal Impact (environmental, emerging regions)

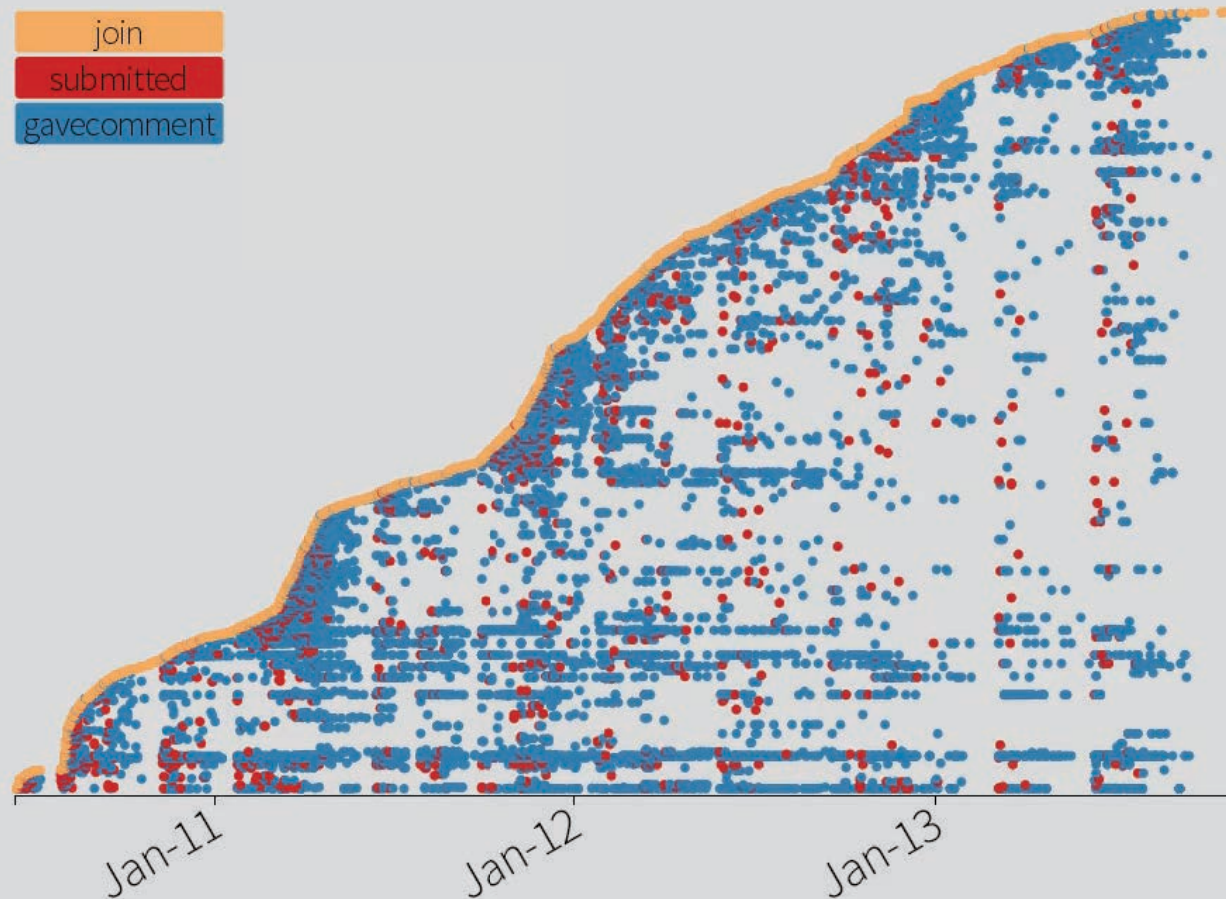


Open IDEO Interaction Over Time



M. Fuge, A.M. Agogino and N. Maton (2014). "How Online Design Communities Evolve Over Time: the Birth and Growth of OpenIDEO, ASME DETC, Design, Theory & Methods.

Open IDEO Interaction



M. Fuge, A.M. Agogino and N. Maton (2014). "How Online Design Communities Evolve Over Time: the Birth and Growth of OpenIDEO, ASME DETC, Design, Theory & Methods.