Designing for the Web

Design Issues

Technical Issues

Past, Present, Future

Some Web Design Issues

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 7±2 study shows 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.

Miller, G. A. (1956). The magical number seven plus or minus two: Some limits on our capacity for processing information. *Psychology Review*.

Sure enough, optimal menu design typically has 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 a page that follows the 7±2 model:
http://www.cs.umd.edu/~egolub/old.index.html

Although this is not commonly done because there is not enough information being presented, you can still see the idea in places. The same 7±2 theory applied in a very different way has a very different look and feel to it:
http://www.cs.umd.edu/~egolub/professional.shtml

A variety of sites reflect thoughts of having 7±2 chunks of information, each of which being divided into 7±2 chunks of information. Google's news.google.com and a number of other sites take this approach (Google News was better with two columns though).

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.

Breadth vs. Depth on the Web (II)

As discussed, if you look at desktop software, you'll see the 7±2 model often influences things like menu design.

So, what is different on the web?

- Data -vs- Operation/Navigation Links
- Slow page load (ie: exploration) times that installed software doesn't have
  - this is a minor issue if the user has good broadband and fast machines or you create "lightweight" pages
  - this is a more major issue if you have pages with video, scripts, etc.
  - this can be a major issue on mobile devices working on EDGE/3G or even on 4G networks depending on a variety of factors
- A sense of more flexibility in layout.
- Search tools for information within a page (or via engines).
- The web has seen the growth of the concept of a "portal" in many ways as it has evolved.

Evan Golub / Ben Bederson / Saul Greenberg

Breadth vs. Depth on the Web (III)

The following study attempted to examine this question carefully:

Web Page Design: Implications of Memory, Structure and Scent for Information Retrieval ***Web Page Design*** / *Kevin Larson* / *Mary Czerwinski*, ***CHI 98,*** p.25-32.
www.acm.org/pubs/articles/proceedings/chi/274644/p25-larson/p25-larson.pdf

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.

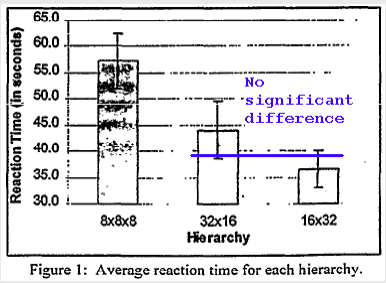


Figure 1: Average reaction time for each hierarchy.

Evan Golub / Ben Bederson / Saul Greenberg

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

There are similarities between this and the sticky note thematic clustering that we've discussed this semester.

Navigation -vs- Content -vs- Advertising

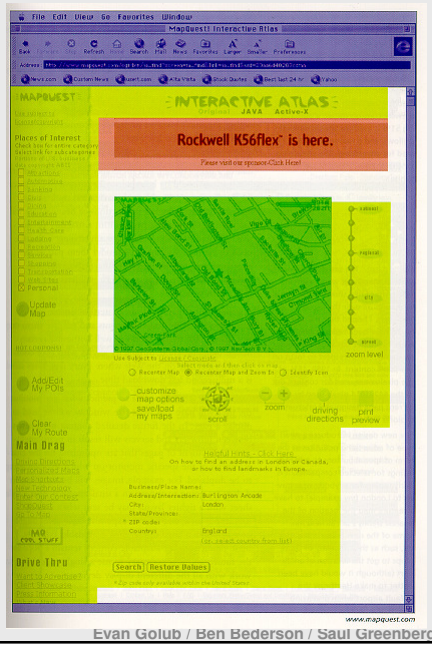
Nobody "wants" to navigate.

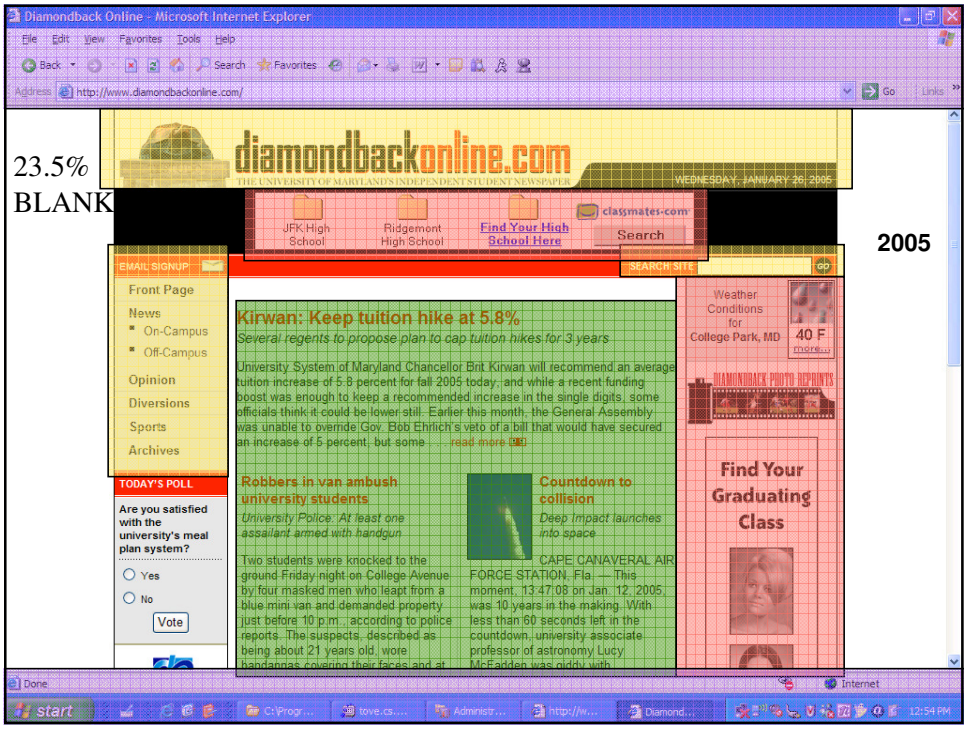
Navigation is a necessary evil.

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

This early Mapquest example from the late 1990s shows how extreme the imbalance can be…

Let's see how the Diamondback site and Facebook has and do look…

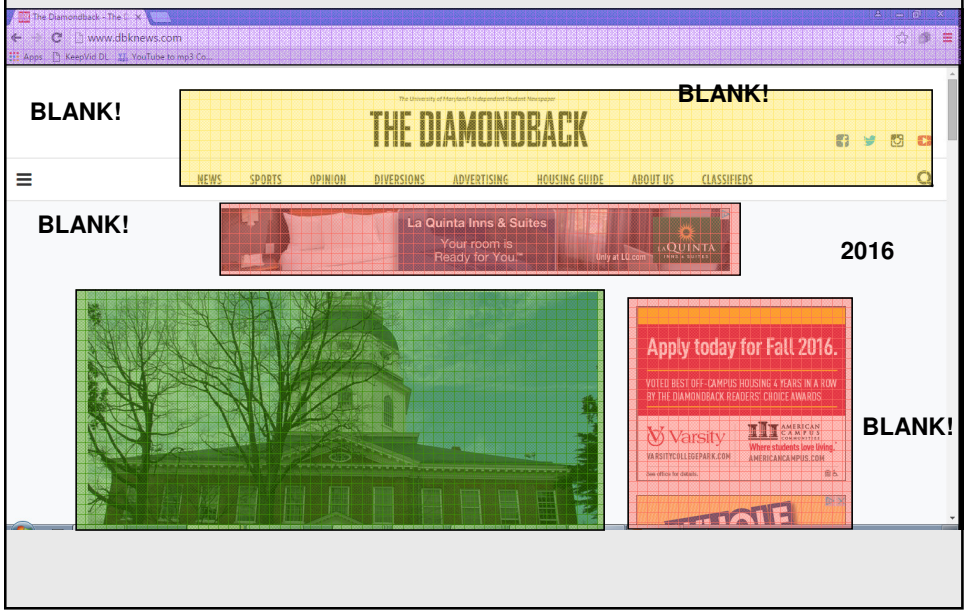




23.5% BLANK

2005

Then it got worse! (my laptop)



BLANK!

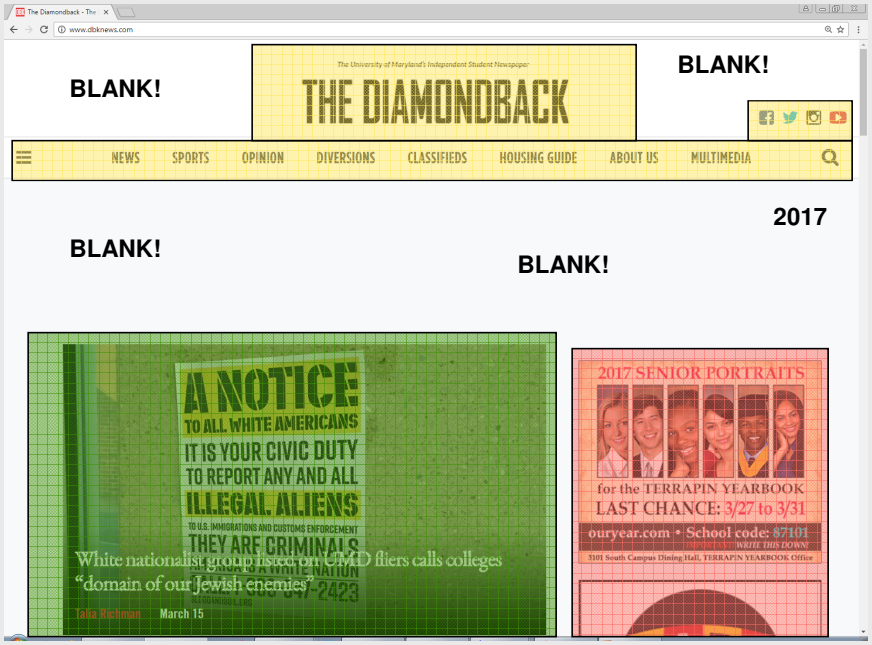
BLANK!

BLANK!

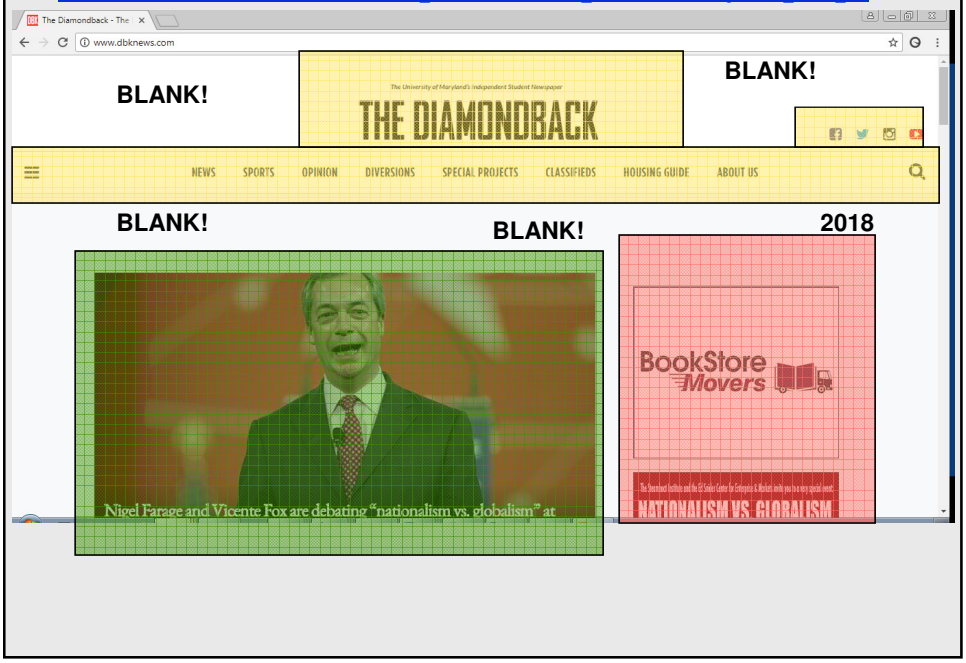
2016

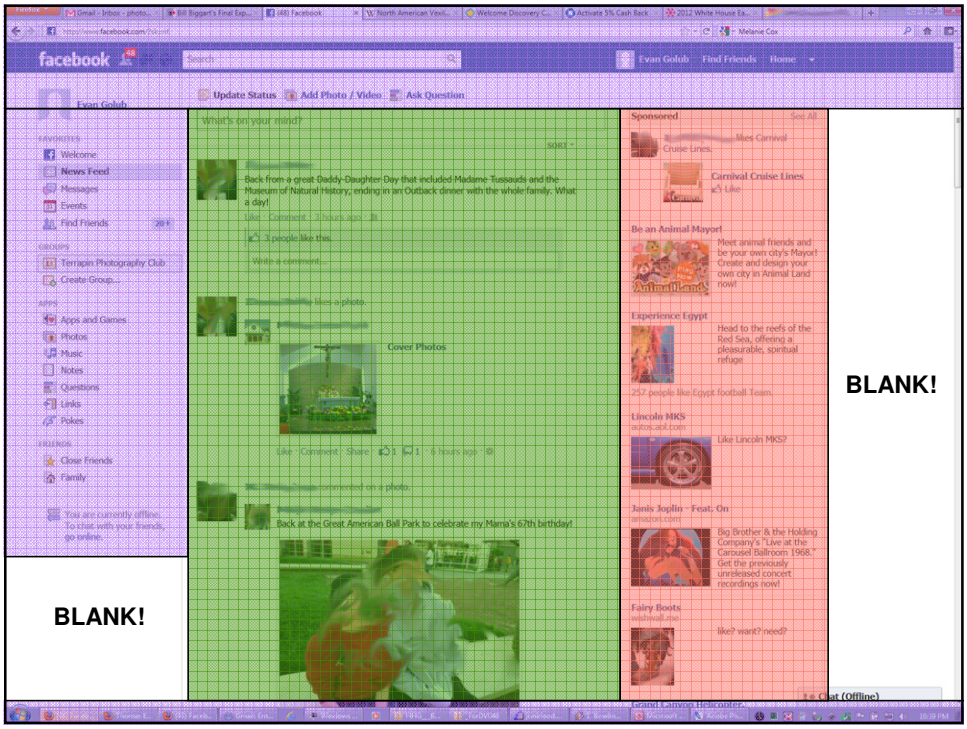
BLANK!

…and stayed that way (my desktop)

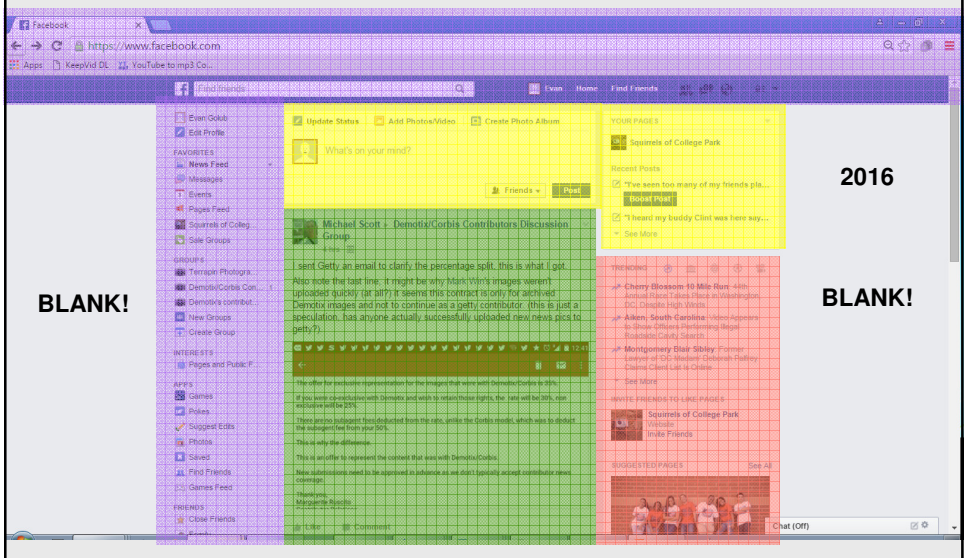


…and doesn't seem to plan to improve (my laptop)





Facebook's space usage on my laptop…



Evan Golub / Ben Bederson / Saul Greenberg

Seller vs. Buyer (Designer vs. User)

We're talking about user's needs, but 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.)

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 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.

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

A good way to do this is to use a machine with high resolution and test a wide variety of window sizes to see how things appear**.** Also, 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.

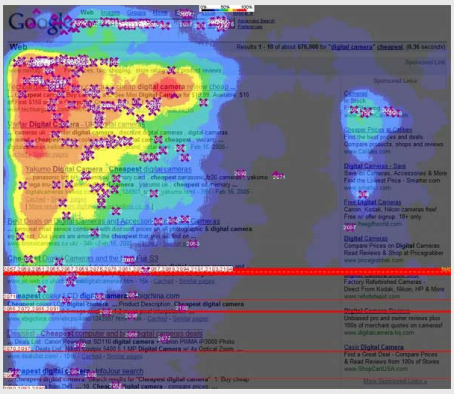
Scent: "Conveys distal target information via category labeling"

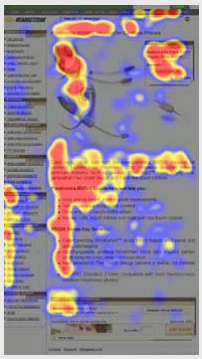
Link coloration is a major tool that users take advantage of to help them understand their own history. Change colors with care. If you do change from the default colors, do not make them counter-intuitive.

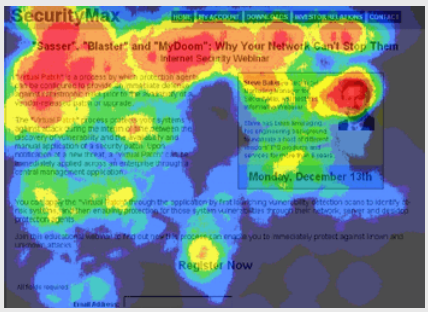
Support search on your page and site. If you do use images that contain words, make sure you have text descriptions (possibly in the **alt** description).

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







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

Evan Golub / Ben Bederson / Saul Greenberg

Technical Issues

Download time

Browser compatibility

Screen size and resolution

Separation of meaning from presentation

Download Time

People have different resources at *home* versus at *work* versus when *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).

http://www.cs.umd.edu/~egolub/360/IribeCSIC/2018-03-25-higher/index1scaled.html

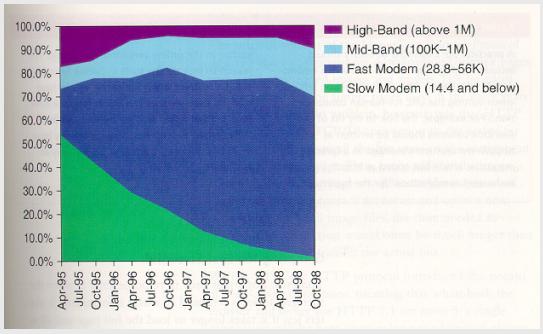
http://www.cs.umd.edu/~egolub/360/IribeCSIC/2018-03-25-higher/index1full.html

http://www.cs.umd.edu/~egolub/360/IribeCSIC/2018-03-25-higher/index6.html

Historic Data for 1995-2001…

Internet Use by Connection Speed in millions of people

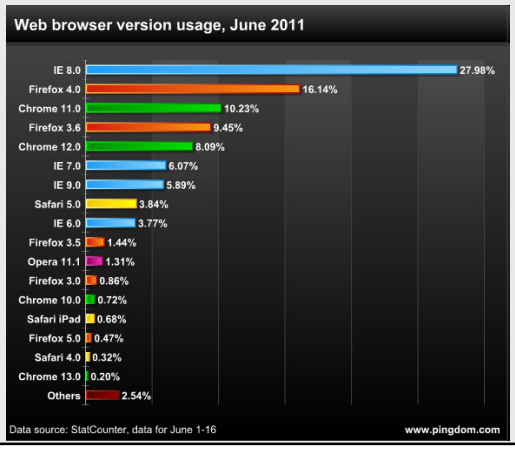
Speed	2000	2001
High	8 (10.9%)	17.7 (17.5%)
56K	49.7 (56.9%)	64.3 (63.4%)
28.8/33.6K	24.2 (27.7%)	15.5 (15.3%)
14.4K	5.3 (6%)	3.9 (3.8%)
	87.3	101.4



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, though it has leveled off somewhat. Usage appears to be higher in academic settings according to some reports.

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 and Modern Data

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

netmechanic.com:

Screen Resolution		1997	1999	2001
≤ 640x480	22%	13%	5%	
800x600	47%	55%	53%	
≥ 1024x768	31%	27%	41%	

statmarket.com:

Screen Resolution		2000	2003
≤ 800x600	66%	42%	
≥ 1024x768	34%	58%	

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?)

Date	Other high	1920x1080	1366x768	1280x1024	1280x800	1024x768	Lower
January 2018	32.9%	18%	34%	4%	3%	2%	6.1%
January 2017	31.6%	17%	35%	5%	4%	3%	4.4%
January 2016	30.7%	18%	35%	6%	4%	3%	3.3%
January 2015	32.7%	16%	33%	7%	5%	4%	2.3%
January 2014	34%	13%	31%	8%	7%	6%	1.0%
January 2013	36%	11%	25%	10%	8%	9%	1.0%
January 2012	35%	8%	19%	12%	11%	13%	2%
January 2011	50%	6%		15%	14%	14%	1%
January 2010	39%	2%		18%	17%	20%	4%
January 2009	57%					36%	7%
January 2008	38%					48%	14%
January 2007	26%					54%	20%
January 2006	17%					57%	26%
January 2005	12%					53%	35%
January 2004	10%					47%	43%
January 2003	6%					40%	54%
January 2002	6%					34%	60%

Screen Resolution: 2012

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 other mobile device penetration has soared, so lower resolution screens are in wide use. Also, even when the resolution is higher on some of those the screen size itself might be rather small (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 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

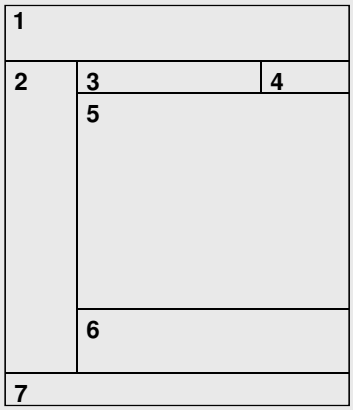
HTML, CSS (Visit the CSS Zen Garden…)
Frames (difficult to do well and not recommended)
Javascript, PHP
Java, Flash
Plugins, Add-ons…

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?

Use 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

Not quite sure I like this (b)acronym…

Relevant to users' needs

Unique to the online medium

Net-centric corporate culture

Evan Golub / Ben Bederson / Saul Greenberg

Universal Accessibility

It is very important to consider users with (relatively) low connection speeds, small screens, different browsers and the like, but it is also important to consider different types of users such as:

- elderly users, younger users
- novice users
- visually and/or hearing impaired users
- users with poor motor control / precision
- 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.

Television-Based Interfaces

Set-top boxes have been 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.

As an example, a visual design that works well for Netflix on a laptop within a web browser or in a mobile app might be a nightmare in the context of an On-Demand system for a cable box.

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…

https://web-beta.archive.org/web/19971009103122/www.umd.edu

https://web-beta.archive.org/web/20080711012948/http://www.umd.edu/

https://web-beta.archive.org/web/20160930143929/http://umd.edu/

Readings…

The same optional reading from the previous slide set of "Designing the User Interface" Chapter 12 (advancing the user experience) applies here as well.

Might be adding one more…