STORYBOARDS, PAPER PROTOTYPES, and MOCK-UPS

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CREATING AND COMPARING ALTERNATIVES

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Creating and Comparing Alternatives

Steven Dow et al.


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
I went with the whole parachute idea and what I had from the beginning...

This is the best approach for such a design...

I am not a very good outside-the-box thinker, so I kinda just had one idea and I was going to try to make it work...

No... for some reason... this seems to be the only idea. There needs to be a platform and then as good of cushion as possible... I don't see any other

Participants picked their concept early
Functional Fixation

Duncker, 1945
Research question

How does parallel design — rather than a serial approach — affect performance?
Task: design an advertisement
Procedure \((N=33)\)

serial prototyping condition

parallel prototyping condition

FINAL
Web advertising analytics
Parallel design -> more clicks

Clicks per million impressions

F(1,30)=4.227
p<.05
...and more time on the site

Average time on client site per visitor (seconds)

- Parallel condition: 31.3 seconds
- Serial condition: 12.9 seconds

F(1,493)=3.172, p=0.076
...and higher expert ratings

Parallel condition: 24.4
Serial condition: 21.7

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

Parallel: 2.78
Serial: 3.18
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”

learning outcome

Solutions to a landlord-renter lease

~ 3x

Gentner, Loewenstein, & Thomson, 2003
Does sharing multiple prototypes improve design results?
Three Conditions \((n=84)\)

- Share Multiple
- Share Best
- Share One
Share Multiple -> More Clicks

![Clicks per million appearances graph]

- **Share Multiple**: 1072.1
- **Share Best**: 734.9
- **Share One**: 774.6

\[\chi^2 = 4.72, p < 0.05\]
Benefits of sharing multiple

- More individual exploration
- More feature sharing
- More conversational turns
- Better consensus
- Increase in group rapport
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Alternatives Provide a Vocabulary

Tohidi, Buxton, Baecker, Sellen, CHI 2006
Walkabout
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

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-consuming. (In-camera/pause editing is most efficient)
FAKING IT
WIZARD-OF-OZ
PROTOTYPING

Scott Klemmer
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What if we could...

• Make an interactive application without (much) code
• Get feedback from people
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
“Why Start-Ups Must Pay Attention To What’s Behind The Curtain”

Venture Capital Dispatch - WSJ

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

Lifalytics

DISCOVER
WHAT MAKES
YOU HAPPY
BEGIN

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

FIDELITY

Storyboards

TIME

scott's image

Draw this
Outline

• Storyboarding
• Creating Paper Prototypes
• Testing Paper Prototypes
• Digital Mock-ups
Storyboarding isn’t about “pretty pictures”

it’s about communicating ideas
Star People (Bill Verplank)
Let's check out places in SF...

Show interactions

Develop a setting

Let's try out Burmese Superstar. Amal rated it & it sounds cool!

Show satisfactions

Finally, be creative! You don't need to be an artist to get a point across.
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
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-bVzUahNlg
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
Get users (and other stakeholders) to help design. Scaffold their efforts
Digital Mock-ups

CRISIS
10:18 AM

Help requested: Anesth.
ETA: 3 minutes

00:00:10 since last dose
WAIT to re-dose, OK in 2:59:59

BENA

Epi 1mg IV q 3-5 min

T

Now

Event Record

10:17 Begin CPR
10:16 HR ↓ 54 bpm
10:15 BP ↓ 130/60
10:14 50 mg benadryl
10:13 100 mg neo
10:12 BP ↓ 120/80

Treatable Causes: Asystole

- Hypovolemia
- Hypoxia
- Toxins (overdose)
- Tamponade - cardiac
- Hydrogen ions - acidosis
- Tension pneumothorax
- Hyper/Hypokalemia
- Thrombosis coronary
- Hypo/Hyperthermia
- Thrombosis pulmonary
- Hypoglycemia/calcemia

Team: WHO’S PRESENT

- Larry Anesthesiologist
- Kyle Surgeon
- Chelsea Nurse

Patient: C. JONES, 47, 76 kg

Procedure: Knee surgery
Allergies: Latex
History: Hypotension
Past surgeries: Hip replacement

Hypoxia:

1. 100% FiO2.
2. Confirm oxygen connections.
3. Check for bilateral breath sounds.

Cognitive Aids: Asystole

HR: 1 min ago
BP: 120/80 ↓ 3 min ago
HR: 138 ↑
Beware Inappropriate Fidelity
Form and Feedback Co-evolve

Needfinding

Storyboards

Lo-fidelity mocks

Hi-fidelity mocks

User Scenarios

Grab some people! [informal]

Structured Critiques

Controlled Experiments
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*