1.4 Web trends

Web technology is changing so fast, that predicting how web tools and behaviors will have changed, even a few years from now, is very challenging. However, some significant trends exist and are important for web developers to consider.

Making predictions

Yogi Berra, the famous baseball player and manager, joked "It's tough to make predictions, especially about the future."

Web browser market share continues to change

The relative usage of various browsers changes continually. Web applications that depend on a particular browser to function correctly can be frustrating to users. *Good practice is to ensure that webpages adhere closely to current technology standards, and that webpages work acceptably on all established browsers.*

Figure 1.4.1: Global browser usage trends.
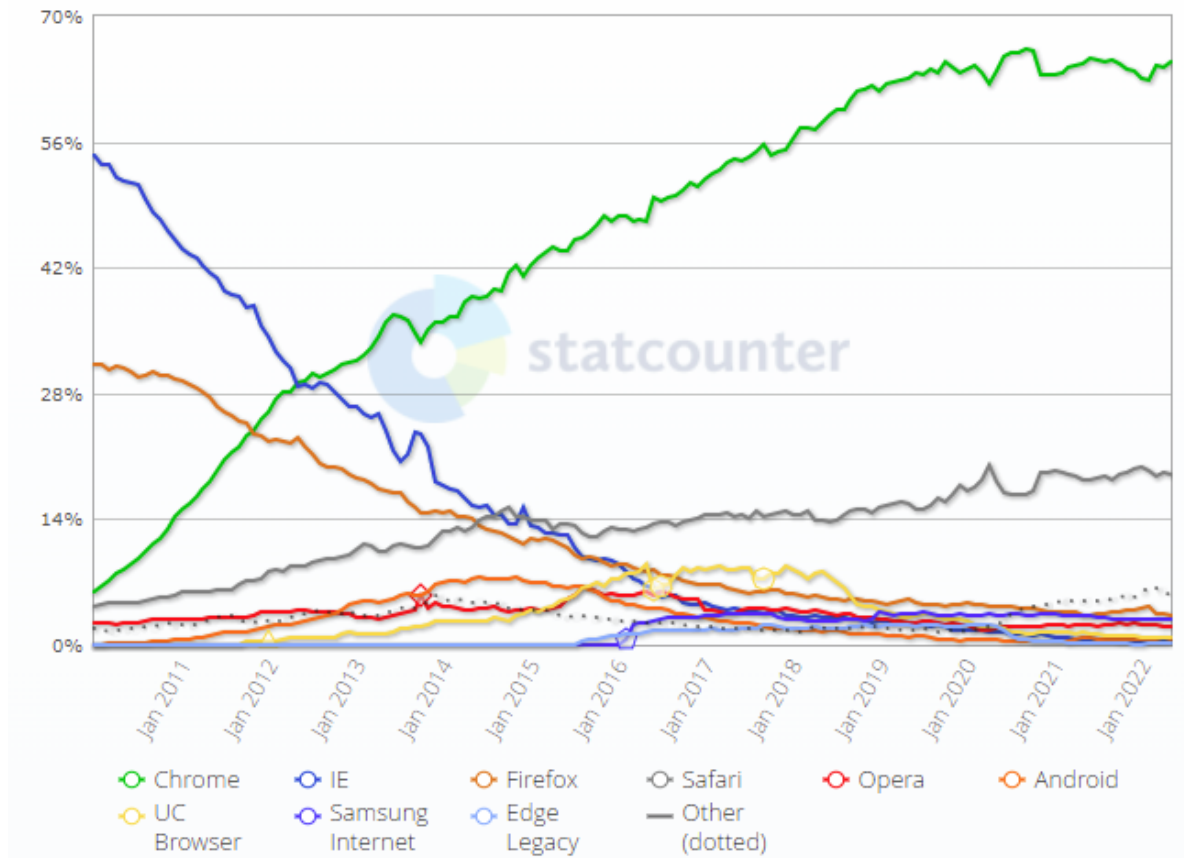
Source: StatCounter GlobalStats

Feedback?

| PARTICIPATION ACTIVITY | 1.4.1: Implications of the market share browsers. | ✅ |

1) Because Chrome is by far the leading browser worldwide, testing a webpage only really needs to be done using Chrome.

○ True

◉ False

Correct

A webpage should work equally well for any commonly-used browser.

2) Web developers typically create webpages using new features available exclusively on a particular browser.

Correct

New features can add additional functionality or visual appeal to a webpage. However, the extra effort required to incorporate the browser-specific features, while simultaneously ensuring that the page works well on other browsers, is hard to justify.

○ True

● False

3) Web developers can sometimes ignore really old web browsers.

Correct

Every browser eventually reaches obsolescence and can be ignored when developing typical sites.

● True

○ False

Feedback?

Mobile devices are replacing desktop computers on the web

A **mobile device** is a handheld computer, like a smartphone or tablet. Mobile devices are used to access the web today more frequently than desktop computers. Web developers need to design applications that work equally well on desktop and mobile devices.

Figure 1.4.2: Global browser usage trends: Desktop vs. mobile.
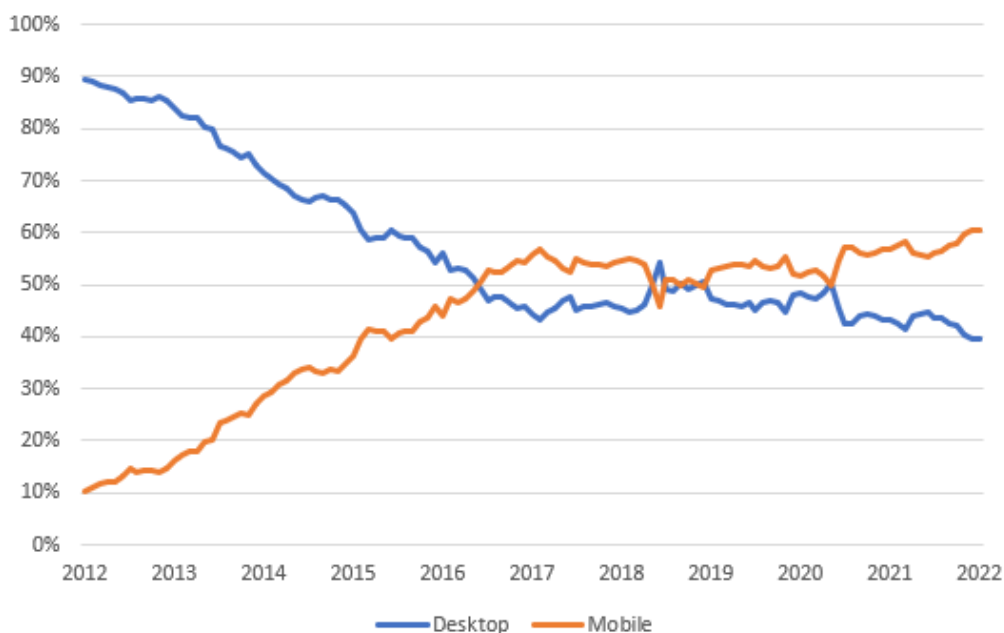
Data source: StatCounter GlobalStats (June 2012 to May 2022)

Developers of mobile-friendly webpages need to consider the following:

- Screen size: Screen size is much smaller than desktops.
- Load speed: Mobile devices may have limited or slower internet connectivity.
- Device speed: Limited memory and CPU speed of mobile devices means mobile browsers are not as powerful as desktop browsers.
- Data cost: Many users have data plans that limit how much content can be downloaded. Large webpages and webpages that keep requesting more data reach a mobile data plan's limit faster.
- Battery life: A webpage that constantly runs JavaScript and frequently loads data will drain the battery faster.
- Interface: User interaction is with touch, not a mouse.

PARTICIPATION ACTIVITY	1.4.2: Important mobile development topics.	✔

If unable to drag and drop, refresh the page.

Mobile first	A web development approach that advocates first creating a reduced-feature version of a website for mobile users. Then, the developer creates a full-featured website for visitors using desktop computers. Because mobile devices are increasingly used everywhere, even at home, developing the mobile-site first is a common approach. In addition, many people do not own desktop computers and only access websites using mobile devices.	**Correct**
Screen size	Physical dimension in pixels of a device's screen. Mobile device screens are much smaller than desktops. Good design requires significant effort to	**Correct**

make websites that work well for different screen sizes.

| Affordances | Visual clues that guide the user in figuring out how to use an app. | Correct |

Affordances, a term invented by usability expert Donald Norman, are harder to implement for mobile devices. For instance, few mobile devices support a touch screen equivalent of hovering with a mouse. So, hovering-based interfaces like tooltips are unavailable on touch based devices.

| Responsive web design | A web design approach that creates webpages that automatically move and resize parts depending on the display size and orientation. | Correct |

Responsive web design requires careful design and typically uses software frameworks to simplify development.

Reset
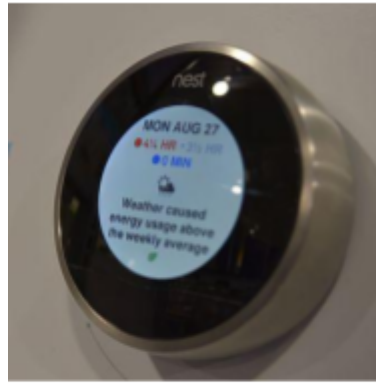
Feedback?

IoT: The Internet of Things

The **Internet of Things** (abbreviated as IoT) is the global collection of communicating devices that sense and control technology on behalf of humans. IoT devices range from a simple temperature sensor to a satellite-based laser scanner used to discover archaeological sites hidden by vegetation.

Example 1.4.1: Example Internet of Things devices.

Nest learning thermostat

LG Internet refrigerator

Source: Nest learning thermostat (Raysonho @ Open Grid Scheduler / Grid Engine / Public domain via Wikimedia Commons), Internet refrigerator (LG전자 / CC-BY-2.0 via Wikimedia Commons)

Feedback?

IoT devices display one or more of the following characteristics:

- Gather information about the physical world using sensors. Ex: temperature, voltage, images.
- Share the sensor data with control systems. Ex: A sensor may report a room's temperature to building control system, or air ozone and water pollution sensors reporting air quality data to urban environment monitoring systems.
- Interact with hardware to execute commands sent by control systems. Ex: Speed up fan moving hot air to part of a building where the sensed temperature is below the target temperature.

People do not typically interact directly with IoT devices. Instead, people access information and control devices using custom apps or webpages. Web developers typically build the webpages that present a system overview and allow users to select and display specific information from the aggregated sensor data. Webpages for IoT may allow a user to change system parameters or activate/deactivate parts of the system.

| PARTICIPATION ACTIVITY | 1.4.3: Internet of Things. | ✅ |

Which statements are likely true about an IoT-based system used to monitor a swimming pool for a pool service company?

1) A technician installs devices that measure and report water chemical concentrations, water level, pump status, and water flow through the filter system.

   ◉ True

   ○ False

   Correct

   These sensors are standard in automated pool maintenance systems.

2) The pool control system periodically transmits summary data over the internet to a pool service company's web server.

   ◉ True

   ○ False

   Correct

   A number of systems exist for reporting sensor data to internet-based servers.

3) The pool company would have to send a technician to the pool to change the control system settings.

   ○ True

   ◉ False

   Correct

   IoT-based control systems can be built so that a technician can access and modify system settings via a webpage from anywhere on the internet.

4) The pool company will not know that the water level is too low unless the customer calls or someone happens to check the system status webpage.

   ○ True

   ◉ False

   Correct

   When the company server receives data indicating that the water level is dangerously low, the server can create an entry in the problem-reporting system. Email and text messages can be automatically sent if the problem is not responded to quickly enough.

5) If the customer notices the low water level and calls, the company receptionist's browser can have the customer's pool status webpage loaded by the time the receptionist answers the phone.

Correct

The caller's phone number can be sent to the server and used to load the caller's pool status webpage automatically.

- ● True
- ○ False

6) After the customer reports the water level, the receptionist could inform the caller that a service technician was already dispatched and was six minutes from arriving at the house.

Correct

The webpage could show which technician had been automatically dispatched by the problem reporting system. IoT devices in the technician's vehicle, such as GPS, can be used to show the vehicle location and predict arrival time.

- ● True
- ○ False

Feedback?

Web accessibility

Web accessibility is the ability of users with disabilities to access and use a webpage with reasonable effort. Designing accessible webpages ensures equal access and opportunity for everyone. Developing accessible webpages requires knowledge of disabilities, assistive technologies and software used by users with disabilities, and following design practices to ensure content is compatible with those assistive tools. Some conditions affecting web accessibility include:

- Visual problems like blindness, low vision, or color blindness
- Hand control issues ranging from tremors to total inability to use hands
- Seizures caused by flashing on the screen
- Cognitive challenges like dyslexia and other difficulties in processing webpages

Figure 1.4.3: Web accessibility timeline.

1973 → **Rehabilitation Act (Rehab Act)** - No discrimination based on disability: affects programs that are run by federal agencies, receive federal assistance, or are federal contractors

1990 — **Americans with Disabilities Act (ADA)** - Communication with disabled must be "as effective as communications with others"

1992 —

1994 — **Rehab Act Section 504 -** No intentional or unintentional discrimination based on a person's disability.

1996 —

1998 — **Rehab Act Section 508 -** Federal government may not procure electronic and information technology goods and services -- including web sites -- that are not fully accessible

2000 —

2002 — National Federation of the Blind sues AOL, alleging violation of ADA Title III public accommodation requirements

2004 — **IDEA (Individuals with Disabilities Education Act) reauthorized -** Children with disabilities must have same educational opportunities.

2006 — Ramada.com and Priceline.com agree to implement a variety of accessibility standards to help users of assistive technology (Ex: screen readers) more easily navigate their web sites.

2008 —

2010 — Staples agrees in legal settlement to make website comply with W3C's accessibility guidelines.
American Cancer Society agrees to make website meet accepted web accessibility standards.

2012 — Ticketmaster enters agreement to make website fully accessible to the blind.

2014 — Bank of America, Harvard, MIT, NBA, Toys "R" Us, eBay, and Redbox agree to increase web accessibility

2016 — Accessibility legal complaints start targeting small local retail stores and restaurants.

Web site accessibility: Increasing legal challenges

Feedback?

PARTICIPATION ACTIVITY

1.4.4: Accessibility fact check.

1) Really small businesses are exempt from web accessibility requirements.

○ True
◉ False

Correct

Although some laws only apply to companies that provide services to federal and local government, nearly all businesses that serve the public must meet ADA provisions requiring effective communication with the disabled.

2) Color blindness is so rare that web developers do not have to consider the issue when selecting colors for a webpage.

○ True
◉ False

Correct

Approximately 8% of men worldwide have some form of color blindness. The most common form of color blindness is the inability to distinguish between red and green.

3) A random website is more likely to have a visitor with low vision than a visitor who is totally blind.

Correct

World-wide, between three and ten times more people suffer from very low vision than suffer from total blindness.

(•) True

( ) False

4) Unlike the blind, people who are deaf do not need special accommodation for websites.

Correct

Although someone who is deaf can read a webpage just as well as the non-deaf, captions and transcripts are needed to help the deaf understand the increasing amount of video and multimedia content on webpages.

( ) True

(•) False

Feedback?

Cognitive computing and big data intelligence

Cognitive computing is the use of artificial intelligence techniques and access to vast amounts of data to simulate human problem solving in complex situations with ambiguity, changing data, and even conflicting information. IBM Watson is the symbol of this trend to create intelligent software systems that process massive numbers of webpages in order to extract information and address challenging problems in areas such as medical treatment, increasing retail sales, and improving the quality of call center help.

When processing webpages, intelligent systems like Watson are aided by effective use of webpage HTML metadata and structure markup. Ex: Text containing digits is more useful when the digits are placed in an HTML table with a title like "Pacemaker failure rates".

Figure 1.4.4: IBM Watson cognitive computing system.
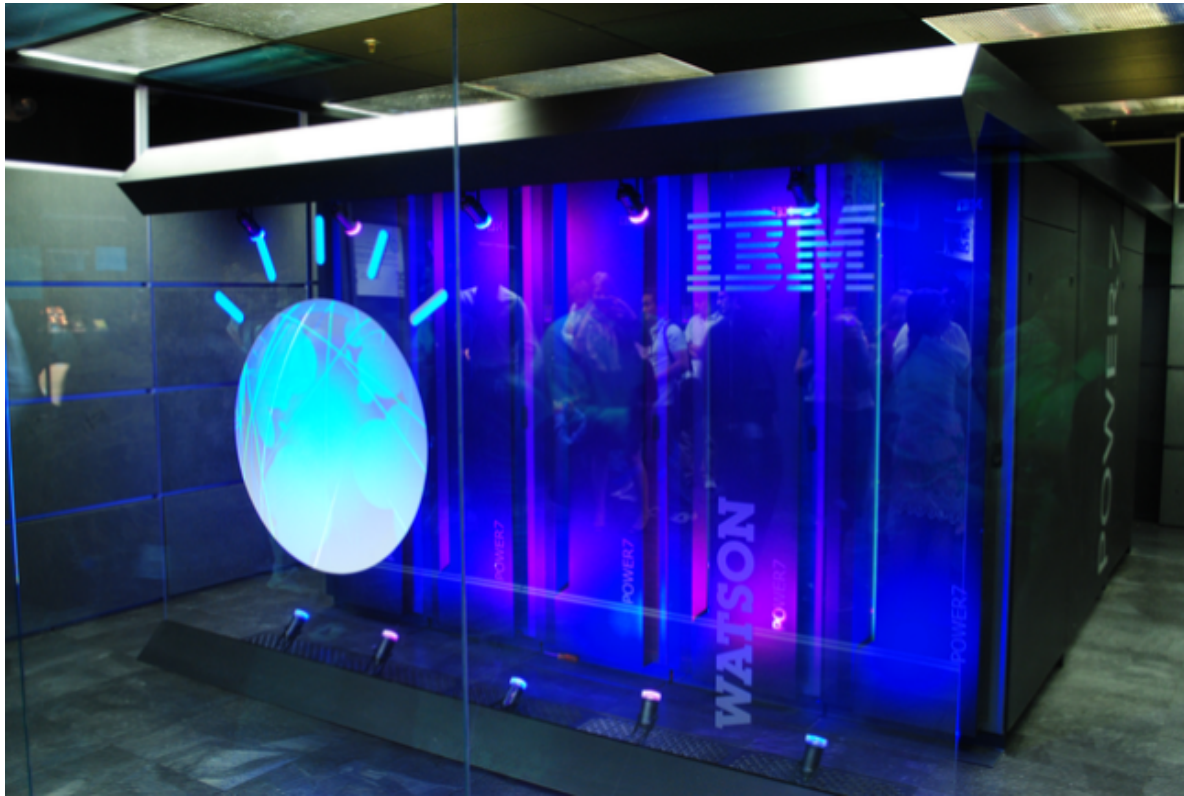
Source: IBM Watson(Clockready / CC-BY-SA-3.0 via Wikimedia Commons)

Feedback?

Separation of concerns

Separation of concerns is the design principle of breaking up web content using distinct languages and documents that overlap as little as possible. In modern web design, document structure and text, visual layout, and page interaction are separately specified using three key languages.

- HTML is the language that describes the page content.
- CSS is the language that describes page layout.
- JavaScript is the language that provides interactive functionality.

When webpages are built so as to cleanly separate document structure, visual layout, and interaction, the following results are obtained:

- Webpages are more likely to work as intended across a wide range of browsers.
- Webpages work better on smartphones and other mobile devices.
- Internet of Things systems are easier to build because relevant data is easier to identify.
- Web accessibility is improved.
- Intelligent systems can extract more meaning from the content of webpages.

Web developers are expected to deliver content that will work well with all devices and browsers. Ideally, a web developer builds websites that will work on any browser, but can

take advantage of recently added features available in newer browsers. Ex: A website that adds additional functionality for touch interfaces on mobile devices, but remains functional on desktops without a touch interface. As the variety of devices continues to proliferate, developing websites that comply to web standards ensures the website will operate correctly on as many devices as possible.

PARTICIPATION ACTIVITY   1.4.5: Review trends in web technology.

1) Which browser lost the most market share between 2010 and 2019?

    ◯ Safari

    ◯ Chrome

    ◉ IE (Internet Explorer)

Correct

Internet Explorer dropped from about 50% in 2010 to less than 10% in 2019.

2) In what year did web browsing first become more likely on mobile rather than desktop?

    ◯ 2010

    ◉ 2016

    ◯ 2018

Correct

According to StatCounter, mobile browsing surpassed desktop browsing for the first time in 2016.

3) Are human doctors or IBM's Watson more likely to keep up with new medical information in the future?

    ◯ Human doctors

    ◉ IBM's Watson

Correct

Already in 2013, researchers estimated that a human doctor would need 160 hours per week to read the same amount of new information as Watson processed per week. As a result, by 2013 Watson already showed advantages in certain areas such as lung cancer diagnosis; Watson was correct 90% of the time, compared to 50% for human doctors.

Feedback?

Exploring further:

- Internet of Things article in McKinsey Quarterly
- W3C Web Accessibility initiative document
- Overview of United States laws relevant to web accessibility