STORYBOARDS, PAPER PROTOTYPES, and MOCK-UPS

Scott Klemmer
www.hci-class.org

CREATING AND COMPARING ALTERNATIVES

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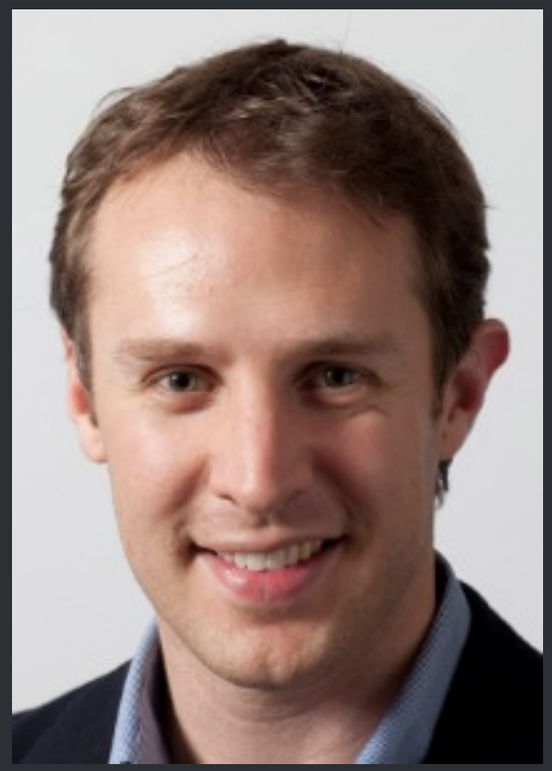
www.hci-class.org

Creating and Comparing Alternatives



Steven Dow *et al.*

Prototyping Dynamics: Sharing Multiple Designs Improves Exploration, Group Rapport, and Results, Steven P Dow, Julie Fortuna, Dan Schwartz, Beth Altringer, Daniel L Schwartz, and Scott R Klemmer. *CHI: ACM Conference on Human Factors in Computing Systems, 2011.*

Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-Efficacy, Steven P Dow, Alana Glassco, Jonathan Kass, Melissa Schwarz, Daniel Schwartz, Scott R Klemmer. *ACM Transactions on Computer-Human Interaction, 2010*

The Efficacy of Prototyping Under Time Constraints, Steven P. Dow, Kate Heddleston, Scott R Klemmer. *Creativity & Cognition, 2009*

Quantity v. Quality?

Bayles and Orland, 2001

Quantity v. Quality?

"While the quantity group was busily churning out piles of work—and learning from their mistakes—the quality group had sat theorizing about perfection, and in the end had little more to show for their efforts than grandiose theories and a pile of dead clay"

Bayles and Orland, 2001

Design an Egg Drop Device

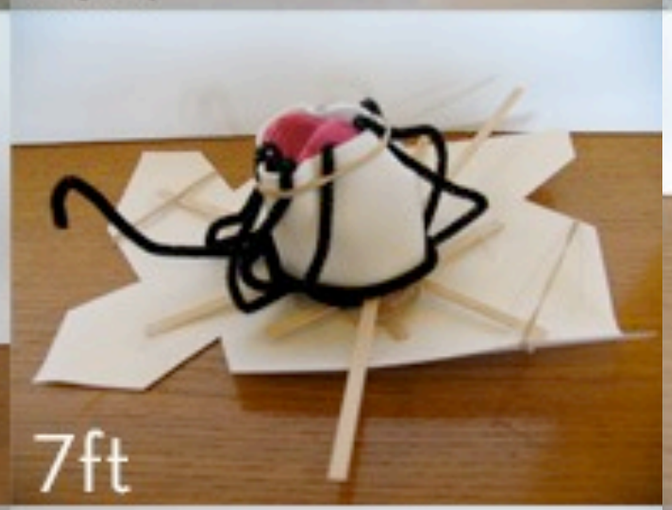
15ft

13ft

7ft

7ft

10ft


7ft

6ft

4ft

6ft

6ft

4ft

3ft

5ft

5ft

3ft

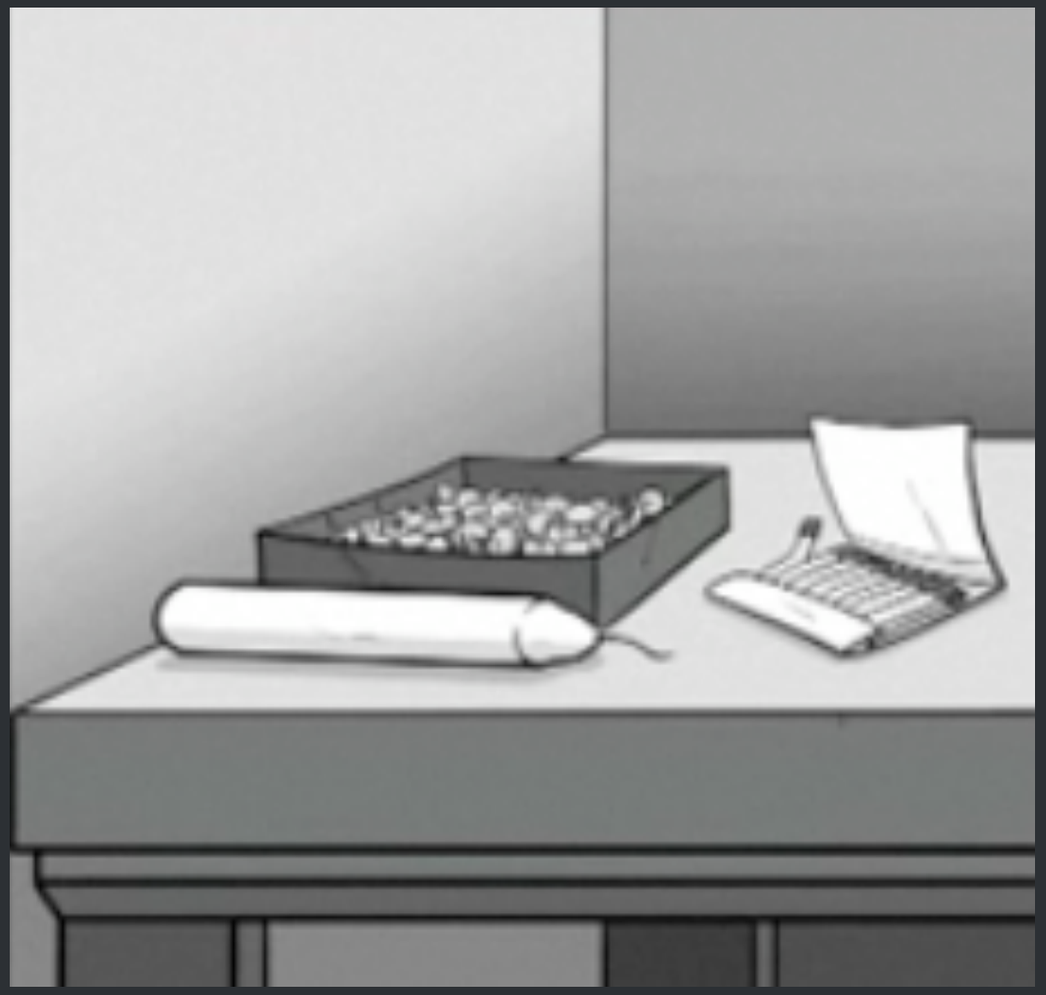
3ft

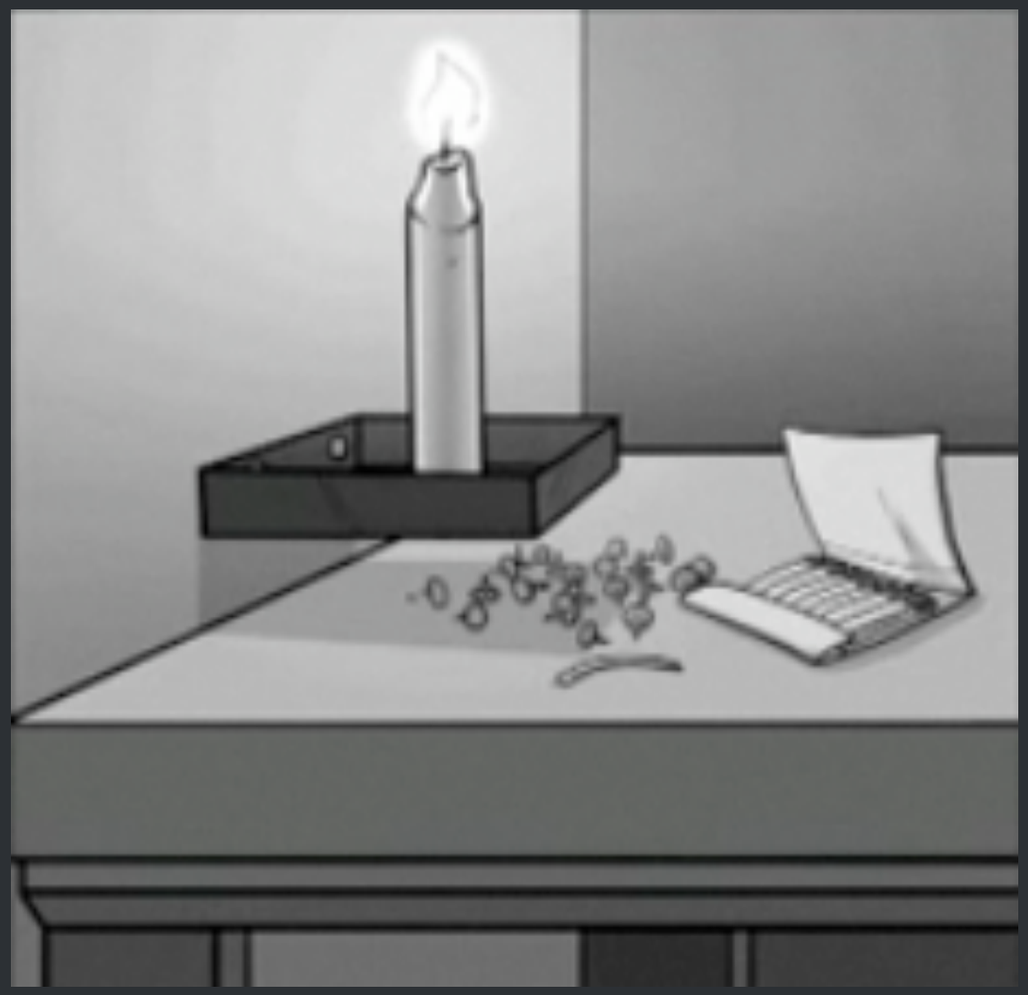
Participants picked their concept early

ITERATION
PARTICIPANT

“[illegible] to be [illegible] possible… I don’t see any other

Functional Fixation

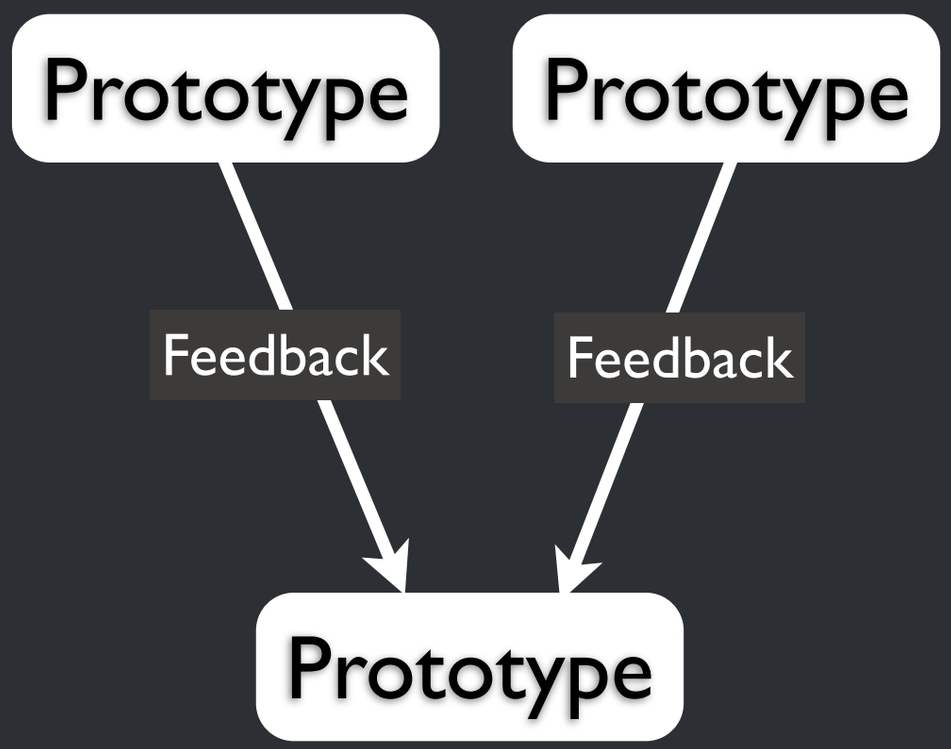




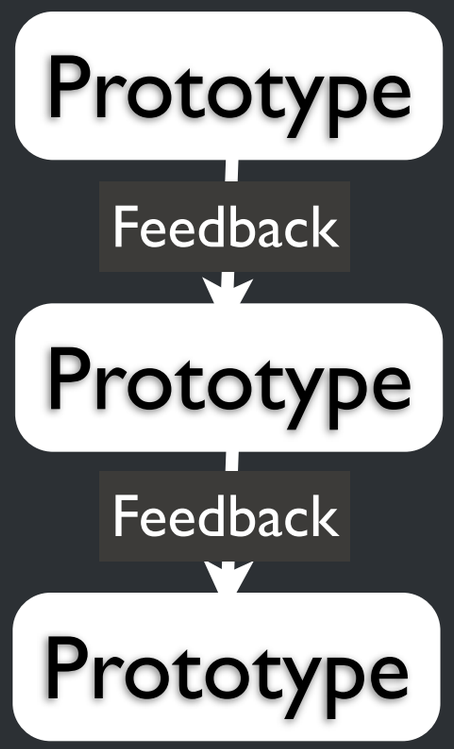
Duncker, 1945

Research question

How does parallel design
– rather than a serial approach –
affect performance?



PARALLEL



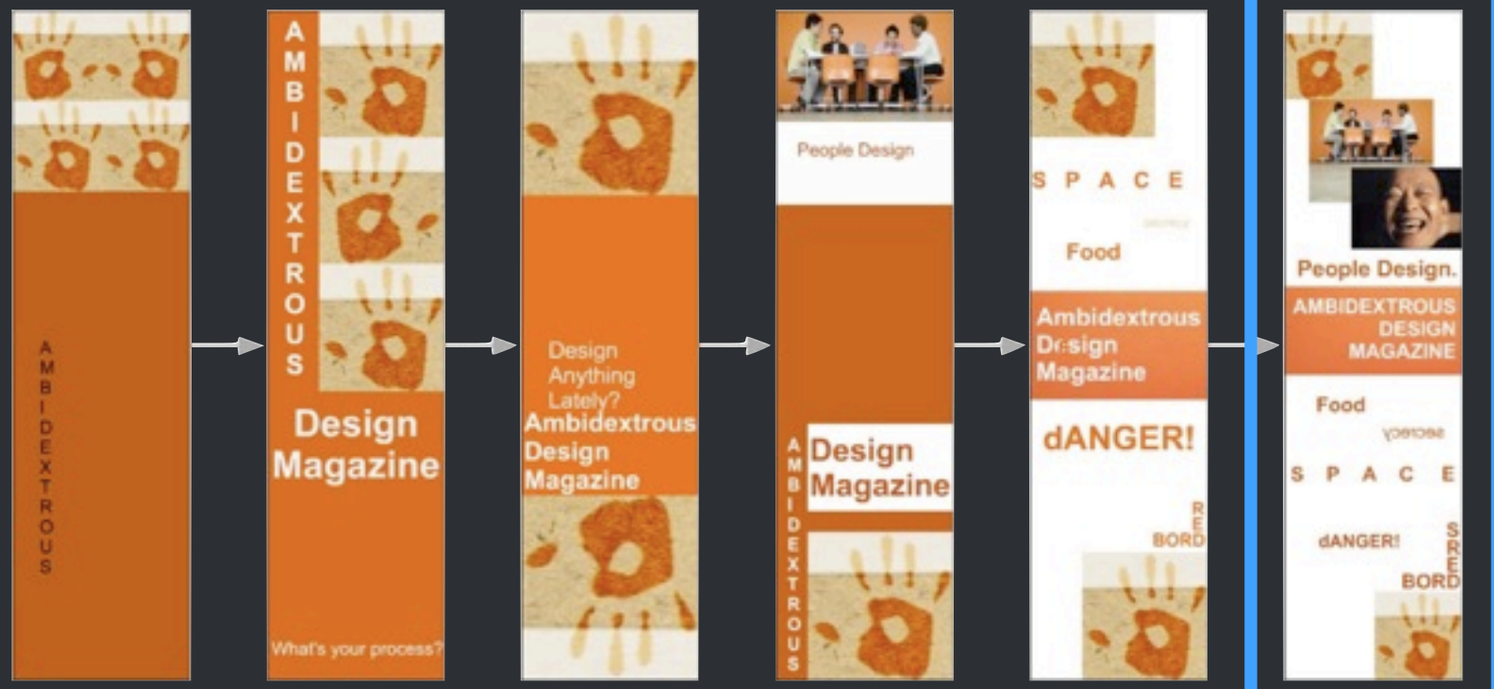
SERIAL

Task: design an advertisement

Procedure (N=33)

FINAL

serial prototyping condition



parallel prototyping condition

AMBIDEXTROUS
JOURNAL OF DESIGN
CULTURAL FOODS
FOOD FOR THOUGHT AND COMICS
DESIGN PROCESS FOR ANYTHING
RESEARCH LABS
WRITER'S CRITICISM ON TODAY'S TECHNOLOGY
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light me
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stanford university's journal of design
Design
People
Are you
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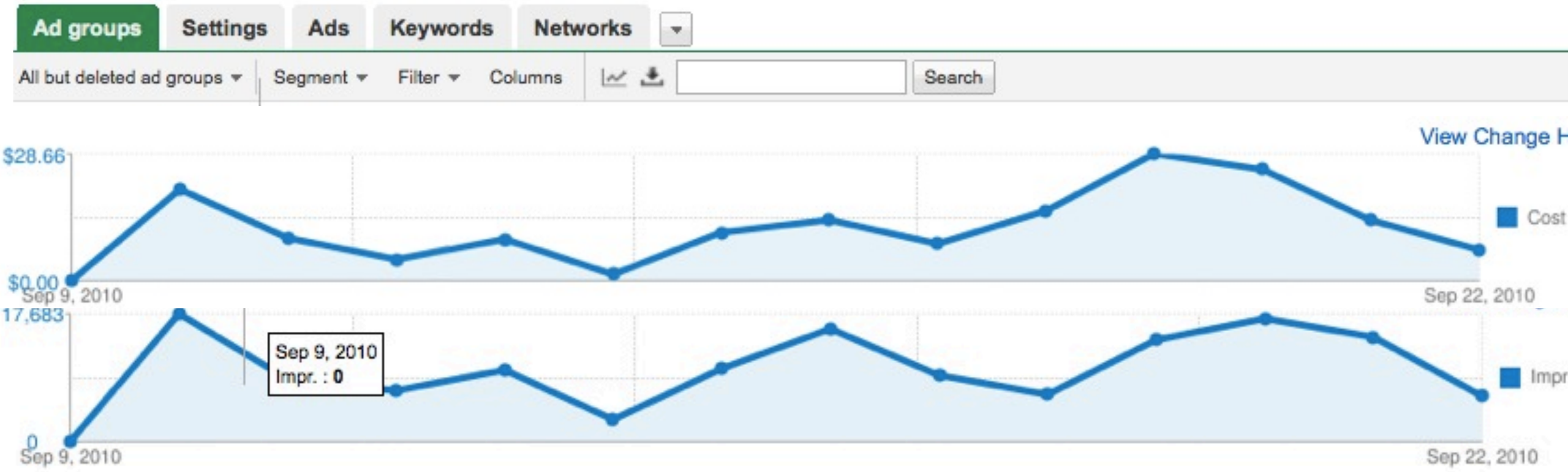
A journal about
DESIGNING THE FUTURE
both hands at a time
ambi dext rous
magazine
a forum for design researchers, professionals, and thinkers
DESIGNERS WANTED
Read
Ambidextrous
other hand
Who can I meet?
Where are we goin

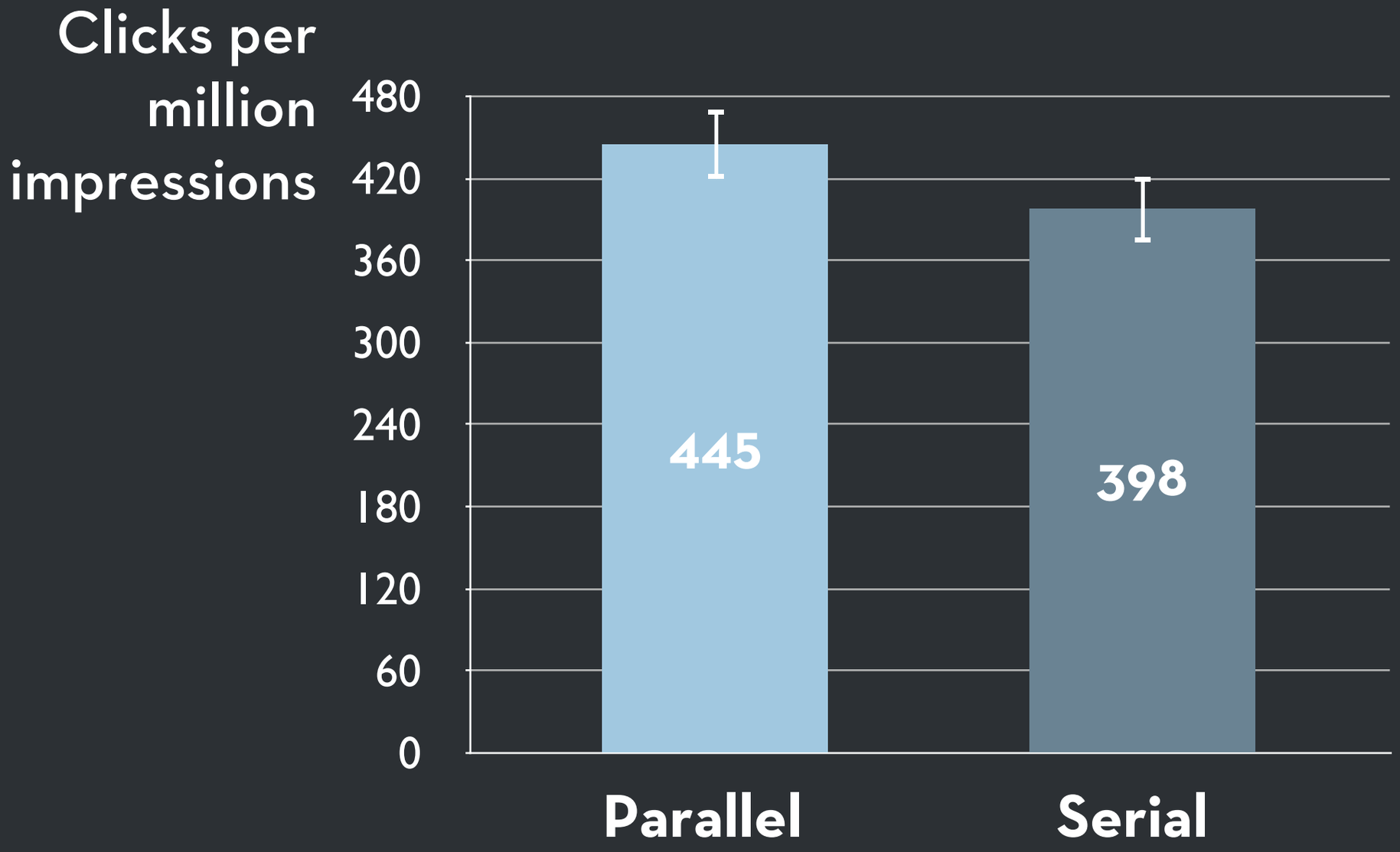
Web advertising analytics



+ New ad group | Edit | Change status... | Alerts

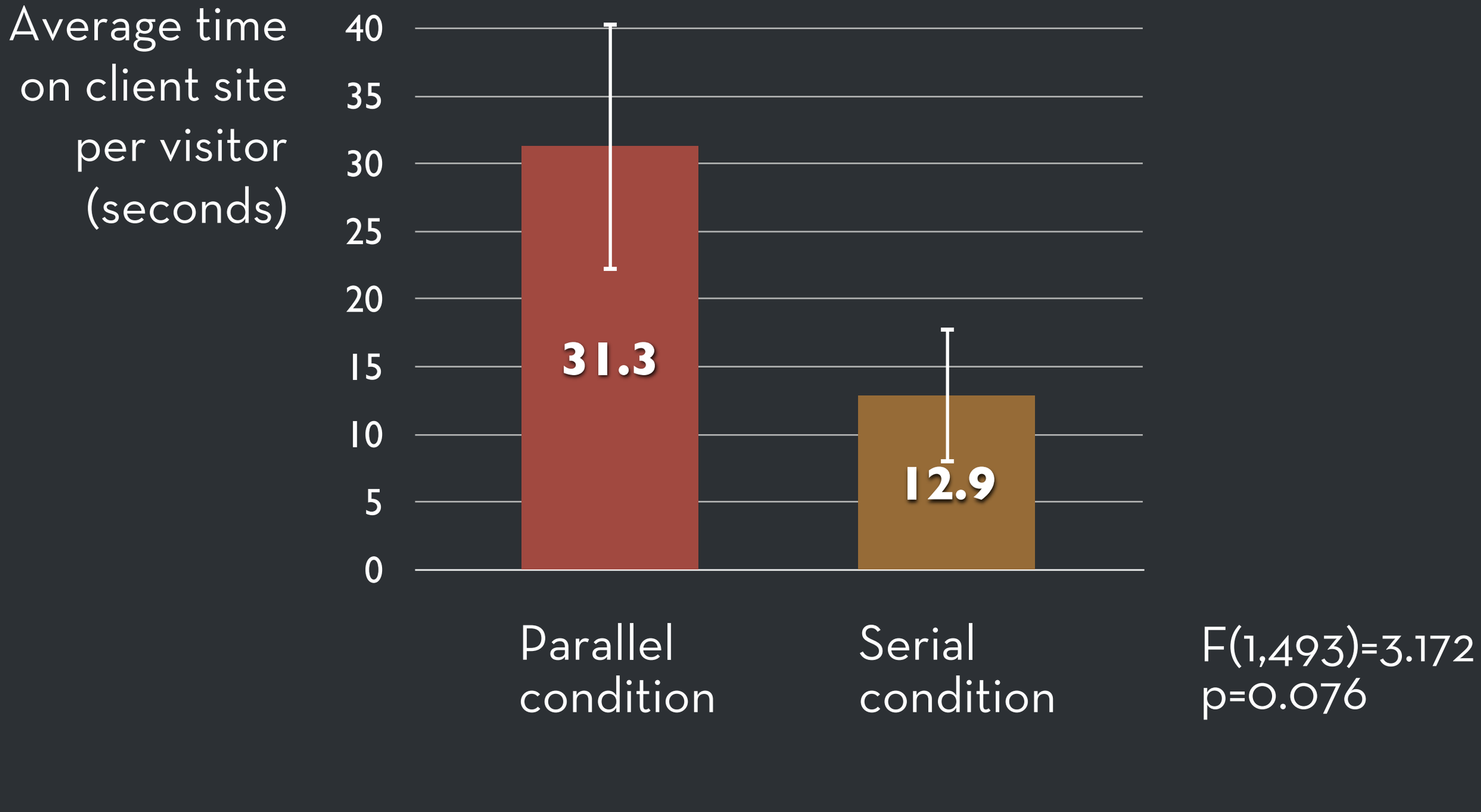
		Ad group	Status	Default Max. CPC	Managed Placements Max. CPC	Display Network Max. CPC	Clicks	Impr.	CTR	Avg. CPC	Cost
☐	●	Ad Group #1	Campaign ended	$2.50	$2.50	$2.50	112	139,600	0.08%	$1.51	$168.61

Parallel design -> more clicks

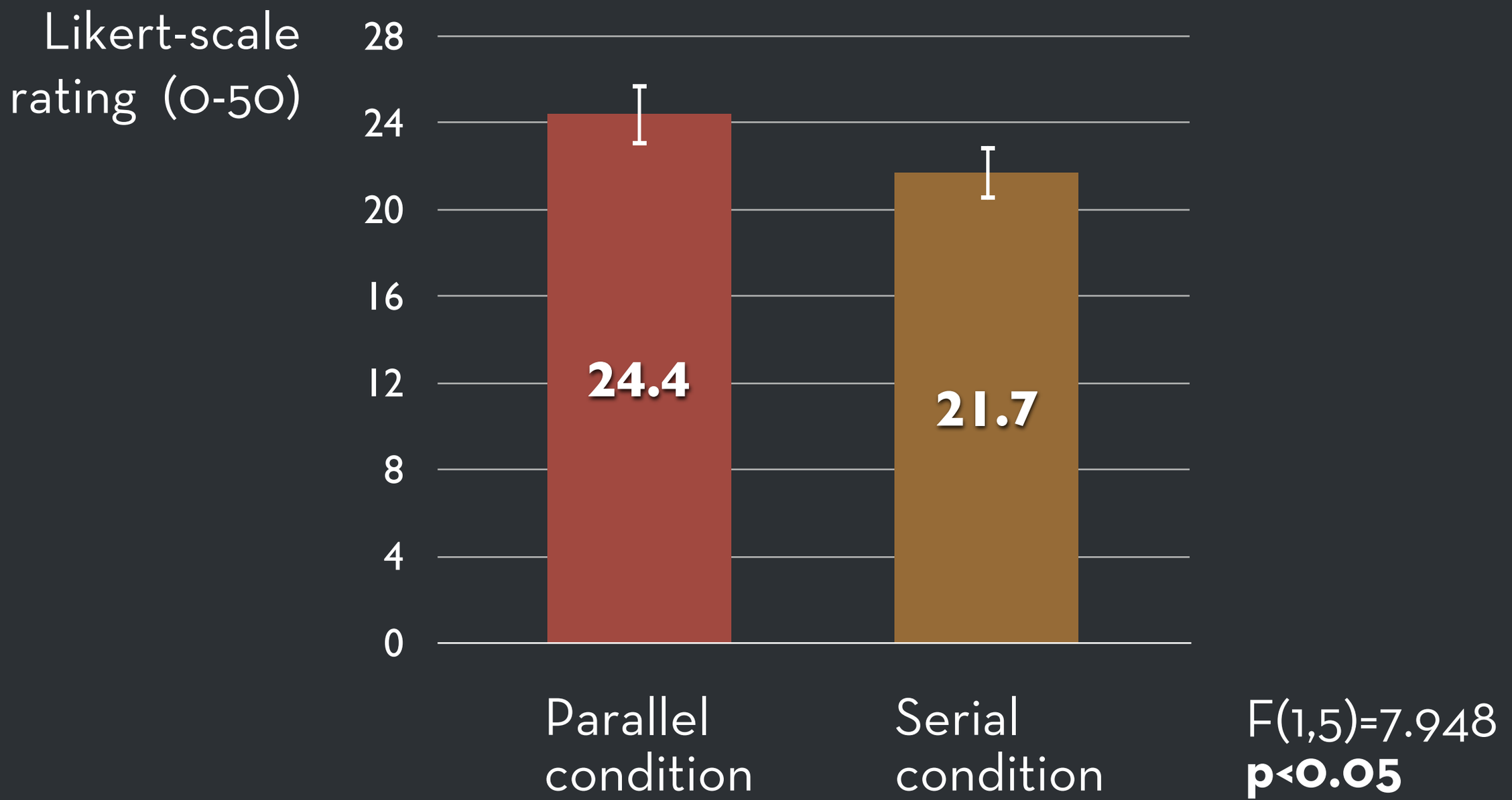


F(1,30)=4.227
p<.05

...and more time on the site



...and higher expert ratings

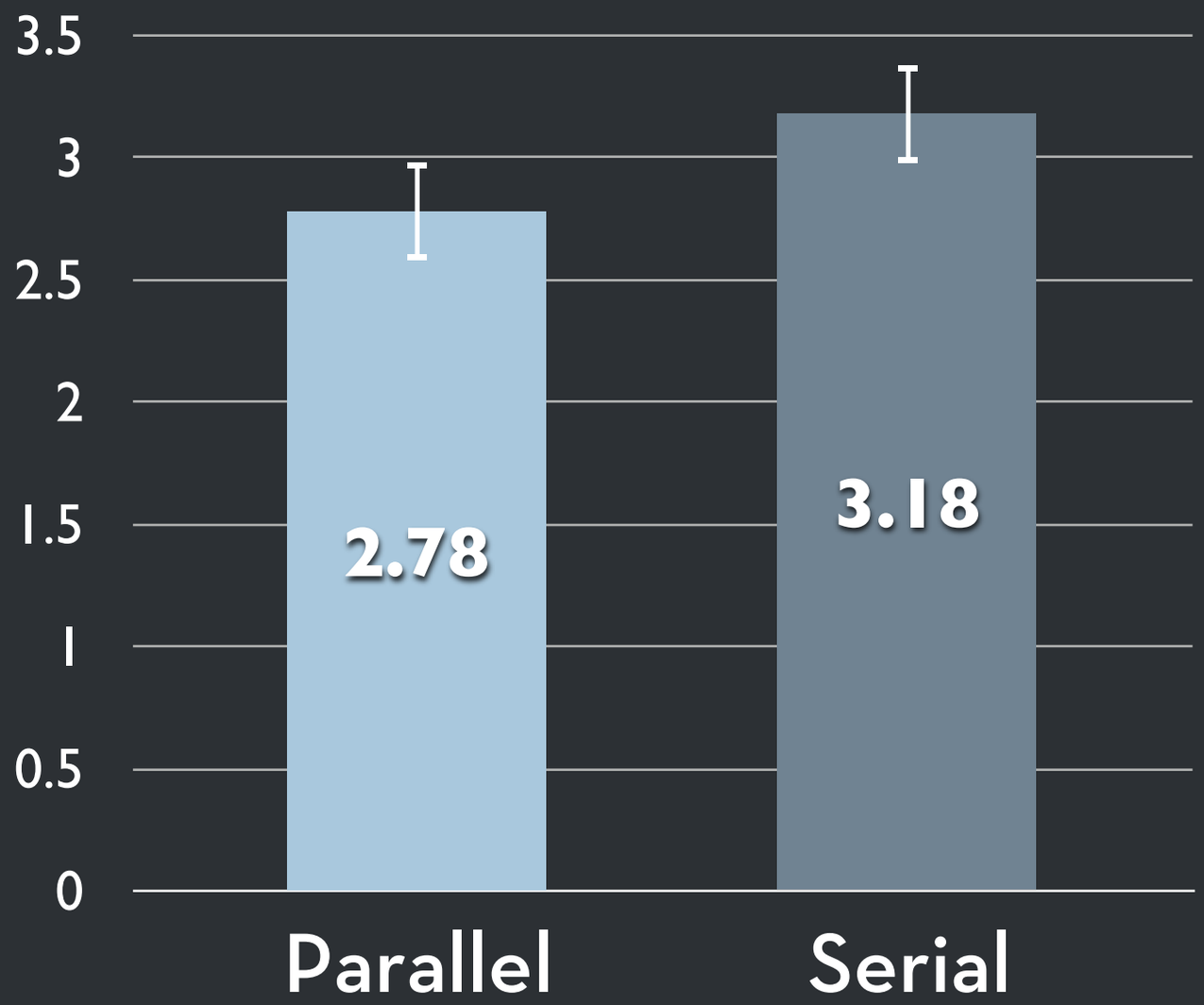


F(1,5)=7.948
p<0.05

...and more diverse designs

7=highly similar

0=not at all similar



F=182, **p<0.001**

Why **does a parallel approach yield** better results?

Separating *Ego*

from *Artifact*

Parallel encourages comparison and transfer

Comparison aids learning

training session

SEPARATE CASES

CASE#1

"Describe the solution."

CASE#2

"Describe the solution."

COMPARISON CASES

CASE#1

CASE#2

"Describe the **parallels** of these solutions"

~ 3x

learning outcome

Solutions to a landlord-renter lease

Gentner, Loewenstein, & Thomson, 2003

Does *sharing* multiple prototypes improve design results?

Three Conditions (n=84)

- Share Multiple
- Share Best
- Share One

to fight AIDS in Africa.

And we look good in red, too.

Want to help?
Click here or visit www.faceaids.org

Help us change this. FACE AIDS

1.4 Million Dollars.
150 chapte

Mobilizing and inspiring students to fight AIDS in Africa.

FACE
AIDS

If you want to do, YOU CAN HELP THEM

HELP CHANGE THEIR LIVES

start a FACE AIDS chapter at your school

Make a difference in their lives.
Start a local chapter today.

FACE

CE AIDS

Get Involved
Make an impact

Make a difference...Face AIDS

GET INVOLVED

I applaud FACE AIDS for their leadership in engaging youth from around the world on this pandemic and am pleased that FACE AIDS is supporting my Foundation's collaboration with Partners In Health in Rwanda.

-President Bill Clinton

Help change their lives.

Start a FACE AIDS chapter at your school and join the fight against HIV.

Take the lead and make them smile!
FIGHT AIDS!

Click here to reach out!

FACE AIDS
A student campaign to fight AIDS in Africa

Join us Save lives

FaceAids.com

When it comes to HIV,
everyone is a victim.

FACE AI
A student campaign to fight AID

Fight AIDS in your campus...

Building a movement ...

Join FACE AIDS
A student campaign to fight AIDS in Africa

REAL FACES.
REAL FEARS.
REAL HOPE.

FACE AID
A student campaign to fight AIDS in Af

nspire HOPE
students for the right of health

faceAIDS

FACE AIDS
Click here to REACH OUT!

Give hope, love, and smiles.

CLICK HERE

FACE AIDS NOW BEFORE AIDS FACE YOU

FACE AIDS
A student campaign to fight AIDS in Africa

Meet our pinmakers, meet our inspiration.

Get Involved

FACE AIDS
A student campaign to fight AIDS in Africa

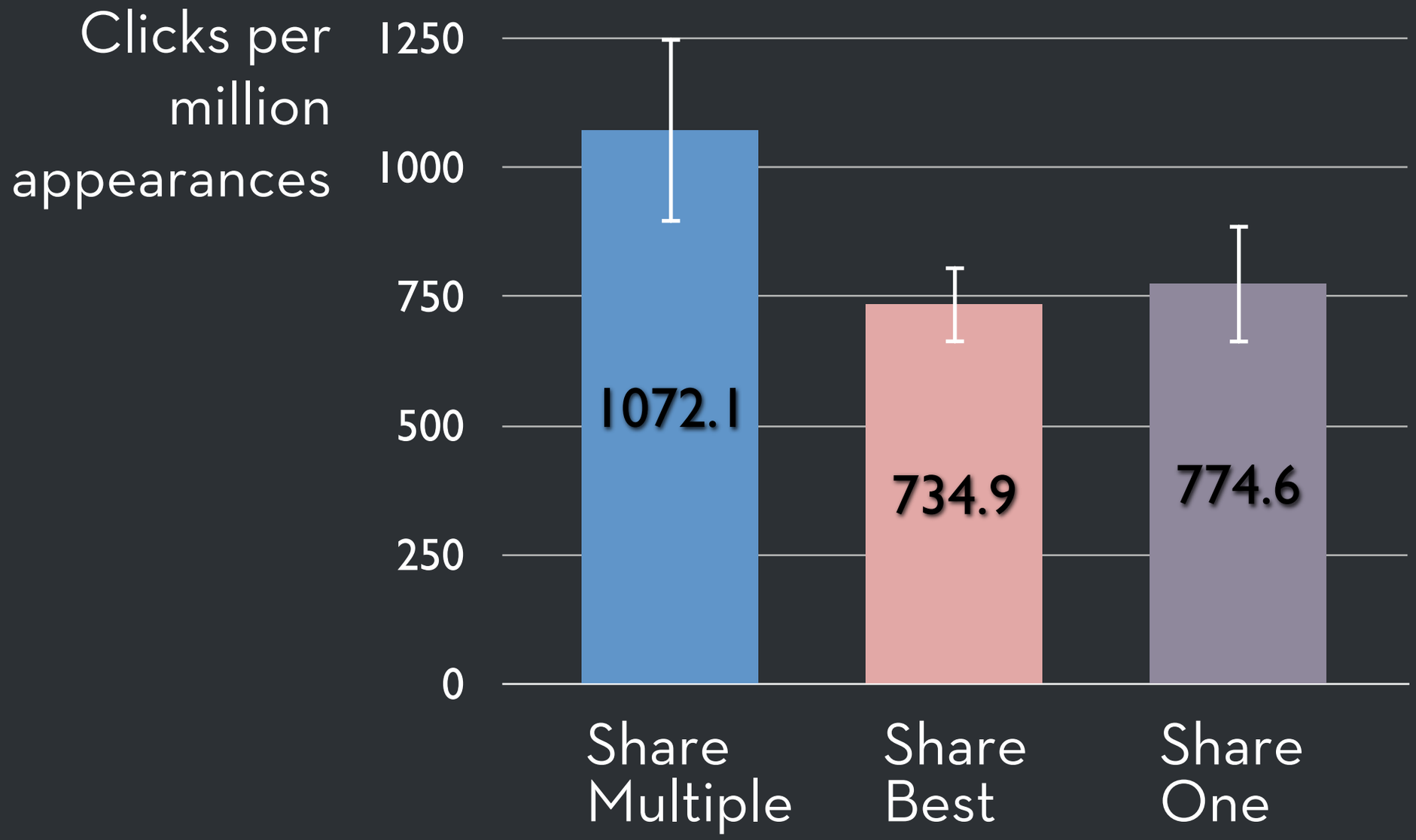
Save Lives

Together
We Can Make A Difference
Be Part Of A Movement

Building a movement means...

Building a future. Building hope. Join us. FACEAIDS

Share Multiple -> More Clicks



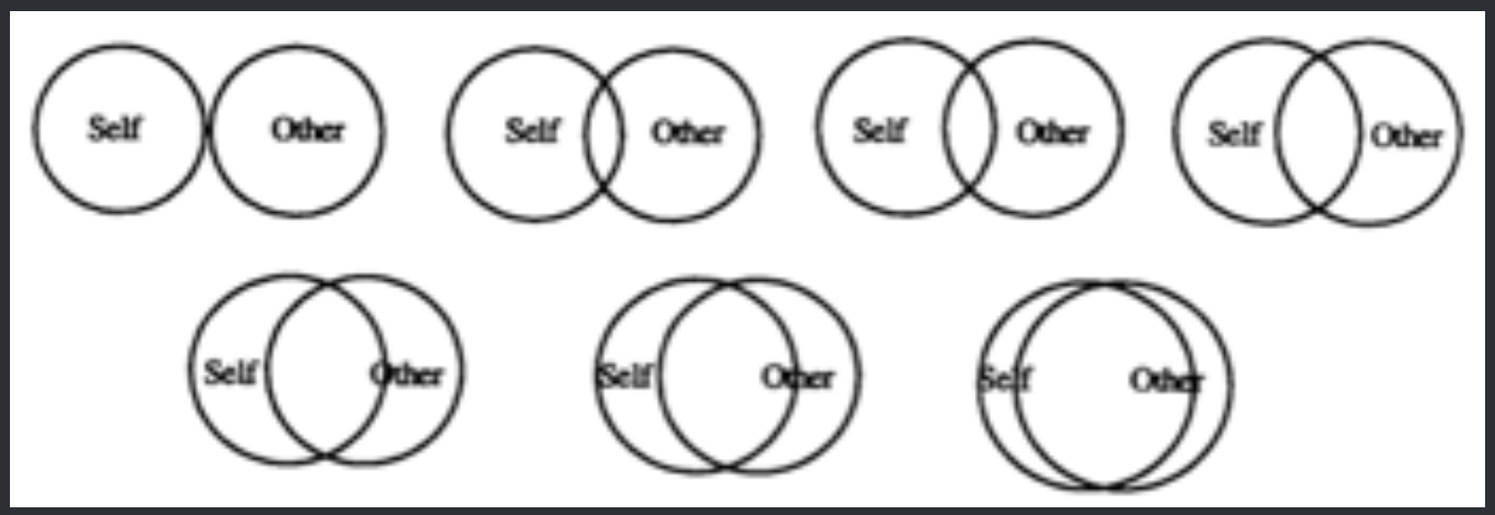
$X^2=4.72$, $p<0.05$

Benefits of sharing multiple

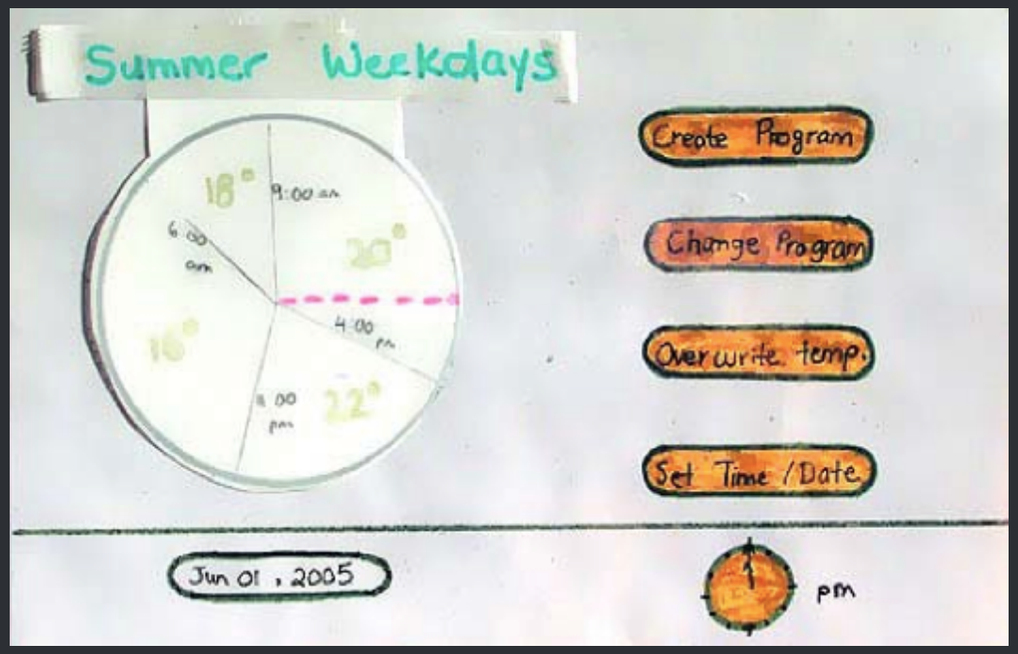
- More individual exploration
- More feature sharing
- More conversational turns
- Better consensus
- Increase in group rapport

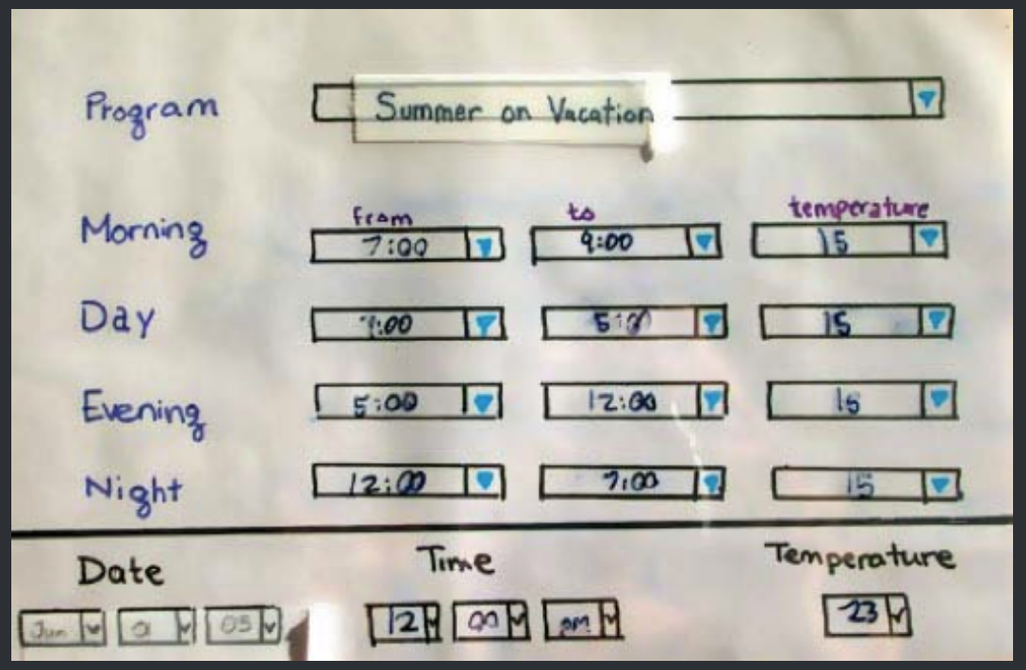
Benefits of sharing multiple

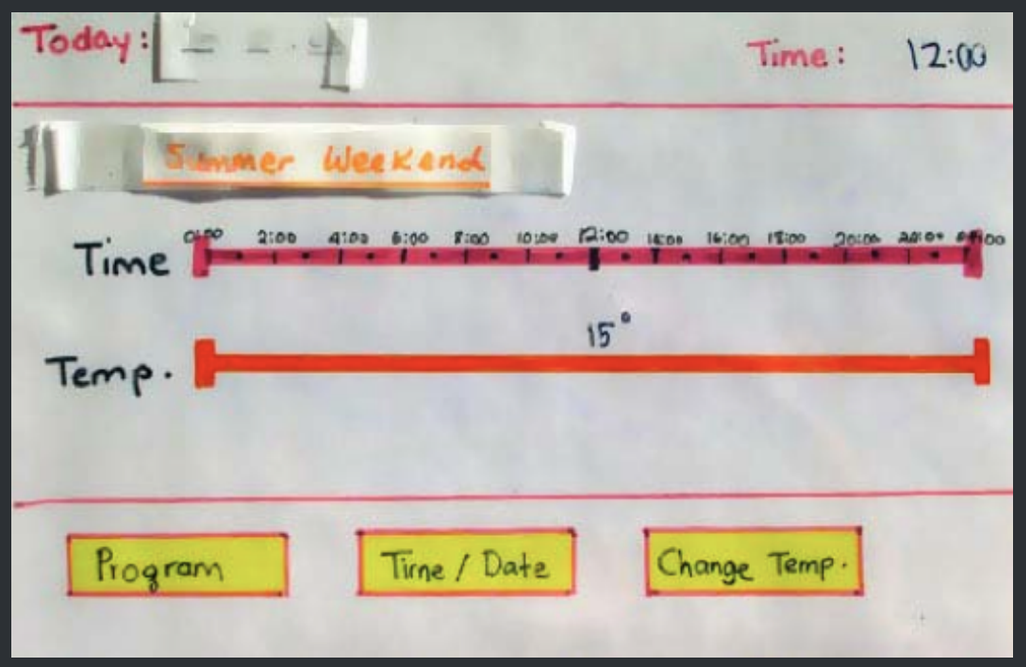
- More individual exploration
- More feature sharing
- More conversational turns
- Better consensus
- **Increase in group rapport**



Alternatives Provide a Vocabulary





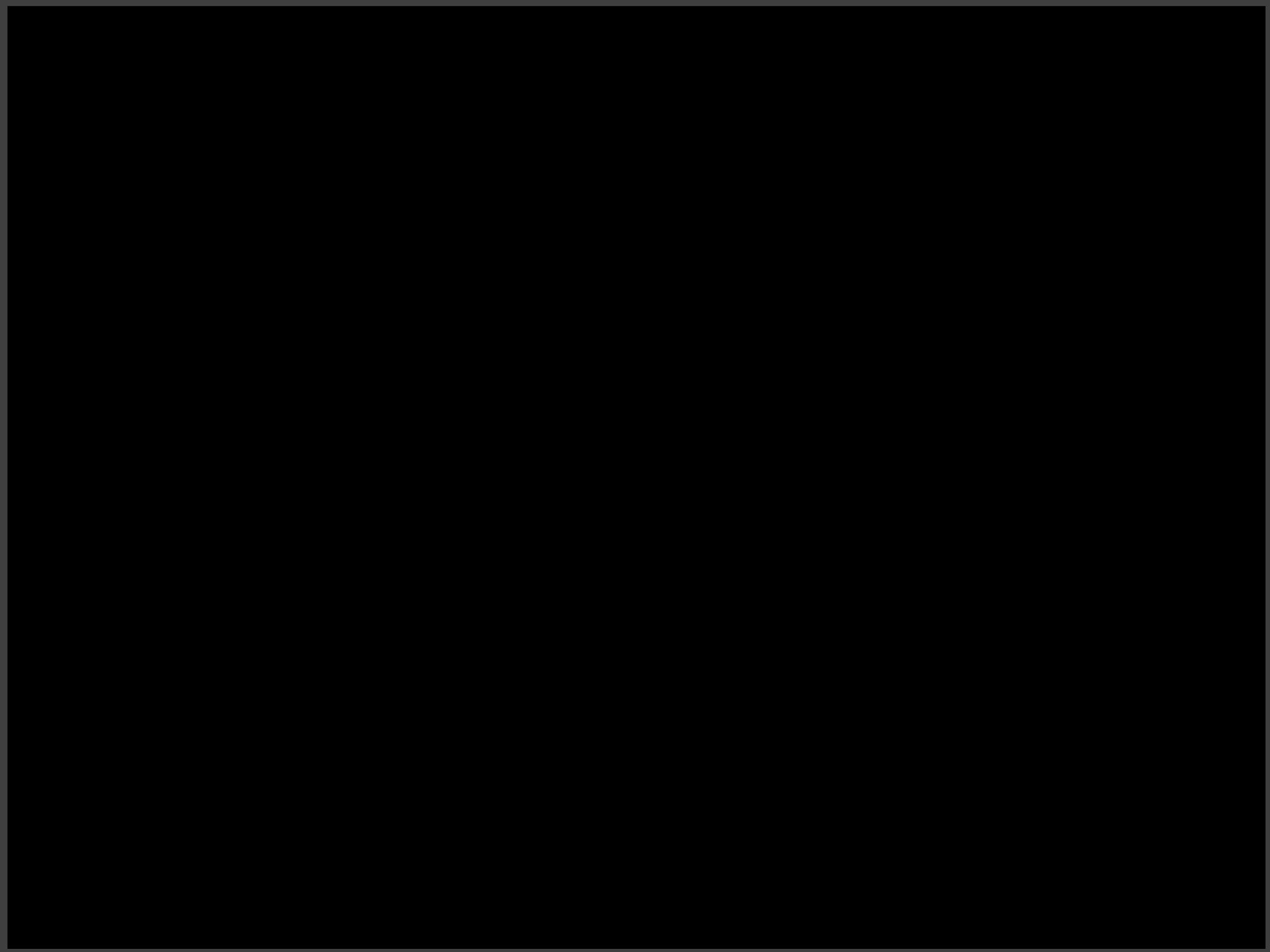


Tohidi, Buxton, Baecker, Sellen, CHI 2006

FAKING IT
VIDEO
PROTOTYPING

Scott Klemmer
www.hci-class.org

Walkabout



Courtesy cs147 2008 Walkabout team: Carissa Carter, Ryan Mason, Brendan Wypich. Stanford University. http://www.snowflyzone.com/?p=441

Benefits of Video Prototyping

- Cheap and fast
- Great communication tools
  - Helps achieve common ground
  - Ideally, portable and self-explanatory
- Can serve as a ‘spec’ for developers
- Ties interface designs to tasks
  - Aligns and orients interface choices
  - Makes sure you have a complete interface
  - And that there’s nothing extra

Thanks to Wendy Mackay. This lecture draws heavily on her video prototyping materials

Video prototypes can be any fidelity

Smart Energy Monitoring

Courtesy Lisa Seeman, Stanford University. http://peec.stanford.edu/behavior/research/Summer%20Energy%20Feedback%20Infrastructure%20Project.php

What should the video show?

- Like a storyboard, the *whole* task, including motivation and success
  - Establishing shots and narrative help
- Draw on tasks you've observed
- Illustrate important tasks your system enables
- Can help scope a minimum-viable-product
- Changes what design teams argue about (in a good way)

What are the steps?

- Like anything, start with an outline (or your storyboards)
- Fine to extemporize
- Equipment
  - a camera. Nothing fancy. Could be a phone, built-in laptop camera...
  - people
  - and a realistic location
- In general, focus on message more than production values

Considerations

- Can use audio or a silent movie with title cards (audio can be finicky)
- Interface can be paper, mock-ups, code, or invisible (just showing the task)
- Can show both success and failure (of your interfaces and others)
- Edit as little as possible because editing is hugely time-consumng. (In-camera/pause editing is most efficient)

FAKING IT
WIZARD-OF-OZ PROTOTYPING

Scott Klemmer
www.hci-class.org

What if we could...

- Make an interactive application without (much) code
- Get feedback from people

Image Courtesy Wikipedia: http://en.wikipedia.org/wiki/File:WIZARD_OF_OZ_ORIGINAL_POSTER_1939.jpg

Wizard-Of-Oz Prototyping...

...simulates machine behavior
with human operators

Wizard of Oz Technique

- Make an interactive application without (much) code
  - Front end interface
  - (Remote) wizard controls user interface
  - Makes sense when it's faster/cheaper/easier than making real thing
- Get feedback from users people
  - Hi-fidelity: users think it's more real
  - Low-fidelity: more license to suggest changes

Courtesy Steven Dow. This lecture draws heavily on his materials on Wizard-of-Oz prototyping

Aardvark

"Why Start-Ups Must Pay Attention To What's Behind The Curtain"

Venture Capital Dispatch - WSJ

http://blogs.wsj.com/venturecapital/2010/04/24/how-a-start-up-grew-by-paying-attention-to-whats-behind-the-curtain/

Making a Wizard-Powered Prototype

- Map out scenarios and application flow
  - what should happen in response to user behavior?
- Put together interface "skeletons"
- Develop "hooks" for wizard input
- Where and how the wizard will provide input
  - selecting the next screen, entering text, entering a zone, recognizing speech, etc.
  - remember that later you'll need to replace with computer
- Rehearse wizard role with a colleague

Running Wizard-Powered Prototypes

- Practice with a friend first
- Once you're comfortable, recruit "users"
- Two roles: facilitator and wizard.
- **Facilitator** provides tasks (paper) and takes notes
- **Wizard** operates interface (more authentic if hidden or remote)
- User feedback can be...
  - Think aloud (speak freely as performing tasks)
  - Retrospective (best when think aloud distracts)
  - Heuristic evaluation (works with experts too)
- Debrief users (reveal wizard if needed)

Lifalyze

Courtesy cs147 2011 Lifalyze team: Greg Grenier, Luke Knepper, Alexandra Liptsey-Rahe, Vivian Shen. Stanford University. http://www.lifalyze.com

Wizards Throughout Development

Advantages of Wizards

- Fast (faster) and thus, cheaper and more iterative prototypes
- Creating multiple variations is easy
- More "real" than paper prototyping
- Identifies bugs and problems with current design
- Places the user at the center of development
- Can envision challenging-to-build applications
- Designers learn by playing wizard

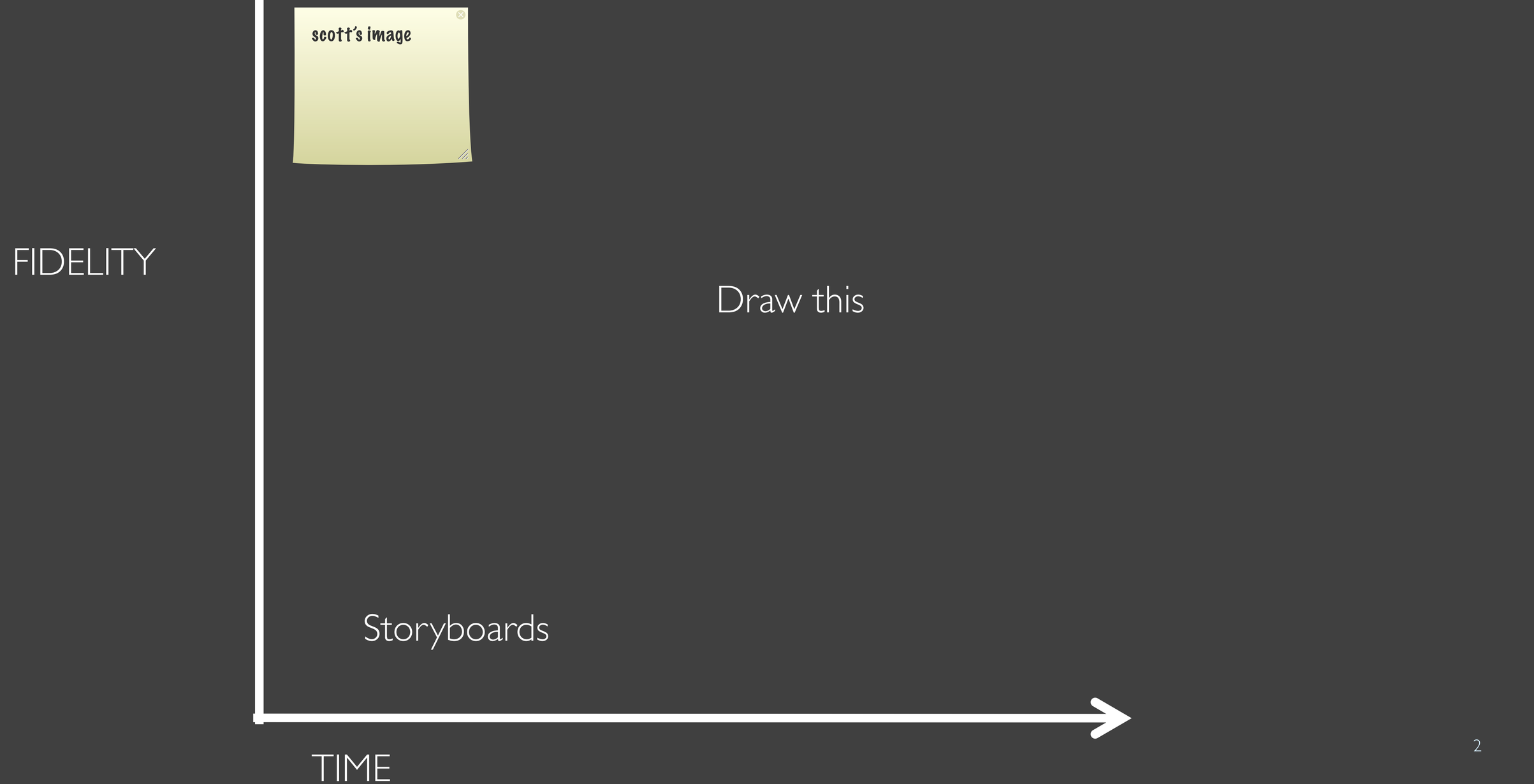
Disadvantages of Wizards

- Simulations may misrepresent otherwise imperfect tech
- May simulate technologies that do not exist (and may never)
- Wizards require training and can be inconsistent
- Playing the wizard can be exhausting
- Some features (and limitations) are difficult/ impossible to simulate effectively
- May be inappropriate in some venues (e.g., home)

For more examples, see...

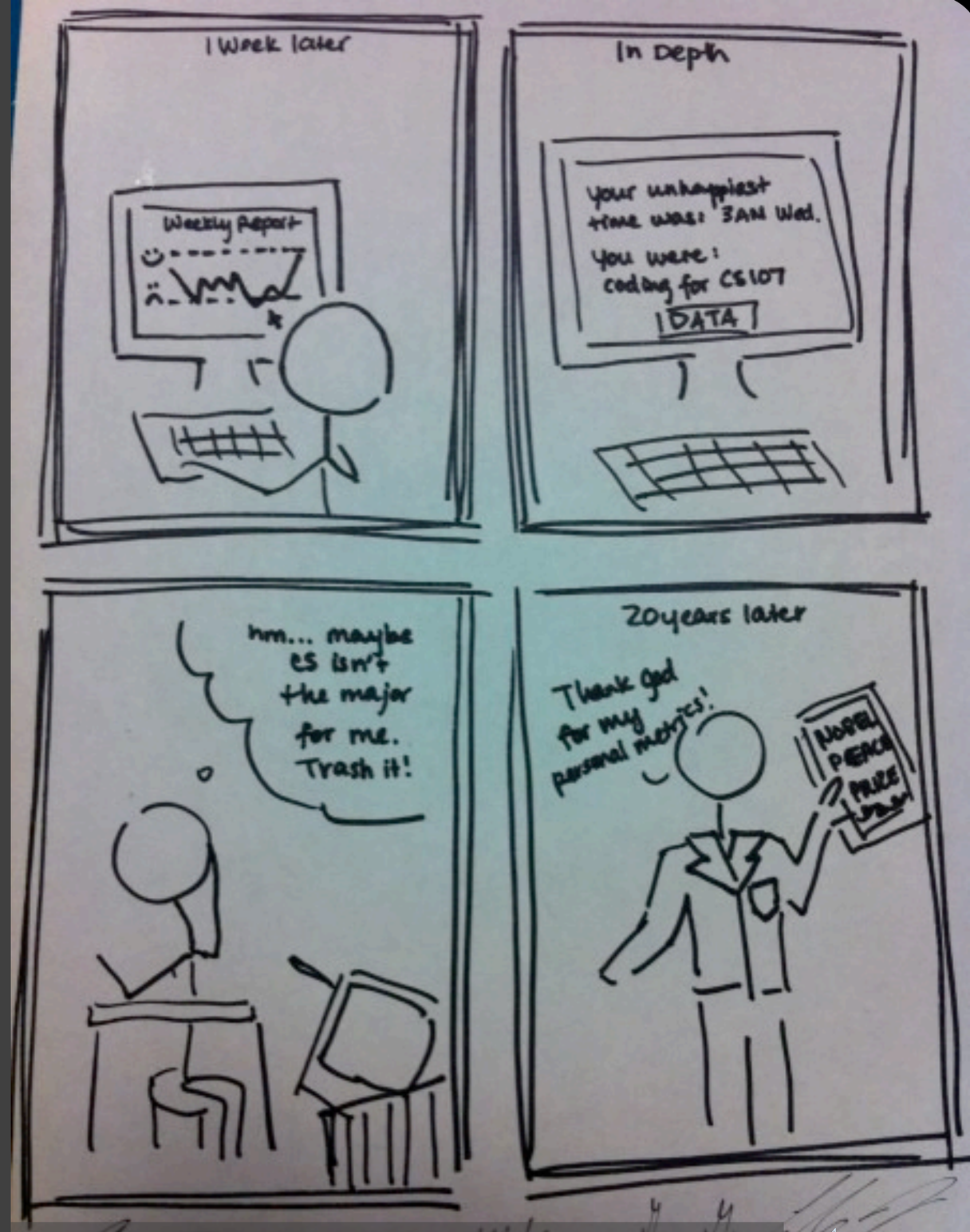
- speckyboy.com/2010/06/24/10-effective-video-examples-of-paper-prototyping
- Steven Dow, www.cs.cmu.edu/~spdow
- www.elsevierdirect.com/companion.jsp?ISBN=9780123740373

Use Stage-Appropriate Tools



Outline

- Storyboarding
- Creating Paper Prototypes
- Testing Paper Prototypes
- Digital Mock-ups

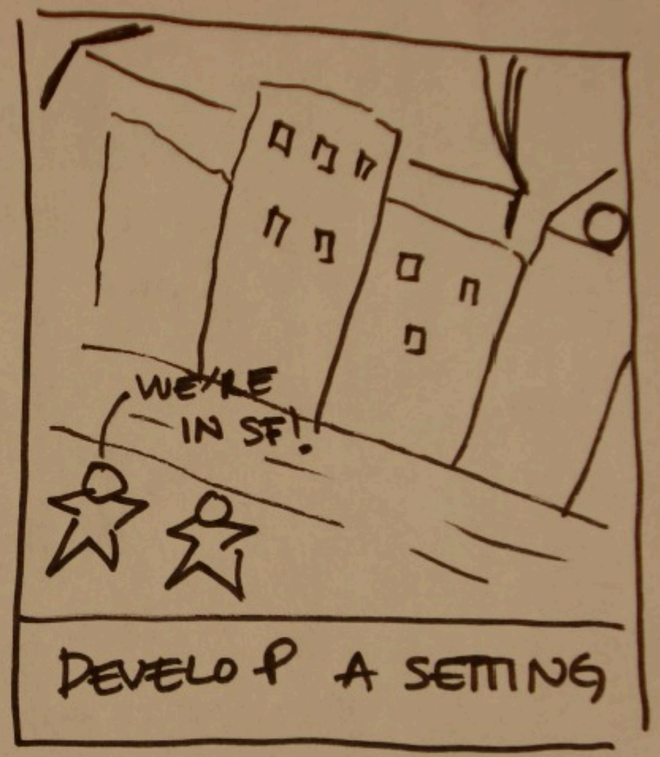


Lifalyze: Greg Grenier, Luke Knepper, Alexandra Liptsey-Rahe, Vivian Shen

Storyboarding isn't about "pretty pictures"

it's about communicating ideas

Star People *(Bill Verplank)*



adapted with permission from Amal Dar Aziz, Guide to Storyboarding, http://hci

Storyboards Should Convey

- Setting
  - People involved
  - Environment
  - Task being accomplished
- Sequence
  - What steps are involved?
  - What leads someone to use the app?
  - What task is being illustrated?
- Satisfaction
  - What's motivates people to use this system?
  - What does it enable people to accomplish?
  - What need does the system fill?

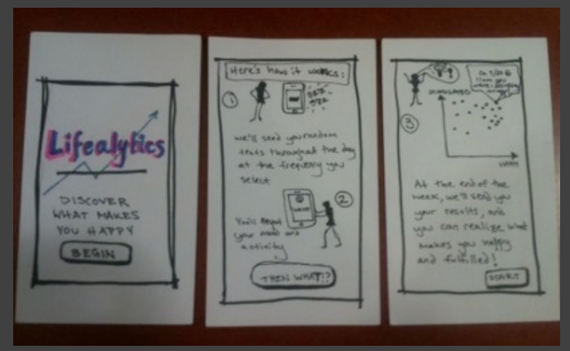
adapted with permission from Amal Dar Aziz, Guide to Storyboarding, http://hci.st/story

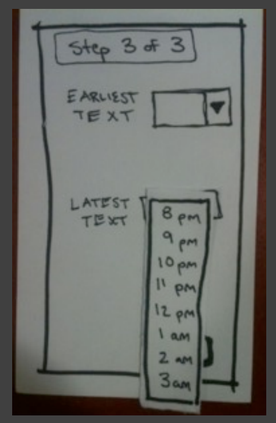
Benefits of Storyboarding

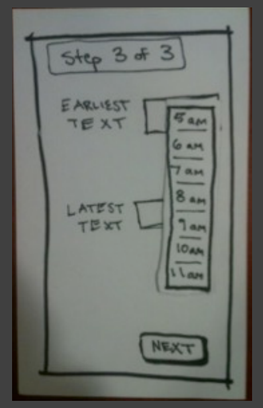
- Holistic focus: Helps emphasize how an interface accomplishes a task
- Avoids commitment to a particular user interface (no buttons yet)
- Helps get all the stakeholders on the same page in terms of the goal

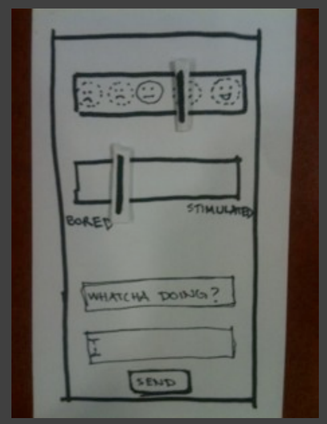
Time Limits Help

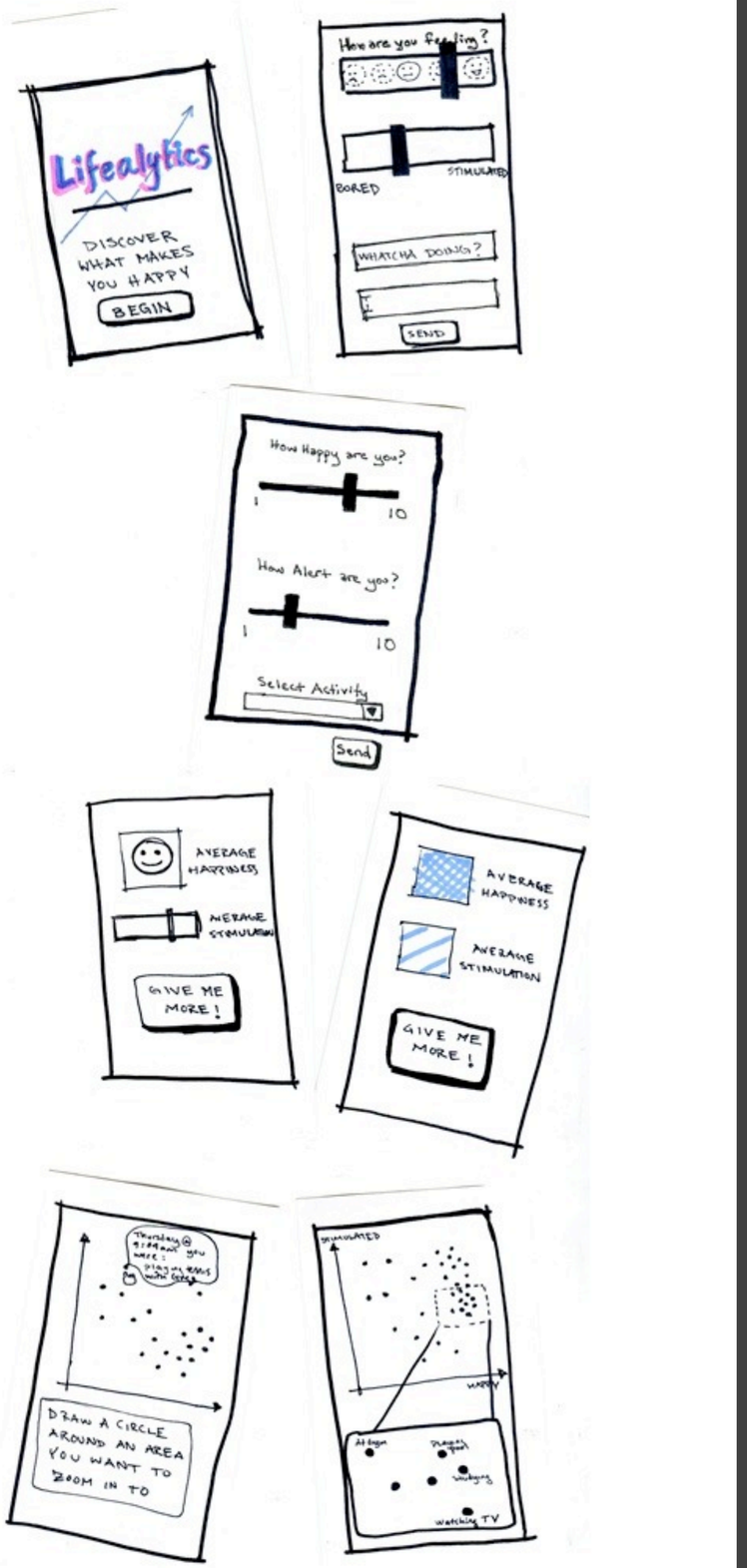
Paper prototyping











6 Paper Prototyping Tips & Tricks

- Keep all your materials in one place! Small interface widgets tend to get lost or damaged easily
- Work quickly and make reusable components (buttons, etc)
- If something is difficult to simulate (progress indicators, right mouse menus, hyperlinks), have the user ask if it is available and then verbally describe the interaction
- Backgrounds (11”x14” poster board) can be useful to contain the prototype and provide context for the user
- Don’t be afraid to mix and match hardware and software! for instance, if size constraints are important, you might want to make a blinder using a photograph of the device that would be used and manipulate the prototype within the frame
- When appropriate, add context by including familiar operating system elements

show examples for each of these during lecture (ie, hold up props)

Get Creative with Materials

- Widgets: Paper, Cardboard, Transparencies
- Connectors: Tape, Glue, Rubber Cement
- Drawing: Pens, Pencils, Markers
- ...and more

more materials...

- Poster board, unlined index cards and foam core are all useful depending on the size of your prototype
- Removable tape or restickable glue is useful for changing components quickly
- Transparency pens allow the user to input content - use a sheet of transparency paper for the input field
- Use wide-tipped pens and markers (think Sharpie) - smaller line widths can be difficult to see
- Use stacks of index cards to simulate tabbed dialog boxes

Lifalyze Video

http://www.youtube.com/watch?v=J-bVzUahNIg

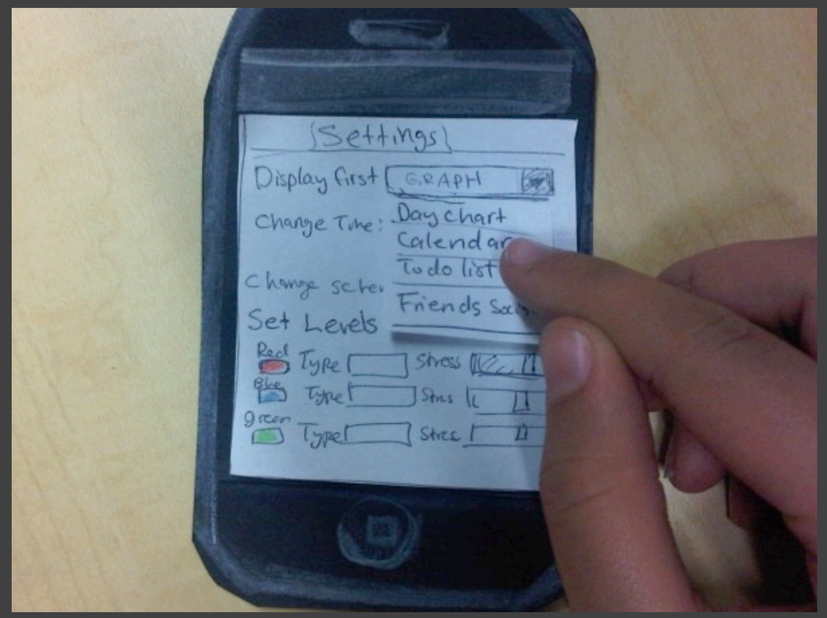
With permission from cs147 2011 Lifalyze team: Greg Grenier, Luke Knepper, Alexandra Liptsey-Rahe, Vivian Shen

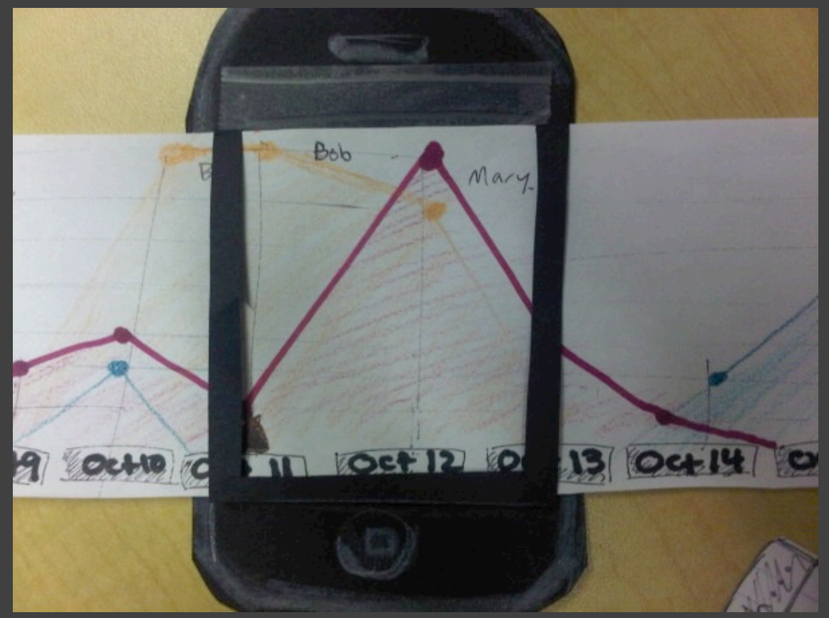
Try Prototypes with People

- Need a picture
- Test multiple
- Emphasis on conversation

With permission from cs147 2011 Lifalyze team: Greg Grenier, Luke Knepper, Alexandra Liptsey-Rahe, Vivian Shen

Test multiple prototypes simultaneously to get most value

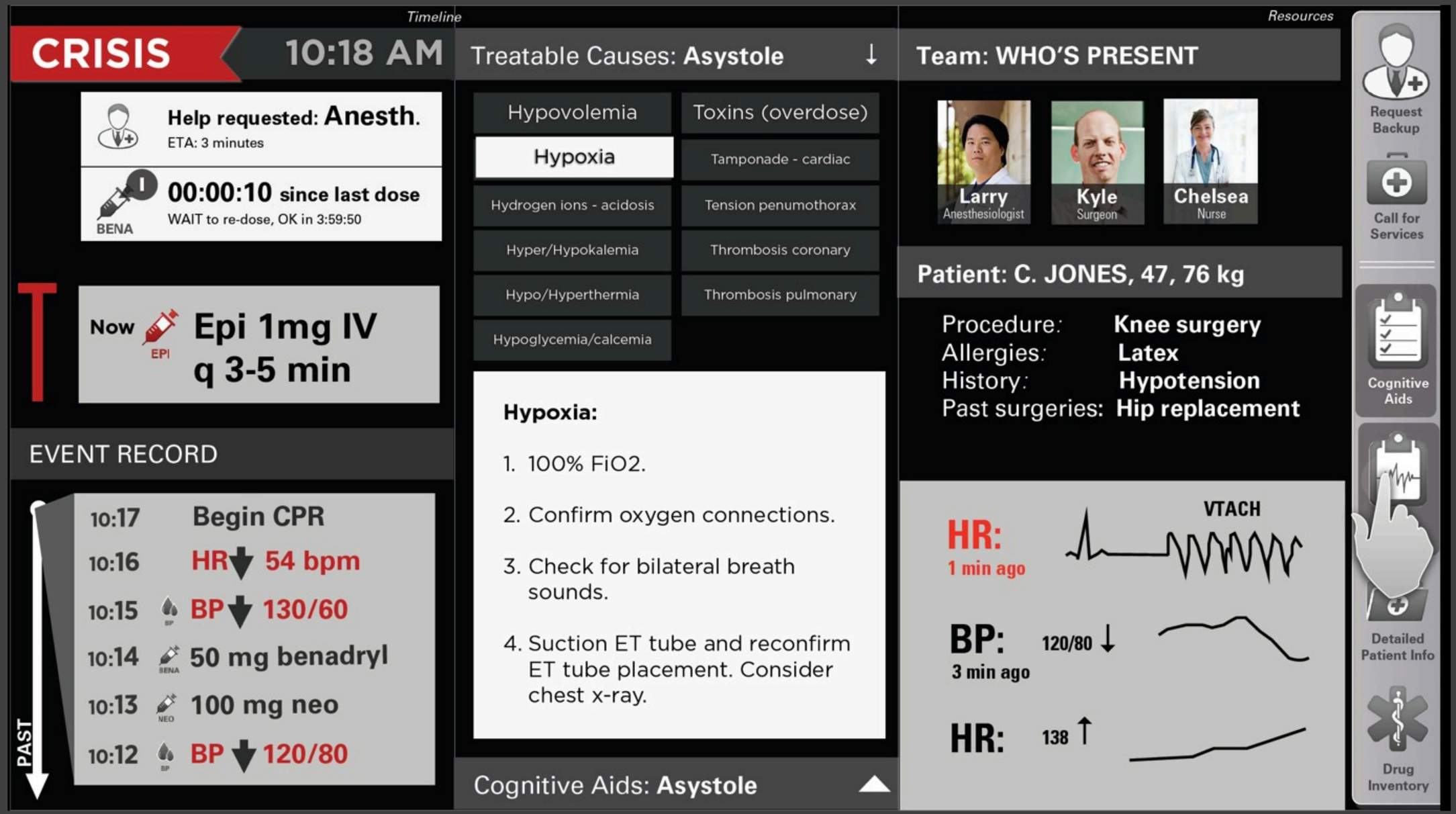




With permission from cs147 2011 Lifalyze team: Greg Grenier, Luke Knepper, Alexandra Liptsey-Rahe, Vivian Shen

Get users (and other stakeholders) to help design. Scaffold their efforts

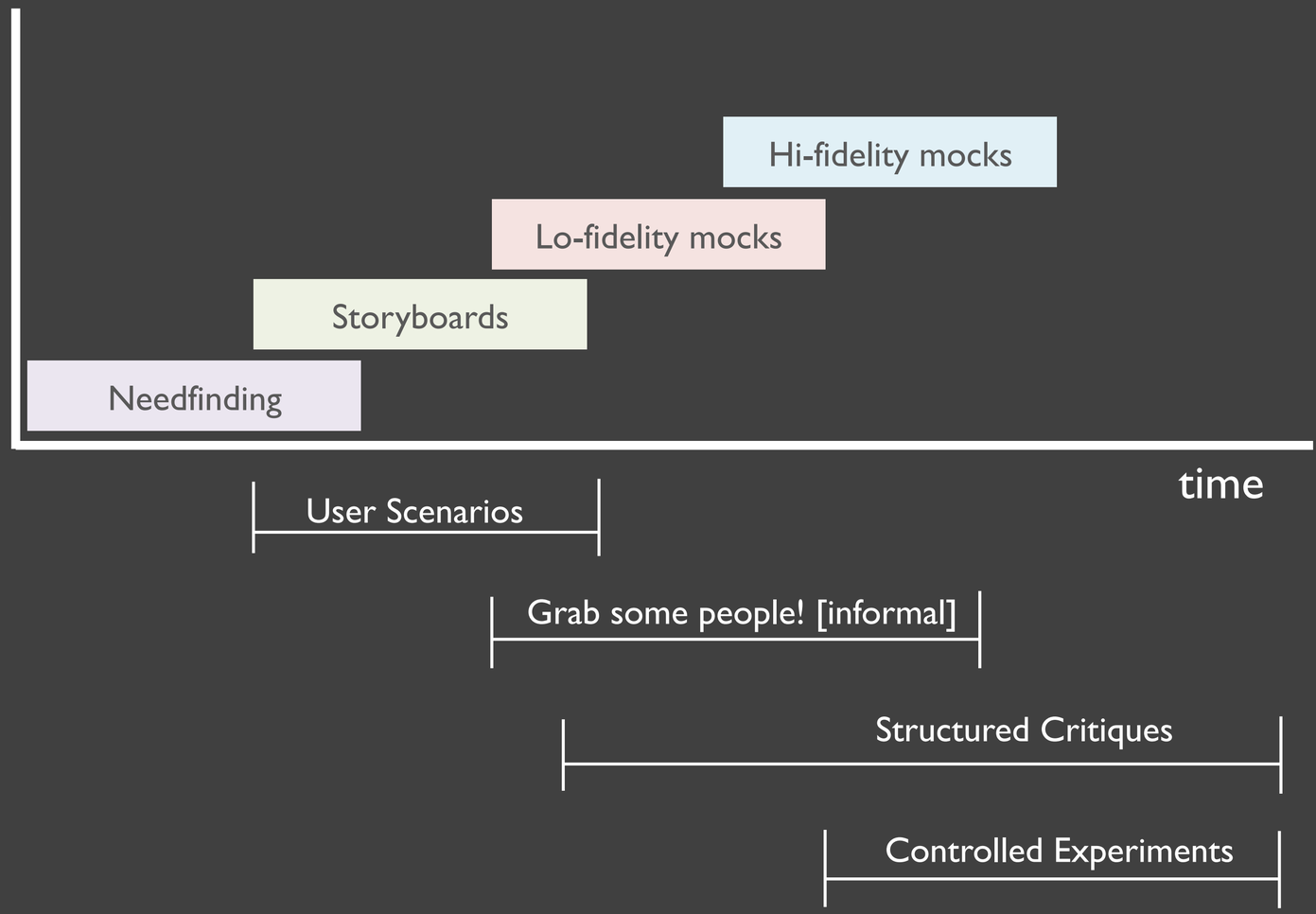
Digital Mock-ups



Interactive Cognitive Aids: Katherine Chen, Kyle Barrett, Jesse Cirimele, Leslie Wu, Stu Card, Larry Chu, Kyle Harrison, Scott Klemmer

Beware Inappropriate Fidelity

Form and Feedback Co-evolve



Further Reading

- Bill Buxton, *Sketching User Experiences*
- Bill Moggridge, *Designing Interactions*
- Carolyn Snyder, *Paper Prototyping*
- Michael Schrage, *Serious Play*
- Houde and Hill, *What do Prototypes Prototype?*
- Todd Zaki Warfel, *Prototyping*