### EXPERIMENTS

Scott Klemmer and Michael Bernstein

### Bill copyright

Sedia de la como de la



### "Do You Like My Interface?"



## "How much do you like my interface?"

## " " This is a useful interface: agree/disagree



### Please the Experimenter Bias



### However: is one of the most effective learning tools anywhere.

Watching people fail to use your design

# Today: measuring success offline and online

- Variables, validity
- Randomization
- Usability testing
- •Online A/B testing

### Getting beyond "do you like my interface?" •What's the comparison? •What's the yardstick?

7

### Getting beyond "do you like my interface?"

- Baserates: How often does Y occur?
  - •Requires measuring Y.

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9

### Getting beyond "do you like my interface?"

- Baserates: How often does Y occur?
  - •Requires measuring Y.
- Correlations: Do X and Y co-vary? •Requires measuring X and Y.
- Causes: Does X cause Y?
  - •Requires measuring X and Y, and manipulating X.
  - variables (confounds)!

•Also requires somehow accounting for the effects of other independent

### Let's introduce a few terms...



### manipulations Independent Variables

### measures Dependent Variables

### precision Internal Validity



# generalizability External Validity

Friday, August 17, 2007 11:03 AM PT Posted by Harry McCracken

### A Not-Very-Useful iPhone Keyboard Study





Research firm User Centric has released a study that tries to gauge how effective the iPhone's unusual on-screen keyboard is. The goal is certainly a noble one, but I can't say that the survey's approach

results in data that makes much sense.

User Centric brought in twenty owners of other phones--half who had ones with QWERTY keyboards, and half who had ordinary numeric phone keypads. None were familiar with the iPhone. The research involved having the test subjects enter six sample text messages with the phones they already had, and six with an iPhone.

Logical end result: These iPhone newbies took twice as long to enter text with an iPhone as they did with their own phones, and made lots more typos.

### Benefits and Drawbacks?



### Manipulation: Input Style •Measure:Words per minute •External validity: not so much



### A better version: actual users



Figure 1. Average time to type a message on phones owned by the participants (M + - SD).

 Manipulation: Input Style •Measure:Words per minute •...and error rate



### iPhone & Qwerty users similar speed, but



Figure 1. Average time to type a message on phones owned by the participants (M + SD).

An In-Depth Look into the Text Entry User Experience on the iPhone, Jennifer M. Allen, Leslie A. McFarlin and Thomas Green, Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2008



Figure 2. Average number of total errors per message made by participants using their own phones (M + J - SD).



### Strategies for fairer comparisons

- larger system
- •When expertise is relevant, train people up

Insert your new approach into the production setting •Recreate the production approach in your new setting •Scale things down so you're just looking at a piece of a

### I) Experimental Design

## Controlled comparison enables causal inference.

Between vs. within subjects designs Randomization

# Should every participant use every alternative?

## Which professor style is more effective?





### What are the measures?

- •Faster?
- •Better test scores?
- •Fatigue?
- •Attention focused on lecture?
- End-of-class evaluations?



 Manipulation: Professor style Measure: Test scores, end-of-class evaluations

### Between subjects design

### Half the participants see one version









### The other half see the other









### Within subjects design

### Everyone uses both versions











### How Can We Address Ordering Effects?































# How about individual differences?

Randomization washes them out.

30

# What about for Three or More Alternatives?



# Latin Square

# What happens if we don't randomize?

# Self-selection effects •Typing in the morning versus the afternoon

# Learning effects •Showing alternatives in sequence

### At a high level: Should every participant use every alternative?


## Two Major Strategies

- •Within-subjects: everyone tries all the options. Good when you're not worried about learning/practice/ exposure issues (that trying one version will 'pollute' the date from another version)
- •Between-participants: each person tries one. Requires more people, and more attention to fair assignment. Has the benefit that each participant is uncorrupted (at least by the study...)

## 2) In-person experiments

## Set a clear, focused goal

- Scope: make a meeting room booking system for Gates.
- Purpose: create a system that encourages people to not overbook the length of time they need
- Hypothesis: splitting the booking process over several screens will encourage more thought and people will book better

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NEXT STEP



## Recruit to match that goal

- Schedule and location: next week, Stanford Gates building
- Participants: 12 people (4 students, 4 office administrators, 4 professors)

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## Create concrete tasks

"Book a room sometime next week for a research group meeting. Andrew will be out of town, so we won't hear his weekly update. The rest of us should be present and give our updates. Besides the usual group members, we'll have two visitors from France who will present their research-maybe they'll take 10 minutes each.

When you're done booking the room, tell Arvind so he can prepare the next task for you."

## "We are testing our design: we are not testing you."

## Experimental Details

- Task ordering
  - Start simple, then build up to complex tasks
- users receive training?
- What if someone doesn't finish?

## Training: is this a walk-up-and-use system? Or will real

## Always pilot your study before launching

- - Pilots = low-cost prototypes of experimental design
- Why pilot?
  - Debug study protocols
- Run two pilots
  - First: friends+colleagues
  - Second: real users

• A pilot study is a practice run before the experiment • Even if you are running behind schedule, do a pilot study

Catch errors early so they don't mess up your results

## Options for capturing results Bring a notebook for freeform feedback

- Instrumented software
- Video recording
- Screen recording

## Think Aloud protocol

- are doing
- Ask users to talk while performing tasks • tell us what they are thinking
  - tell us what they are trying to do
  - tell us questions that arise as they work
  - tell us things they read
- Prompt the user to keep talking:
  - "Tell me what you are thinking"
- Make a recording or take good notes
  - make sure you can tell what they were doing

• Need to know what users are thinking, not just what they

## 3) Online field experiments

## Relative merits: online vs. in-person

Offline: deep understanding Online: scale and resolution

## NATIONAL ALERT REGISTRY Be Aware • Be Alert • Be Safe

## Search Results

bearch Results			
Search Initiated:	8/2/2005	Time:12:12 P.M.	
Search Location:	Zip: 32225	City: JACKSONVILLE, JAX	State: FL
		·	

33 Registered sex offenders are located in your Immediate area.

Get the complete report including map, photograph, and addresses to find out who they are and where they live. You will be able to enter your full address and specify a larger radius.

The complete report includes:

Photos AMPLE MAP RECEI Appearance Details Conviction Information Offense Dates Offense Details Street Addresses 🔵 Name Aliases 🛨 You 🔹 Results See the entire sample Report!

> To get a complete Predator Report today, register below with National Alert Registry, and for just \$10.00 we will create a custom report using your address. We will also send you a "Red Alert" notification when new predators are in your area.











## Background

The U.S. Congress passed three laws that require States to keep track of sex offenders; the Wetterling Registration Act, the Lynchner Tracking and Identification Act and Megan's Law. On March 5, 2003, The Supreme Court ruled that information about potential predators may be posted on the Internet.

## The Problem

The information is available and you have the right to see it. But the problem is that access is very difficult. You have to know the name of the individual you are looking for and in many States you must go to your police station and complete a request form. In some States there is a fee and limit to view only two names

The Solution -Predator Report

Now in the **privacy** of your home you can view the same information displayed on a map of your neighborhood. The free service provides the number of predators in your neighborhood. You can then choose to purchase the full service, which includes details about those sexual offenders, including specific addresses. The full service search is based on your exact address.

## NATIONAL ALERT REGISTRY

## Search Results for Zip Code 32225

	-		
Search Initiated:	8/2/2005	Time: 12:11 P.M.	
Search Location:	State: FL	City: JACKSONVILLE, JAX	Zip: 32228
There are currently	/ 32 Registere	ed Sex Offenders located in vou	ur zip code

## Would you like names, pictures and addresses? Click Here

The National Alert Registry has made all this vital information available to you. Plus you can get a custum map of your neighborhood, identifying your home and where offenders reside in proximity to it.

## Your complete "Predator Report" includes all of the below:

ID Name Color Photos (when available) SAMPLE MAP Appearance Details STEVENS THADDEUS Street Addresses 🔵 A Detailed Map Name & Aliases Conviction Information Offense Dates Offense Details 🖈 You 🔹 Resul See the entire sample Report!

Your can purchase your complete Predator Report and access this vital information today. For just \$10.00 we will create a custom report using your address.



## Be Aware • Be Alert • Be Safe





"I love my NAR monthly Predator Report. You can't imagine my shock to find a registered sex offender living one mile from my home. I have grandchildren that visit often and you can bet I will keep a MUCH closer watch on them from now on. NAR is a wonderful tool for keeping my family safe." Jolene S., Florida

"WAR Predator Report Is wonderful! I live in an upscale neighborhood and thought I was safe, but when I checked my Predator Report I discovered that we have three (3) offenders living in our neighborhood. I was astounded." Bill S., New York

"I am very pleased that I subscribed to this. It does indeed, keep me: ALERT, and AWARE and I feel SAFER! THANK YOU for these services." -- Justice of Colorado



32 Re	aistered	i Sex Offender	rs currently locat
Search Loc	ation:	State: FL	City: JACKSON
Search Init	iated:	8/2/2005	Tir



- updated daily when new information is available.
- are in your area.
- updated.



Interface courtesy of A List Apart: http://www.alistapart.com/articles/designcancripple

## Search Results

Search Location:	Zip: 32225	City: JACKSONVILLE, JAX	State: FL
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Get the complete report including map, photograph, and addresses to find out who they are and where they live. You will be able to enter your full address and specify a larger radius.

## The complete report includes:



To get a complete Predator Report today, register below with National Alert Registry, and for just \$10.00 we will create a custom report using your address. We will also send you a "Red Alert" notification when new predators are in your area.







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States you must go t your police station a

complete a request

form. In some State

view only two name

The Solution -

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Background The U.S. Congress

Search Initiated:	8/2/2005
Search Location:	State: FL
There are currently	32 Registere

- Appearance Details



Interface courtesy of A List Apart: http://www.alistapart.com/articles/designcancripple

A/B/C Split Test			
	PAGE A	PAGE B	PAGE C
Percent of traffic	34%	33%	33%
New sales	244	282	114
Change	N/A	15.57%	-53.28%

Interface courtesy of A List Apart: http://www.alistapart.com/articles/designcancripple

## NATIONAL ALERT REGISTRY

## Free Search Results for Zip Code 32225

Search Initiated:	8/2/2005	Time: 12:12 P.M	••••••
Search Location:	State: FL	City: JACKSONVILLE, JAX	Zip: 32
32 Registered	l Sex Offende	rs currently located in your zi	ip code

## Create Your Sex Offender Map And Detailed Predator Report

Get a custom map of your neighborhood, identifying your home and where offenders reside in your area. It only takes a few seconds to generate your report and costs just \$10.



## Be Aware • Be Alert • Be Safe



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Search Initiated:	8/2/2005	Time: 12:11 P.M.	
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√eriSign

55

## Ways design makes a difference

- Position and color of a call to action
- Position on the page of testimonials, if used • Whether linked elements are in text or as images • Amount of white space on a page, giving the content space
- to "breathe"
- Position and prominence of the main heading Number of columns used on the page Number of visual elements competing for attention Attributes of people and objects in photos



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**EDUCATORS CORNER** Entrepreneurship Education Resources

## Quick Shots

Spend just two minutes and a few odd seconds to learn bright ideas to build, grow, or sustain your entrepreneurial drive. These bite-sized, informative videos offer a fast jolt to your fast-tracking career.



Negotiating with Customers and Don't Kill Projects; Morph Them <u>Clients</u> Stan Christensen | Dan Springer <u>Marissa Mayer</u> 2 min. 1 sec. 2 min. 2 sec.

## New Podcasts

From medical devices to social responsibility, corporate acquisitions to personal tales of trial and triumph, our speakers share their collective wisdom and decades of business savvy.



Debra Dunn, Skoll Foundation | Jay Coen Gilbert, B Corporation | Bart Houlahan, B Corporation | Andrew Kassoy, B Corporation - 50 min. 56 sec. The co-founders of B Lab, Jay Coen Gilbert, Bart Houlahan, and Andrew Kassoy, unveil their infrastructure play that seeks to give voice to the burgeoning panoply of green business. They explain how a higher set of corporate standards accountable to the environment, employees, and the community, can craft a healthier corporate

ecosystem for all.



## Podcast: Healthy Entrepreneurship in Medical Devices

Mir Imran, InCube Labs - 54 min. 28 sec. Parallel entrepreneur Mir Imran, CEO of InCube Labs, has launched twenty companies - at times simultaneously. He shares his solutions-focused expertise and identifies the vitality and growth of the biomedical healthcare vertical.

## Podcast: The Path to an Acquisition



Brett Crosby, Google Analytics - 1 h 1 min. 5 sec. Brett Crosby, Group Manager of Google Analytics, describes the ebb and flow of the process by which his web analytics company, Urchin, was acquired by Google. He also shares some inspirational lessons in making small business loom large.

Educators Corner, a project of Stanford Technology Ventures Program at Stanford University, is a collection of recordings from hundreds of Silicon Valley's most practiced entrepreneurs and thought leaders. The collection offers over 1,200 videos and podcasts, freely available to the public.

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Taking Risks

Vinod Khosla

2 min. 26 sec.

## Podcast: Representing the Socially Responsible Enterprise

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EDUCATORS CORNER Entrepreneurship Education Resources

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Spend just two minutes and a few odd seconds to learn bright ideas to build, grow, or sustain your entrepreneurial drive. These bite-sized, informative videos offer a fast jolt to your fast-tracking career.



Dan Springer, Responsys - 2 min. 1 sec.

Dan Springer, CEO of Responsys, acknowledges that the most frequent and important negotiations often occur with customers. Furthermore, Springer advises that the keys to a successful negotiation with customers include: 1) Preparation to discover what the customer wants and 2) Identifying the few things on which you will stand firm.



## Video: Don't Kill Projects; Morph Them

Marissa Mayer, Google - 2 min. 2 sec. Repackage, rejuvenate, re-market, and re-examine those products or practices you thought would fly, and craft them a new set of wings. Head of Google product development Marissa Mayer lives by the old adage that if at first you don't succeed, try again. She pushes aspiring business thinkers to breathe new life into

failed ventures, as opposed to cutting the cord.



## Video: Taking Risks

Vinod Khosla, Kleiner, Perkins, Caufield & Byers - 2 min. 26 sec. Launching a start-up is not a rational act. And Vinod Khosla, a partner in Kleiner, Perkins, Caufield & Byers and former Sun Microsystems CEO, believes that success only comes from those who are foolish enough to think unreasonably. Entrepreneurs need to stretch themselves beyond convention and

constraint to reach something extraordinary.

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From medical devices to social responsibility, corporate acquisitions to personal tales of trial and triumph, our speakers share their collective wisdom and decades of business savvy.



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## Courtesy Forrest Glick, Stanford STVP http://project8180.stanford.edu/category/wireframes/



## Video: Negotiating with Customers and Clients

Stan Christensen, Stanford Technology Ventures Program; Arbor Advisors

## Podcast: Healthy Entrepreneurship in Medical Devices

## Results

- Opened: 1638 Click thrus: 722 Forwards: 4
- Version B (Quick Shots version) was sent to 6263 users. Opened: 1769 - Click thrus: 922 - Forwards: 14

Version A (traditional version) was sent to 6272 users.



Courtesy Dan Siroker, Stanford HCI Seminar http://hci.stanford.edu/courses/cs547/speaker.php?date=2009-05-08

## Which option performed best?

- Sign up
- Learn More
- Sign up Now
- Join Us Now

## Now for the visual material: five options

Courtesy Dan Siroker, Stanford HCI Seminar http://hci.stanford.edu/courses/cs547/speaker.php?date=2009-05-08



Courtesy Dan Siroker, Stanford HCI Seminar http://hci.stanford.edu/courses/cs547/speaker.php?date=2009-05-08

## Which do you think did best?

- Family Image
- Change Image
- Barack Video
- Springfield Video
- Sam's Video



Courtesy Dan Siroker, Stanford HCI Seminar http://hci.stanford.edu/courses/cs547/speaker.php?date=2009-05-08

65

## Here We Saw

• Small changes: big difference Our expectations are often wrong

## Which got the most clickthroughs?

- l'm on <u>twitter</u>
- Follow me on <u>twitter</u>
- You should follow me on <u>twitter</u>
- You should follow me on twitter <u>here</u>

<u>twitter</u> twitter <u>here</u>

## Which got the most clickthroughs?

4.70% l'm on <u>twitter</u> 7.31% Follow me on twitter

## 10.09% You should follow me on <u>twitter</u>

## **12.81%** You should follow me on twitter here

## Typography Experiment: Color Contrast on MSN Live Search

Live Search typography trends	2
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Adobe - Some keen observers of the design world have been thinking about the <b>typography</b> they see in publications, advertising, and other work. Here is a summary of their thoughts on the <b>trends</b>	Typography: Purchase and do
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## A: Softer colors

Content courtesy Ron Kohavi



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www.lc.capellauniversity.edu/~jb6083/ED722/Ty	pography.htm · <u>Cached page</u>	See your messa

## B: High contrast

Queries/User up 0.9% Ad clicks/user up 3.1%

leur De Lis & More. Fashions.com

## : Fonts.com

and others

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## n Advice?

ly products etrend.com

## at Amazon.com

mazon.com and save over \$25 ship free

ige here..



## Large scale changes design

- Making small but consequential differences detectable.
- Small differences accumulate
- Watch out for spurious results: do you trust your measurements?

# Which version produces more purchases?



NEWS Online travel firm Expedia has found that data analytics can deliver a multi-million dollar kick to a company's bottom line.

The company used SAS analytics to identify a single change to a web page that generated an overnight surge in sales, Expedia's VP of global analytics and optimisation Joe Megibow told the SAS Premier Business Leadership Series conference in Las Vegas last week.

Expedia analysts realised the site needed to be changed after investigating why many customers who clicked the 'Buy Now' button on the company's site did not complete the transaction.

"This is someone who was on our site, found the right location and hotel, put in all their billing and travel information and clicked the 'Buy Now' button," Megibow said.

"As far as leading indicators of purchase intent go, this is as good as it gets and yet we weren't taking the money."

Analysts began examining and correlating information about these failed transactions to identify what traits they had in common.

The answer, it turns out, was quite simple: "We had an optional field on the site under 'Name', which was 'Company'," Megibow said.


# Small distractions such as extra fields can yield big changes

## Small changes have positive impact, too

#### Version A

#### Please let us know if this content was helpful.

Rate this content:

ネネネネネ

Tell us why you rated the content this way (optional):

Remaining characters: 650

courtesy Greg Linden's blog: http://glinden.blogspot.com/2006/04/early-amazon-shopping-cart.html



Submit

### Version B



#### 2x the response rate of Version A



### Fewer options; custom response

### Version C



3.5x the response rate of Version B!

on h	elpful?	
)	I don't know	
	What are you trying to do?	
		Back Submit
ion m	ore helpful?	
	Back Submit	





 Commitment escalation: if they agree to do a little bit, then add more later, they're much more likely to do it than if you ask for everything up front

### The big picture: continuous iteration

• Iterative design plus controlled experimentation are a formidable combination for quickly improving your design

### Design in the online age

- alternatives
- People are often too sure of themselves
- Rapid experimentation means the first release is (sometimes) less important -- fail fast

• Designers role shifts to being about creating multiple