

# **HEIX 701: Research Project**

## **Web-Browsers In Health Informatics Applications**

*A Review Of The Most Prevalent Web-  
Browsers, Their Functionalities & Limitations  
In Health IT Systems*

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## **Introduction:**

One of the areas covered in this 701 course was "HTML & Web Design" during which an interface for a person to request more information about a business had to be created. One of the key issues identified during this process was the challenges faced in ensuring inter-browser compatibility of the code - especially for the Javascript which often was incompatible with Internet Explorer. Such issues are not limited to Javascript or to Internet Explorer. For example, it is well known that Apple devices do not support web-based Flash animations.

When designing web-based health tools it is imperative to be aware of the difference between the most common web browsers that are used. In particular, compatibility and code-interpretation need to be known so that web-pages and their tools can be designed to function properly, efficiently and safely (especially if, for example, the tool serves a critical function such as helping to predict drug doses that are subsequently given to a patient).

Alternatively, when one is designing their own Health Information System it is equally important to know which web-browser to choose to install on a system such that it is as compatible as possible while maintaining other features such as security and usability.

Therefore, this project will undertake research on what are the most common available browsers, the platforms they are compatible with and will note their key differences that are important to consider when designing a health-based web-page or to consider when choosing a web-browser for a new health-IT system.

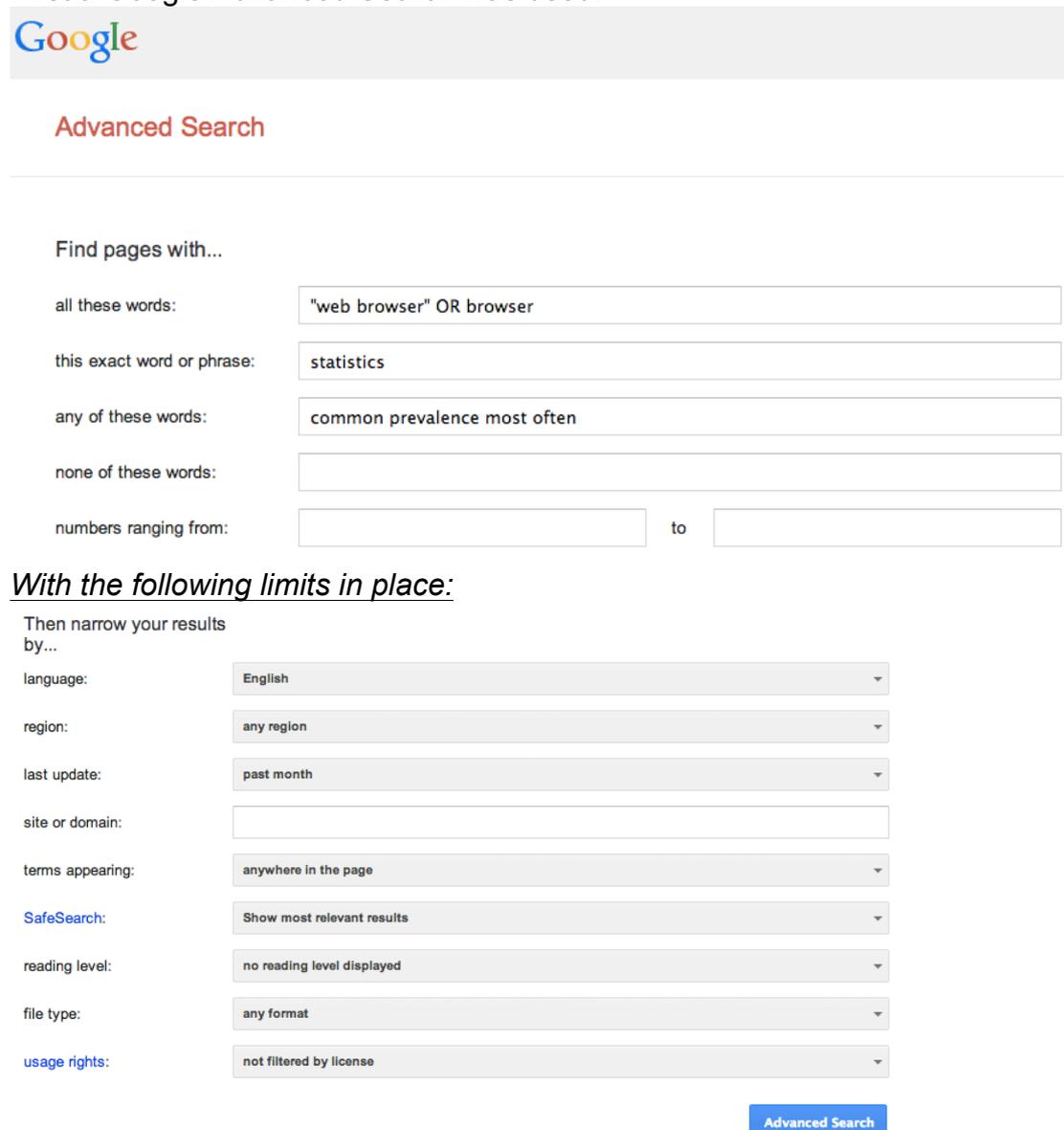
## Literature Search:

To start the search a question was first formulated so that keywords could be identified. The question decided on was "what are **the major available web browsers available** and **how do they differ** in their **compatible platforms, code compatibility, code interpretation and other features?**".

A number of different search engines were used to find this data including Google, Bing, DuckDuckGo and Yahoo.

The first task was to find statistics on the prevalence of use of different browsers then to find comparisons between these browsers. The steps involved are outlined below:

1) Search criteria were selected to find data on the most common browsers. First a Google Advanced Search was used:



The image shows a screenshot of the Google Advanced Search interface. At the top left is the Google logo. Below it, the text "Advanced Search" is displayed in red. The main section is titled "Find pages with..." and contains several search criteria fields:

- "all these words:" with the input "web browser" OR browser
- "this exact word or phrase:" with the input statistics
- "any of these words:" with the input common prevalence most often
- "none of these words:" with an empty input field
- "numbers ranging from:" with two empty input fields separated by "to"

Below this section, the text "Then narrow your results by..." is followed by a list of filter options, each with a dropdown menu:

- language: English
- region: any region
- last update: past month
- site or domain: (empty input field)
- terms appearing: anywhere in the page
- SafeSearch: Show most relevant results
- reading level: no reading level displayed
- file type: any format
- usage rights: not filtered by license

At the bottom right, there is a blue button labeled "Advanced Search".

2) Next Bing.com was also used with similar search criteria to the Google Search:

Searched for: *"web browser" OR browser common OR prevalence OR most often OR "statistics"*

WEB IMAGES VIDEOS KNOWS MAPS NEWS DICT SCORE MORE

"web browser" OR browser common OR prevalence OR most often ' 

3) In addition, another search was completed on "DuckDuckGo":



web browser OR browser common OR prevalence OR most often OR "statistics"

4) Finally, Yahoo.com was also searched:



"web browser" OR browser common OR prevalence OR n 

Search

-> All of these methods returned similar top results.

5) Next these same four search engines were used to search for data on the differences between browsers. The keywords of "differences" "browsers" OR "web browsers" were used and web pages were limited to within the past year to ensure their data was recent enough to be meaningful (especially given the frequent updates in browsers).

a) The search started with Google:



### Advanced Search

Find pages with...

T

all these words:

differences

this exact word or phrase:

any of these words:

"web browsers" "browsers"

none of these words:

numbers ranging from:

to

### *Filters Were Applied:*

Then narrow your results  
by...

language:	English
region:	any region
last update:	past year
site or domain:	
terms appearing:	anywhere in the page
SafeSearch:	Show most relevant results
reading level:	no reading level displayed
file type:	any format
usage rights:	not filtered by license

Advanced Search

b) Then results from Bing were obtained:

WEB IMAGES VIDEOS KNOWS MAPS NEWS DICT SCORE MORE

"web browsers" OR "browsers" differences



c) Then results from DuckDuckGo were obtained:



"web browsers" OR "browsers" differences

d) Finally results from Yahoo.com were obtained:



"web browsers" OR "browsers" differences

Search

### **Sources:**

1. Google Advanced Search

Accessed at: [http://www.google.com/advanced\\_search](http://www.google.com/advanced_search)

2. Microsoft Bing Search

Accessed at: <http://www.bing.com>

3. DuckDuckGo Search

Accessed at: <https://duckduckgo.com>

4. Yahoo Search

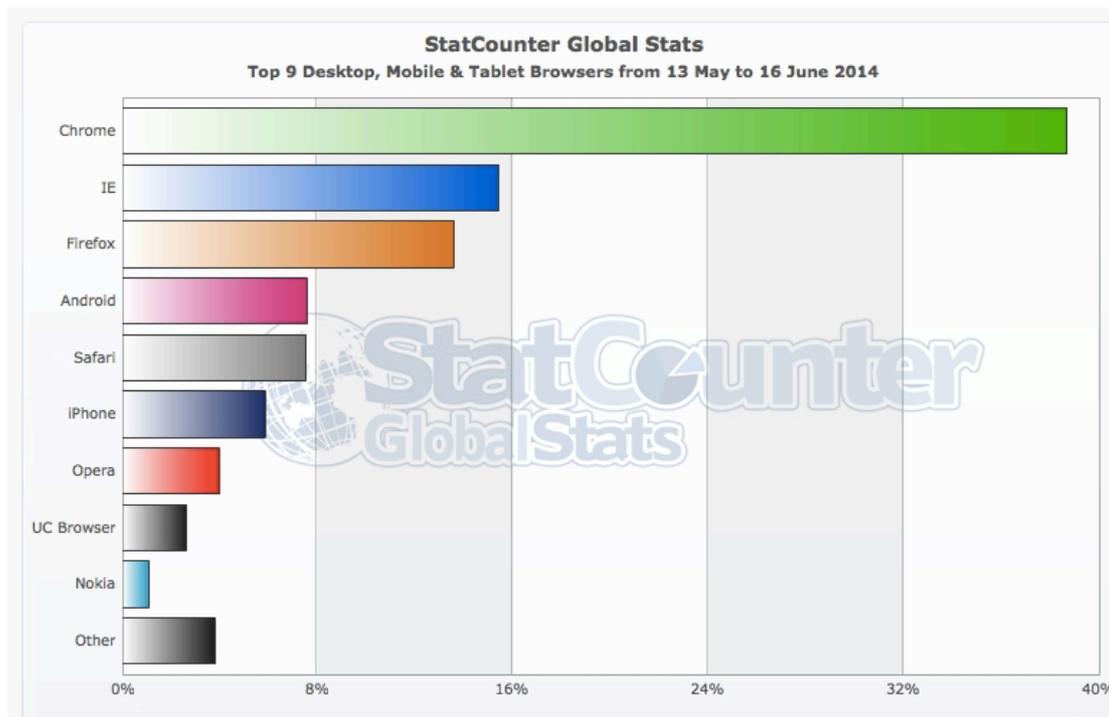
Accessed at: <http://www.yahoo.com>

## Method:

### Identifying The Most Common Browsers

The prevalence of different browser use was investigated by visiting a number of analytical-webpages suggested by the top-ranking search results above.

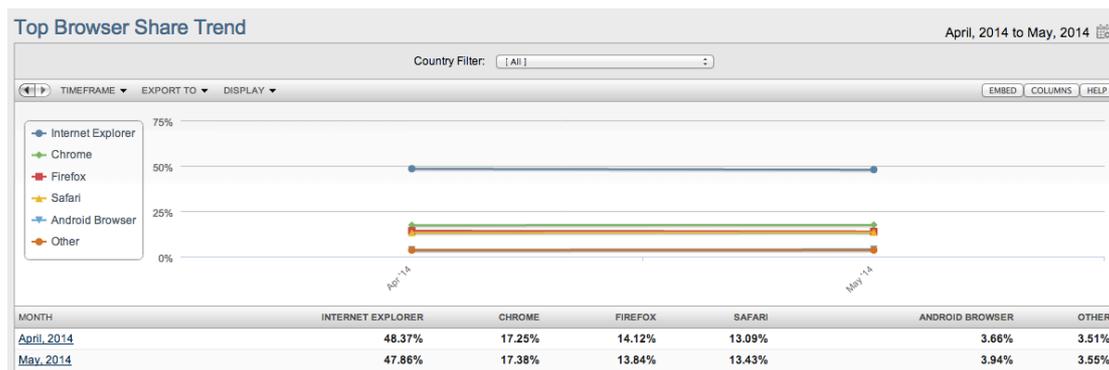
1) Firstly, was data from "Stat Counter" which is a tracking service that records more than fifteen billion page views per month over more than three million different websites. Their data was analysed over the past month and showed that Chrome, followed by IE, Firefox, Android-Based browsers, Safari, iPhone-based browsers and Opera were the most commonly used.



*Image: Graph Showing Statistics Of Different Browser Use When Visiting Websites For The Months May-June Of 2014.*

*Accessed at: <http://gs.statcounter.com/#desktop+mobile+tablet-browser-ww-daily-20140513-20140616-bar>*

2) A different analytics service called "Net Market Share" identified similar browsers in the most-commonly used (albeit with Internet Explorer being placed as first).



*Image: Graph Showing Statistics Of Different Browser Use When Visiting Websites For the Months April-May 2014*  
 Accessed at: <http://www.netmarketshare.com/browser-market-share.aspx>

3) To confirm the assessment of which browsers are most commonly in use, a review of the different analytic statistical trackers was completed by Wikipedia in January 2014. This also showed the same data as above for the most common browsers.

**Usage share of desktop browsers for January 2014**

Source	Chrome	Internet Explorer	Firefox	Safari	Opera	Other
StatCounter	46.6%	24.6%	20.4%	5.1%	1.3%	2.0%
W3Counter	34.1%	20.3%	18.3%	17.8%	2.7%	6.8%
Wikimedia	42.7%	18.0%	15.3%	6.1%	2.4%	15.6% <sup>†</sup>
NetApplications	16.4%	58.2%	18.0%	5.8%	1.3%	0.4%

*Image: Table Showing The Prevalence Of The Most Common Internet Browsers Detected By Analytics' Services In January 2014.*  
 Accessed at: [http://en.wikipedia.org/wiki/Usage\\_share\\_of\\_web\\_browsers](http://en.wikipedia.org/wiki/Usage_share_of_web_browsers)

### **Identifying Differences Between Browsers & Discussion**

Next, the key differences between the common browsers were identified. These browsers were Chrome, Internet Explorer (IE), Firefox, Safari and Opera for desktop OS based systems.

#### **1. Operating System Compatibility:**

While Chrome, Firefox and Opera are compatible with OSX (Mac), Windows and Linux, Internet Explorer is now only supported for Windows-based OS and Safari is only supported for OSX (Mac). Also, newer versions of the browsers are only supported on the latest versions of the Operating Systems.

#### **2. Cost:**

All browsers on a desktop OS were free. The benefit to the companies of making the browsers free include being able to make users more inclined to use their other services and to gather thorough statistics that can be used to improve marketing and advertising.

#### **3. Browser Features:**

Key features to consider are bookmarking, downloads managing, password storage and management, form completion, spelling and grammar checking, the ability to configure privacy differently for different sites, the presence of a

privacy mode and the ability to automatically keep up to date. **All** of the popular browsers had these features.

#### 4. Ease-Of-Use Features:

While all the browsers showed an ability for tabbed browsing, incremental searching, page enlarging/zooming and full text searching, Chrome and Safari both do not allow for ad-filtering and Chrome also does not allow blocking of all pop-ups.

#### 5. Rendering Accuracy & "Acid Tests"

All popular browsers passed with full scores on the "Acid Test" including at "Acid3" standard.

*Source: <http://acid3.acidtests.org>*

#### 6. HTML5 Support

Currently HTML5 is in its drafting stages and there are varying levels of support for its features. Current support is shown by a score rated out of 555 and is assessed by a website called "HTML5 Test".

At present, Chrome has the most support for HTML5 followed by Opera, Firefox, Safari and Internet Explorer.

#### **current**

<b>Score</b>	<b>Browser</b>
<b>507</b>	Chrome 35 »
<b>496</b>	Opera 21 »
<b>467</b>	Firefox 29 »
<b>397</b>	Safari 7.0 »
<b>376</b>	Internet Explorer 11 »

*Image: Table Showing Scores (out of 555) For Supporting HTML5*

*Source: <http://html5test.com/results/desktop.html>*

#### 7. Support For Different Languages:

All of the browsers above support HTML, Cascading Style Sheets 2.1, Frames, XSL-Transformations, X-HTML 1.1 and Math-Markup Language (except on Safari).

Only Opera accepts Nav-Link tags in HTML and only Firefox accepts XForms. Web Forms 2.0 are only supported by Opera and Firefox.

#### 8. Javascript:

All of the popular browsers support Javascript. The Direct Object Model Version 3 is still in development and so the browsers only have partial support for this.

However, as seen below, there are subtle differences in the terms IE recognises compared to the other browsers. This is especially apparent in older versions of IE where whole methods are not supported.

Action	IE	Mozilla
Get Element by ID Name	document.all	document.getElementById
Get All Elements on a Page	use the document.all array	document.getElementById('*')
Get all child elements	element.children works in IE to get all HTML elements. element.childNodes works in all browsers but returns all from a node nodes, not just HTML elements.	
Make one node the child of another	applyElement (appendChild works too)	appendChild

*Accessed at:*

<http://www.htmlgoodies.com/primers/jsp/article.php/3624446>

Method or property	Internet Explorer							Firefox			Safari	Opera					Chrome		
	5-5	6	7	8	9	10	11	23 Win	23 Mac	23 Linux	6	12 Win	12 Mac	12 Linux	15 Win	16 Mac	29 Win	29 Mac	29 Linux
<b>getElementById()</b> Get the element with this ID <a href="#">Test page</a>	almost		yes					yes			yes			yes					yes
<b>Lower case 'd'!</b>	If there is more than one element with id="test", the method selects the first in the document. All others are ignored. <ul style="list-style-type: none"> <li>IE7 and lower also return the element with name="test".</li> </ul>																		
<b>getElementsByClassName()</b> Get a nodeList of the elements with this class. <a href="#">Test page</a>	no		yes					yes			yes			yes					yes
	<pre>document.getElementsByClassName('test')</pre> <pre>document.getElementsByClassName('test test2')</pre> The first expression returns a nodeList with all elements that have a class value that contains "test". The second one returns a nodeList will all elements that have a class value that contains both "test" and "test2" (in any order).																		

*A sample image demonstrating the compatibility of two methods used in Javascript. Note the limited compatibility in older versions of IE.*

*Image Source: [Quirksmode Compatibility For Javascript](#)*

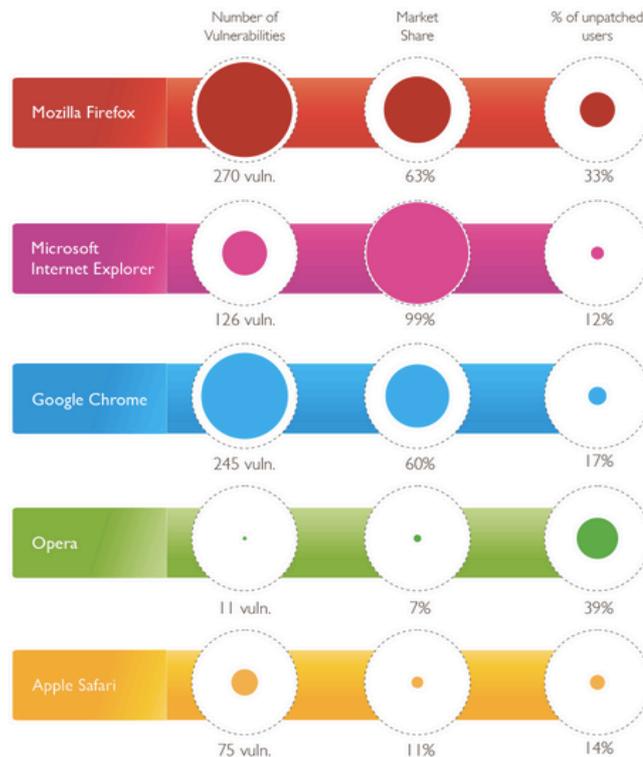
*Accessed At: <http://www.quirksmode.org/dom/core/>*

## 9. Browser Plugins:

Of the most popular browsers only Internet Explorer accepts ActiveX controls and Java support is only seen on Chrome and Safari.

## 10. Security Record:

Of the common browsers, Chrome, Firefox, Opera and Safari all have multiple identified vulnerabilities. Patches tend to me made available very quickly. Of the vulnerabilities in 2013, most were found in Firefox (n=270) and Chrome (n=245). However, those whose users remained unpatched were highest in the users of Opera and Firefox. Refer to the image below.



*Image Source: Secunia Vulnerability Review 2013.*

*Accessed at: [https://secunia.com/vulnerability-review/browser\\_security.html](https://secunia.com/vulnerability-review/browser_security.html)*

**Sources Above:**

*Note that unless specifically stated, information was obtained from the following additional sources.*

1. Internet Explorer Help & Online Documentation

Accessed at: <http://windows.microsoft.com/en-NZ/internet-explorer/internet-explorer-help>

2. Google Chrome Help & Online Documentation

Accessed at: <https://support.google.com/chrome/?hl=en>

3. Mozilla Firefox Help & Online Documentation

Accessed at: <https://support.mozilla.org/en-US/products/firefox>

4. Safari Help & Online Documentation

Accessed at: <http://www.apple.com/nz/support/mac-apps/safari/>

5. Opera Help & Online Documentation

Accessed at: <http://help.opera.com/Mac/12.10/en/>

6. Wikipedia - Comparison Between Browsers

Accessed at: [http://en.wikipedia.org/wiki/Comparison\\_of\\_web\\_browsers](http://en.wikipedia.org/wiki/Comparison_of_web_browsers)

## **Discussion Continued:**

Therefore, the five most common browsers were all very comparable in their overall functionality and features.

Some clear differences were seen such as Internet Explorer only being compatible with Windows, and Safari with Apple / OSX. In addition security statistics seem to suggest that a higher proportion of users have unpatched vulnerabilities in Firefox and Opera which can compromise security - especially for health-based applications. In addition, Firefox and Chrome had the greatest incidence of new vulnerabilities but all browsers did support an auto-update feature that means patches can be quickly implemented for most users.

Another key difference was in support for HTML5 properties and the greatest support was clearly seen in Chrome with the least support seen in IE. This is especially important for "Web 3.0" technologies and being able to utilise the full potential of these for health-based websites. Other differences were Java being supported only by Chrome and Safari, and ActiveX only by Internet Explorer.

Javascript was another area of differing support. It was clear that IE used different methods at times, which can make writing the script difficult and prone to errors. However, all did support Javascript, which is reassuring.

One of the major issues that is especially apparent is the lack of Javascript support for older versions of IE. This is especially important as many users on older versions of Windows would be unable to upgrade to the latest version of IE and so have browsers that weren't compatible with many Javascript features.

Overall, it appears that many of the browsers are similar in their functionality and support apart from a few key features. In particular, one needs to take extra care when writing health-based applications that they are compatible (especially with Javascript methods across the IE and non-IE browsers) and to take into consideration the likely presence of older non-compatible browsers.

In designing a Health IT System one would need to ensure that the chosen Operating System was going to be compatible with one of these modern browsers and that it was likely to stay compatible for a significant period of time despite updates being released for the browser. In addition, if there were any particular service-specific applications that e.g. needed Java or ActiveX this would also need to be taken into consideration. Finally, security is a key issue and choosing a browser that has frequent updates and a history of few vulnerabilities should be attempted.

In terms of further research, it would be useful to look at mobile-phone web browsers e.g. on iOS and Android devices as well and to complete a similar analysis.

**Additional Note:**

*References Included Following Each Relevant Section Of This Project*