CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 14:
Designing for Diverse Needs

James Fogarty
Daniel Epstein
Brad Jacobson
King Xia

Tuesday/Thursday
10:30 to 11:50
MOR 234
Today

Digital Mockups Due
Getting the Design Right Reports Due
Getting the Design Right Presentations
Exam

Designing for Diverse Needs
A Basic Tenet of Design

If you do not actually understand your design problem, then you cannot make the best design.
A Basic Tenet of Design

You are not designing for yourself

- You bring a lot of background to the table
- That background is your asset
- But you also need to be mindful of it

You need to understand the context of your design and the people who will use it

- What this means can vary widely
- And may be beyond what you can or will do
Pinkification

This is a really complicated issue

But it is not new

We will start here

Then work to more obvious problems
Kodak, 1926

Kodak launched this black camera in 1926.

It was successful, but was selling more to men.

Engaged Walter Dorwin Teague to design a model that would appeal to women.

His solution was to release the camera in 5 different colors, each packed in a pseudo-silk lined box, where the box and liner matched the color of the camera.
Apple, 2001

Apple launched this white iPod in 2001

It was successful, but was selling more to men

Designed a model that would appeal to women

Their solution was a smaller version of the iPod in 5 different colors

Apple G1 iPod, October 2001
Observations by Buxton

Same basic design brief

Same use of color
Same number and choice of colors
Same simultaneous release of colors

Teague/Kodak example is a classic

Known to any trained industrial designer
Jonathan Ive is an extremely well trained designer
Draws inspiration from the past
How About Less Controversial

Our perception of the trustworthiness and usability of a website is dramatically shaped by a first impression of appeal.

How about we examine appeal around the world.

Throw in age and gender for good fun.
Please rate the website you have just seen based on visual appeal.

very unappealing   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very appealing
Tapir Design specialises in producing attractive, stylish websites that are accessible to all Internet users, regardless of the web browser or computer operating system that they use.
Please rate the website you have just seen based on visual appeal.
Welcome to Hotel Chez Lando!

Hotel Chez Lando, your first window to Rwanda. At Chez Lando, we apply the traditions of Rwandan hospitality to the needs of modern travelers; we cater to the highest level of your stay. Our quaint garden-style hotel is located just five minutes from Kigali International Airport and is right on the way to the heart of Kigali.

Sixteen years after the Genocide, Hotel Chez Lando is opening its new Barbasa, new Restaurant with Terrace and new Meeting Hall where comfort and style meet Rwandan culture. The architecture of the new additions blends with its environment, stylish and modern, it is matching the new face of Rwanda.

*** Special Offers ***

-We offer a free breakfast, airport shuttle & Wi-Fi, must mention the arrival date, flight name & number in your booking.
-Get special rates on online booking! VISA & Master Card Accepted.
Please rate the website you have just seen based on visual appeal.

very unappealing

very appealing
Please rate the website you have just seen based on visual appeal.

very unappealing  

very appealing
Popular Rwandan Website

![Webpage screenshot](image)

**Keep Track of Your Account on the Go**

- With SMS & Email Alerts
- You want to acquire your first drive?
- Carry your bank with you 24/7
- Simple things that make life easier.

**Latest News**

- Banque Populaire du Rwanda scooped an Award as the Best Agro Business...

**Tariff Guide**

**Exchange Rates**

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Large Scale Data Collection

2.4 million ratings
39,975 participants
430 websites
Visual Feature Analysis

- 2.4 million ratings
- 39,975 participants
- 430 websites
- 39 image metrics describing website perceived colorfulness and complexity
- Age, country, gender, education

Reinecke and Gajos, CHI 2014
female

male
Plotting Appeal by Complexity

Reinecke and Gajos, CHI 2014
Plotting Appeal by Colorfulness
Other Countries

Reinecke and Gajos, CHI 2014
Abandoning “One Best Design”

People have different preferences

- We can study these preferences
- We can even predict these preferences

How should we think about differences

- One powerful viewpoint is social justice
Accessibility is the Law

National Federation of the Blind vs. Target, 2006

Americans with Disabilities Act, 1990

Requires accessibility in employment, public entities and public transportation, public accommodations and commercial facilities

Rehabilitation Act, 1973

Section 508, 1998

Mandates federal procurement of accessible electronic and information technologies
Universal Design vs. Assistive Technology
Personal Texting by Deaf People

Teletypewriter (TTY) used by deaf people in their homes circa 1970

1990s TTY with built-in acoustic modem

SMS texting
People with Disabilities

1 billion people worldwide

15% of the population

50 million people in US

Including yourself if you are fortunate to live to develop disabilities
A Social Justice Problem

1 billion people worldwide
  15% of the population

50 million people in US

Including yourself if you are fortunate to live to develop disabilities

16% of people in the US
10% of workforce
5% of STEM workforce
1% of PhDs in STEM
Current State of Devices
Current State of Devices

Slide Rule, Kane et al, ASSETS 2008
Apple VoiceOver
Equal Access to Information

Is this access equal?
Equal Access to Information

Is this access equal?

Some dimensions to consider

- Cost
- Speed
- Accuracy
- Ease

It simply being possible is not enough
A Closer Look at Text Entry
A Closer Look at Text Entry
Contrast with Braille Input
Contrast with Braille Input
Perkinput
Perkinput
Detect Maximum likelihood to decide which finger input each touch.
Update

Shift the hit distributions towards the input points.

Perkinput

Azenkot et al, GI 2012
Perkinput
Perkinput
Speed and Accuracy

Speed

- Perkininput
- VoiceOver

Accuracy

- VoiceOver
- Perkininput

Words per Minute

Uncorrected Error Rate

Session

Azenkot et al, GI 2012
Another Problem
Another Problem
PassChords
PassChords
PassChords
PassChords
PassChords
PassChords

Azenkot et al, ASSETS 2012
PassChords

Azenkot et al, ASSETS 2012
PassChords

Set new password
Confirm
Enter

Azenkot et al, ASSETS 2012
Time to Authenticate

Seconds

PassChords  VoiceOver PINs

Azenkot et al, ASSETS 2012
What About Security?
What About Security?

One measure is Guessing Entropy

The minimum number of bits needed to encode the set of all possible passwords

4-digit PINS: 12.7 bits
Finger Pattern Frequency

Note the relative absence of three-finger chords

Index
Middle
Ring
Pinky

Azenkot et al, ASSETS 2012
What About Security?

One measure is Guessing Entropy

The minimum number of bits needed to encode the set of all possible passwords

4-digit PINS: 12.7 bits
4-tap PassChords: 12.6 bits
Speech Input
When one of my hobbies is hiking, I really enjoyed getting away…

The triangle consists of a 2 mile hike to the beach, a three-mile hike along the beach, and a 2 mile hike back.

It is a very common hike, but I knew to the northwestern if you like I need to do it.
When one of my hobbies is hiking. I really enjoyed getting away… The triangle consists of a 2 mile hike to the beach, I three-mile hike along the beach, and a 2 mile hike back. It is a very common hike, but I knew to the northwestern if you like I need to do it.

Serial Access in Reviewing Transcript

When
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Serial Access in Reviewing Transcript
Serial Access in Reviewing Transcript

my
When one of my hobbies is hiking, I really enjoyed getting away.
The triangle consists of a 2 mile hike to the beach, I three-mile hike along the beach, and a 2 mile hike back. It is a very common hike, but I knew I need to do it.
Reviews and Edits

80% of composition time in review and edits

Azenkot et al, ASSETS 2013
Spifi

Azenkot et al, ASSETS 2013
Spifi
Spifi
Recognize Speech as N-best List

Do you need a day?
Do you need today?
Do you need it today?
Do you need to today?
Find Uncertain Words

Do you need a day?
Do you need today?
Do you need it today?
Do you need to today?
Do you need ** ** ** ** **

Azenkot et al, ASSETS 2013
Split Into Phrases and Align Alternatives

Do you need a day? today? it today? to today?

Azenkot et al, ASSETS 2013
Accessibility is More than Text Entry

“Sometimes you don’t follow along as well unless [you are] one on one.”

Eyes-Free Yoga, Rector et al, ASSETS 2013
Accessibility is More than Text Entry
Accessibility is More than Text Entry

Eyes-Free Yoga, Rector et al, ASSETS 2013
Accessibility is More than Text Entry

![Screen with OneBusAway app]

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Last Update: 03:57 PM

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Ferris et al, 2010
Accessibility is More than Text Entry

How do you find a bus stop?
Accessibility is More than Text Entry

StopInfo, Campbell et al, ASSETS 2014
What is Disability?

Old model is medical, focused on the individual with a mindset of “fixing” an impairment

Current model understands disability is imposed by society and design not accounting for diversity

“Disability is thus not just a health problem. ...the interaction between features of a person’s body and features of the society in which he or she lives. Overcoming the difficulties...requires interventions to remove environmental and social barriers.”
What is Disability?

Impairment
  a problem in body function or structure

Activity Limitation
  a difficulty encountered by a person in executing a task or action

Participation Restriction
  a problem experienced by a person in involvement in life situations
A Basic Tenet of Design

You are not designing for yourself

You need to understand the context of your design and the people who will use it

We need diversity in who is doing design

As a field, our work suffers because of this failing
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