Some Web-Specific Design Issues
Earlier in the semester we explored visual design in general. With the web, there are often different (additional) issues to consider…

• Breadth vs. Depth
• Navigation vs. Content
• Seller vs. Buyer (i.e., Designer vs. User)
• Colors and Images

Several images in this presentation are from “Designing Web Usability” by Jakob Nielsen [New Riders 1999]
**Breadth vs. Depth**

Numerous studies starting in the 1980s showed that when designing menu structures, you should aim for breadth over depth, but not too broad. Miller’s famous 1950s “7±2” study showed that people’s short term memory consistently was limited to about 7 things. The good news is that he also observed that people could “chunk” things, and thus remember more.


Sure enough, optimal menu/layout/options design was shown to typically have about 7 chunks of related items.

**It is typically different when navigating on the web!**

**Breadth vs. Depth on the Web (I)**

It is possible to create an webpage that follows 7±2

http://www.cs.umd.edu/~egolub/old.index.html

but this is not commonly done because there is too little information being presented. Instead, 7±2 is applied in sub-contexts, and has a very different look and feel to it.

Many sites reflect the approach of having 7±2 chunks of information, each of which might then be divided into 7±2 chunks of information. Google’s news.google.com and a number of other sites take this approach (Google News was generally better with two full columns though).
**Breadth vs. Depth on the Web (II)**

In practice, many sites and pages have gone to far broader designs to make it easier to be found by searches and also to support on-page search by users. As discussed, if you look at desktop software, you’ll see the 7±2 model often influences things like menu bar design.

Web pages have evolved since the early (1990s) days in many ways, but some broad issues still exist and deserve consideration…

---

**Breadth vs. Depth on the Web (III)**

**What is different at a high level on the web?**

- We need to think about data and/versus operation/navigation links.
- Even with a “faster Internet” and “faster machines” users have very different speed experiences and pages have more content, which can lead to slow load times (impacts exploration) that installed software doesn’t have.
  - Can create “lightweight” pages (smaller image and file sizes, no complex scripts).
- Designers enjoy a greater sense of flexibility in layout in general.
- Search tools exist for information seeking overall or within a page.
- The concept of a “portal” introduces a different mindset.
**Historic Breadth vs. Depth Study**
The following study attempted to examine this question carefully:


They compared 512 items from Encarta encyclopedia in structures of size:

8x8x8  16x32  32x16

Note: They did not have the “slow link” factor so this experiment might not apply to the “mobile web” in general right now but it’s certainly getting close.

- Short term memory is only one factor.
- Limiting depth is more important than increasing breadth.
- Chunking of information is a likely important factor.

---

**Menus and Option Naming/Grouping**
There are many ways to involve the user in the design and organization of a website’s menus.

“Card Sorting” provides several variations to support different levels of freedom for the representative users brought in. [https://www.usability.gov/how-to-and-tools/methods/card-sorting.html](https://www.usability.gov/how-to-and-tools/methods/card-sorting.html)

There are similarities between this and the sticky note thematic clustering that we’ve discussed this semester.
**Navigation -vs- Content -vs- Advertising**

Nobody “wants” to navigate, but to many degrees navigation is still a necessary evil (unless we give up and use our favorite search engine, which is a sign of design failure for a site).

Screen space taken up with explicit navigation typically takes away from actual content.

The early Mapquest example on the next slide, from the late 1990s shows how extreme the imbalance can be, as do the slides with the Diamondback and Facebook screens.

---

**Early Map Site**

[Image of early Mapquest site]
Then it got worse! (my laptop)
...and stayed that way (my desktop)

2017

...and didn’t seem to plan to improve (my laptop)
...and even got worse (my laptop)

...even after closing the ad (my laptop)
What about Facebook?

...or Facebook on my laptop...
**Designer vs. User**

In this course we’ve been exploring user’s needs and tasks…

Designers don’t/can’t always have the user’s best interests in mind.

This might be “more” true for web sites than other software where something is typically being sold (a product, a university, a brand, advertising, etc.)

---

**Seller vs. Buyer**

Banner ads are the prototypical example. Users hate them, marketers require them. Designers often are on the user’s side, but employed in part to “serve” the marketers.

–The best thing you can do is probably to be aware of these tradeoffs, and be able to make informed decisions.

However, consider the following 2012 question – why did Facebook feel Instagram was worth a billion dollars to them with no profits and no obvious profit model. Was the whole value in the users there? Do you think it was “worth it” looking back as we can now?
Colors and Images on the Web

If you change background colors, make sure you change the `link`, `vlink` and `alink` attributes or `link`, `visited` and `active` style selectors of your document to avoid “invisible” or annoying color combinations.

If you use a background image, make sure you can still read the text that is going to be on top of it. Test how that image will tile and how the text will move as the browser window is resized.

If you have many images, think about load time and whether the image will be understood at the display size.

Take Universal Usability Seriously

For example, when you have a color palette, test the contrast between foreground and background combinations: https://webaim.org/resources/contrastchecker/

Test a variety of window/device sizes to see how things appear (consider that a 15” monitor at 1400x1050 is different than a 21” monitor at 1400x1050.

If you don’t have access to certain devices, you can emulate many within web browsers like Chrome, but realize that they don’t always replicate the exact behavior of the actual devices…
Give the users some hints
“Describe” your links well. People will very often just read the link text.

Not good… If you want more information, click here.
Better but can be improved… Click here for more information.
Or just be direct! More information.

Researchers call this “information scent” – users hunt for information based on the tiny fragments that they think will lead them in the right direction. This kind of “greedy” algorithm is known to be unreliable, but it’s how many users work. The third example above shows a good use of information scent.

Information Scent
The concept of information scent has been described as an approach that “conveys distal target information via category labeling.”

- Link coloration is a major tool that users take advantage of to help them understand their own history. Change colors with care. If you do change from the default colors, do not make them counter-intuitive.
- Support search on your page and site. If you do use images that contain words, make sure you have text descriptions (possibly in the alt description).
- If you have images that look like they can be clicked make sure the user can click on them! Don’t do this: http://www.cs.umd.edu/~egolub/butterfly.html
**Study Where People Look**

[Images of eye tracking heatmaps]

http://www.eyetools.com/inpage/research_google_eyetracking_heatmap.htm

---

**Technical Issues**

- Download time
- Browser compatibility
- Screen size and resolution
- Separation of meaning from presentation

Evan Golub / Ben Bederson / Saul Greenberg
**Download Time**

People have different resources (eg: *home vs work vs mobile*).

- Access rates are a moving target. Back in 2007 you had 20% of users who had Internet in the US still having “narrowband” access at home. Broadband is the norm now, with a 15Mbps US home average, but there is a wide range.
- Mobile is far faster than it was, but still only around 5Mbps as a national average. Individual bandwidth might be throttled or congested (big issue with mobile) and server loads can be an issue.

Keep these in mind as you place images, videos, etc. on web pages since the more you place there the longer it will take to load. One study from 2011 said that the size of videos on web pages (on average) had tripled since 2003, and they just get bigger…

---

**Is it worth the wait?**

The following all have the same “image” but at different resolutions (and thus quality).


Historic Data for 1995-2001...

Internet Use by Connection Speed in millions of people

<table>
<thead>
<tr>
<th>Speed</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>8 (10.9%)</td>
<td>17.7 (17.5%)</td>
</tr>
<tr>
<td>56K</td>
<td>49.7 (56.9%)</td>
<td>64.3 (63.4%)</td>
</tr>
<tr>
<td>28.8/33.6K</td>
<td>24.2 (27.7%)</td>
<td>15.5 (15.3%)</td>
</tr>
<tr>
<td>14.4K</td>
<td>5.3 (6%)</td>
<td>3.9 (3.8%)</td>
</tr>
<tr>
<td></td>
<td>87.3</td>
<td>101.4</td>
</tr>
</tbody>
</table>

Browser Version

People historically had tended to upgrade browsers slower with each successive version, and it would often take an operating system upgrade to get a browser upgrade.

However, the current trend of supporting automatic upgrades and of sites restricting users of old browsers has changed that trend, but you can see how old versions stick around.
Dealing with Browser Versions

Firefox saw high initial penetration (especially in academic settings) though it leveled off. Chrome is currently the “top dog” browser, and they seem to have an update every week…

• Ideally, you should collect browser versions and software platforms to test your site. While some software/platforms do not make this easy, if you design pages as a career, it is worth your time to set up a machine with multiple “virtual” machines, and have a different version of each browser on each “machine”.

Also, consider that some devices might have non-standard, possibly custom-written, embedded, browsers.

Finally, different sites draw different browser audiences, so you should learn about your current audience.

Screen Resolution: Historic Data

Some historic distribution of desktop/laptop monitor resolutions against the 1024x768 mark:

netmechanic.com:

<table>
<thead>
<tr>
<th>Screen Resolution</th>
<th>1997</th>
<th>1999</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 640x480</td>
<td>22%</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>800x600</td>
<td>47%</td>
<td>55%</td>
<td>53%</td>
</tr>
<tr>
<td>≥ 1024x768</td>
<td>31%</td>
<td>27%</td>
<td>41%</td>
</tr>
</tbody>
</table>

statmarket.com:

<table>
<thead>
<tr>
<th>Screen Resolution</th>
<th>2000</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 800x600</td>
<td>66%</td>
<td>42%</td>
</tr>
<tr>
<td>≥ 1024x768</td>
<td>34%</td>
<td>58%</td>
</tr>
</tbody>
</table>
Screen Resolution: Modern Data

Of course, this is “desktop” not mobile…

steampowered.com (2018, ones with more than 1% popularity among their users)

- 1280 x 1024: 1.58%
- 1360 x 768: 1.31%
- 1366 x 768: 9.86%
- 1440 x 900: 2.39%
- 1600 x 900: 2.59%
- 1680 x 1050: 1.83%
- 1920 x 1080: 72.01%
- 2560 x 1440: 3.50%

Evan Golub / Ben Bederson / Saul Greenberg

W3Schools Stats History
(note that there are differences for 2018 from previous slide – why?)

<table>
<thead>
<tr>
<th>Date</th>
<th>Other High</th>
<th>1920x1080</th>
<th>1366x768</th>
<th>1280x1024</th>
<th>1280x800</th>
<th>1024x768</th>
<th>Lower</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2018</td>
<td>32.9%</td>
<td>16%</td>
<td>34%</td>
<td>4%</td>
<td>3%</td>
<td>2%</td>
<td>6.1%</td>
</tr>
<tr>
<td>January 2017</td>
<td>31.6%</td>
<td>17%</td>
<td>35%</td>
<td>5%</td>
<td>4%</td>
<td>3%</td>
<td>4.4%</td>
</tr>
<tr>
<td>January 2016</td>
<td>30.7%</td>
<td>18%</td>
<td>35%</td>
<td>6%</td>
<td>4%</td>
<td>3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>January 2015</td>
<td>32.7%</td>
<td>16%</td>
<td>33%</td>
<td>7%</td>
<td>5%</td>
<td>4%</td>
<td>2.3%</td>
</tr>
<tr>
<td>January 2014</td>
<td>34%</td>
<td>13%</td>
<td>31%</td>
<td>9%</td>
<td>7%</td>
<td>6%</td>
<td>1.0%</td>
</tr>
<tr>
<td>January 2013</td>
<td>36%</td>
<td>11%</td>
<td>25%</td>
<td>10%</td>
<td>8%</td>
<td>9%</td>
<td>1.0%</td>
</tr>
<tr>
<td>January 2012</td>
<td>35%</td>
<td>8%</td>
<td>19%</td>
<td>12%</td>
<td>11%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>January 2011</td>
<td>50%</td>
<td>6%</td>
<td>13%</td>
<td>14%</td>
<td>14%</td>
<td>14%</td>
<td>1%</td>
</tr>
<tr>
<td>January 2010</td>
<td>39%</td>
<td>2%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2009</td>
<td>57%</td>
<td>3%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2008</td>
<td>38%</td>
<td>4%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2007</td>
<td>26%</td>
<td>4%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2006</td>
<td>17%</td>
<td>4%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2005</td>
<td>12%</td>
<td>4%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2004</td>
<td>19%</td>
<td>4%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2003</td>
<td>6%</td>
<td>5%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>January 2002</td>
<td>4%</td>
<td>5%</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>20%</td>
<td>4%</td>
</tr>
</tbody>
</table>

http://www.w3schools.com/browsers/browsers_display.asp
Screen Resolution: 2012 and now

By 2012 things were at a point where 85% of screens of those visiting W3Schools were larger than 1024x768 and it just kept rising. However, smartphone and tablet device penetration means that lower resolution and physical size screens are in wide use (even when the resolution is higher, on mobiles the screen size itself might be rather small, like how the iPhoneX is 1125x2436 but the ppi is 458).

When the iPhone was first competing with Android phones, one of the “sales pitches” of developing for the iPhone was a standard resolution across all models. Those days are long gone…

Screen Resolution: Discussion

For home/work we now need to consider widescreen versus 4:3 aspect ratio monitors. We should also consider whether or not users are using their full screen resolution for the browser. For smartphones and tablets we need to consider physically smaller screen sizes and/or lower resolutions but also different aspect ratios.

Overall we might want to consider who might be the “typical visitor” for a particular site and attempt to determine their stereotypical screen resolution or have multiple versions that load based on the device stats.

There are tools to test your webpage at different resolutions (Chrome built-in, some plug-ins, some websites).
Content Formats/Resources

HTML, CSS (Visit the CSS Zen Garden…)
Frames (difficult to do well and not recommended)
Javascript, PHP
Java, Flash
Plugins, Add-ons…

How long will they exist? How cross-platform are they?
Which elements differ based on the platform or version?
What’s “easy” to do?

How to Build Web Prototypes?

Start with a drawing program or prototyping tool – not live pages on the web! Build “wireframes” – the rest is the same as with other software…

Example Layout Model
(1) Logo
(2) Local or Site Index w/Links
(3) Search Dialog
(4) Current date
(5) Primary Content
(6) Secondary links
(7) Last update, copyright info, etc.

Each item should have more information for each item with explanations and justifications.
**Hit a HOME RUN with Nielsen?**

- High-quality content
- Often updated
- Minimal download time
- Ease of use
- Relevant to users' needs
- Unique to the online medium
- Net-centric corporate culture

Really not sure I like this (b)acronym...

---

**Universal Accessibility**

While it is important to consider users and their connection speeds, screen sizes, browsers, etc. it is also important to consider different types of users such as:

- elderly users, younger users, novice users
- users with poor motor control / precision
- users with visual and/or hearing impairments
- users with poor short-term memory

Consider using things like:

- the WebAIM color contrast checker when thinking about colors
- the Siteimprove Accessibility Checker Chrome plug-in to help you find issues.
**Search Engine optimization**

Good search engine optimization is also something to consider in terms of accessibility considering how many users utilize general search (perhaps after too much disappointment with site design). This should not be seen as a replacement for good site design, but a complement to it. Words over images, etc. all help here too…

True anecdote: I wanted to find out what time my doctor’s office opened so I could pick up a form so I searched on his name to find his site. Google “told me” his office opened at 7:30am but I wanted to confirm on the site itself and it was hard for me to find that info there…

**Television-Based Interfaces**

Set-top boxes have been used by some as web browsers, and some modern ones have had a wide range of features, and their designs are sometimes influenced by “web” thinking (or “mobile” thinking) yet users might typically interact with them via a very limited remote control rather than keyboard and mouse.
Television-Based Interfaces

As an example, a visual design that works well for a video service within a web browser on a laptop or in a mobile app might be a nightmare in the context of an On-Demand system for a cable box. Thinking about the use of the number keys’ “letters” and “smart” interpretations of them and speaking to the remote could expand ease of use…

Consider if I pressed “827” – perhaps generate a dynamic menu of what it could mean, like channel 827 or TBS as a network (or VCQ but only the first two of those make sense in the context unless there was a show with VCQ in the title, in which case maybe list any available eps as options).

Seeing the past, considering the future…

A valuable resource for seeing how webpage design has evolved (or perhaps devolved in some cases) is http://archive.org

For example…