AN ANALYSIS: GOOGLE CHROME KEEPS ON BEING THE MOST POPULAR WEB BROWSER

Gopika Krishnakumar [1], Riby Varghese [2], Arjun Krishna [3], Hena Biji [4], Anu Joseph[5]
[1] Freelance UI/UX designer, Kerala
[2,3,4]PG – Masters in Computer Application, Kristu Jyoti College of Management and Technology, Kerala
[5]Assistant Professor – Department Computer Application, Kristu Jyoti College of Management and Technology, Kerala

ABSTRACT

"We are all now connected by the Internet, like neurons in a giant brain", these are the famous words of Stephen Hawking. The internet revolution gave an increase for the convenience of access to free data. To access this data there ought to be a medium; an online browser acts as a medium. The browser is the most elementary part of an ADP system and we talk to it because of the internet. There are several browsers within the world and are classified in many sorts. This paper is an analysis of why google chrome is being well-liked in today's market with some case studies.
Keywords: Web browser, Google Chrome, Microsoft edge, Bing, Web kit, Blink, UI/UX, Privacy, multi-platform compatibility, search engine, omnibox.

1. Introduction

A web browser is a software package application that permits a user to show and act with text, images, videos, music, and alternative information that might get on a website. Text and pictures on an internet page contain hyperlinks to alternative sites at a similar or totally different website. Browsers enable a user to quickly and simply access information provided on several websites by traversing these links.

Google Chrome is a cross-platform application programme developed by Google. Chrome is a free internet browser formally discharged by Google on Gregorian calendar month eleven, 2008. Its options embrace synchronization with Google services and accounts, tabbed browsing, and automatic translation and spell check of sites.

Among internet browsers market share google chrome has the highest share. [1] In September 2021, Google's Chrome had a global market share of 65.13%, making it by far the largest browser. Safari comes in second place with a significantly smaller 18.41% and Edge at third with 3.76%. When the market share per platform is analysed carefully it is evident that Google ranks supreme on desktops as well as with a market share of 67.55% followed by Safari with 9.69% and Edge with 8.74%. On mobile Chrome also reigns supreme with a market share of 64.32% and Safari coming back stronger with 24.21% and Samsung Internet with 5.31%.

As above mentioned, chrome came into existence in the year 2008, within 10 years chrome productively owned the browser space within market share of almost 70%. How did Google enter and dominate an entirely new sector in just ten years? This is a detailed analysis on it. This paper analyses different aspects that made chrome so popular in today's world. A graph showing the comparison of different browsers in market share is given below.

2. Difference between search engine & web browser

[3] Search engine and web browser are two very commonly used terms but are different from each other. A program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, used especially for finding particular sites on the World Wide Web

is called a search engine. Whereas, a web browser is a software application that allows you to access information using the World Wide Web. The World Wide Web's Graphical User Interface (GUI) was utilized by web browsers to provide interactive online sessions for users. The web browsers do not have their own databases. They only used memory to store cache and cookies. The uniqueness of web browsers is that multiple web Browsers can be installed on a single device. Examples of Web Browsers are Chrome, Firefox, Mosaic, Edge, Opera etc. Whereas search engine is kind of a website where a user can search for information. Search engines have mainly three components: a search index, crawler and search algorithm. The search engines have their own databases. Search engines are not installed in the system. The examples of search engines include Google, Yahoo, Bing, Ask etc.
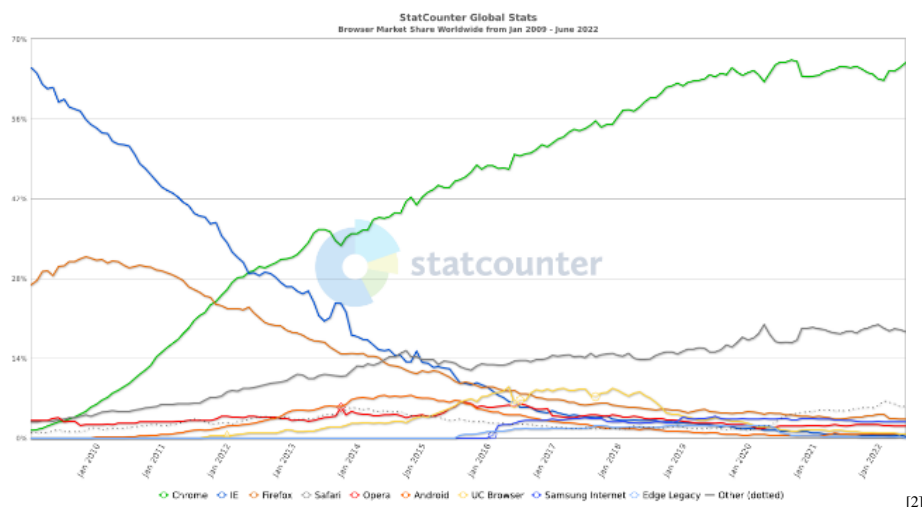

[2]

Fig 1. Graph of year wise share market of browsers

3. The story of google chrome

During the early phase when there existed only the Google Search Engine and the user dependent on other web browsers like Internet Explorer, Mozilla Firefox etc for information, even though the market share of Google was pretty high still a huge amount was being distributed among different web browsers. After so much analysis and studies the current CEO of Google Mr. Sundar Pichai came up with a new initiative of creating a web browser owned by google. Then the rise of google chrome happened in 2008. Chrome debuted at a time when developers and internet users were growing frustrated with Internet Explorer, and Firefox had been steadily building momentum.

Although there exist numerous web browsers chrome is designed in a unique way and it is one of the fastest web browsers. Within a single tap, chrome loads its web pages and multiple tabs with its applications at lightning speed. The web kit was the rendering engine of chrome but later in 2021 chrome switched to Blink. Now except in iOS chrome is using blink, in iOS chrome is using web kit. In the address bar, both the web address and searches are done more effectively at high speed with the help of omnibox. The omnibox and multi tabbed browsing make navigating the web smoothly.

While closing chrome, it is able to remember the tabs that were already open which helps the user to pick up right where you left the chrome. The main attraction of chrome is that it comes with a built-in PDF viewer, so there is no need of installing any other software extensions, which allows even to print, resize and save the PDF. While browsing, Chrome promises to keep the users' private information under control. Browse using Incognito mode helps the user to visit websites, download or record any data without any cookies.

Additionally, if the device is being shared by other people there is an option to add multiple users to keep the user bookmarks, apps and extensions separate. Anything that is being updated on one device

will be instantaneously updated everywhere the user sign in to the chrome browser. These reasons have a great part in making the users switch to Google Chrome.
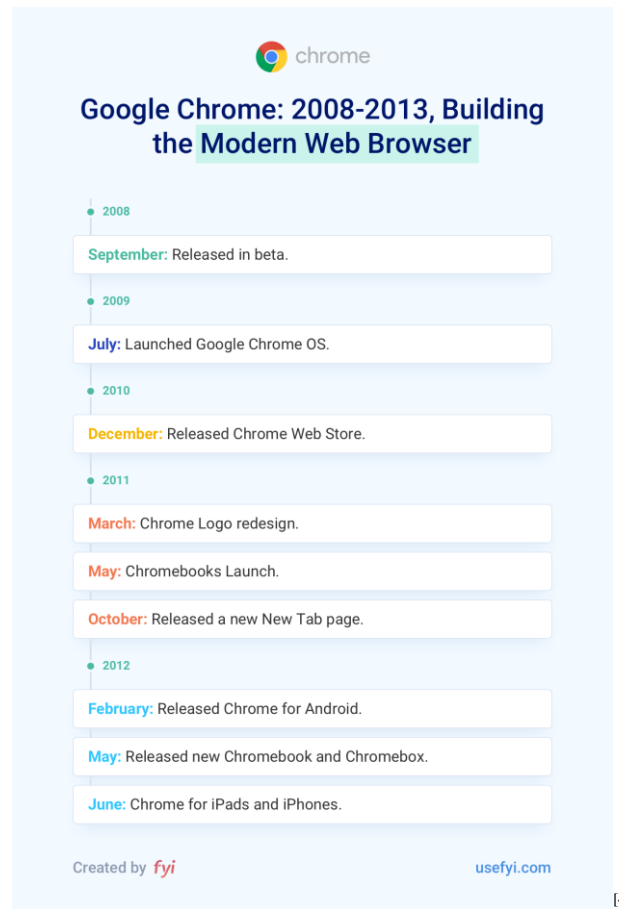

Fig 2 Chart showing the evolution of modern web browsers.

4. Better user experience

While searching in chrome it is very evident that the results given by it are very relevant when compared with other web browsers. The main attraction of the chrome which makes it so popular is the user experience provide while searching information. The Fitts law which predicts the human system interactions and can accurately predict the amount of time which the user takes to move to a particular position and select a target.

[5] Although originally developed according to movement in the physical world, in human-computer interaction Fitts's Law is typically applied to movement through the graphical user interface using a cursor or other type of pointer. So, everything will be properly aligned which makes the user more comfortable. Another user interface feature of google is the top tabs showing the filter results. Even though many other web browsers have the same features still google chrome always shows more relevant information.

5. The omnibox

The omnibox API allows you to register a keyword with Google Chrome's address bar, which is also known as the omnibox. Web browsers has two areas for searching. One search bar and one address bar. Google chrome allows the users to search keywords in both search bar and address bar and will be redirected to the result page making the users convenient while searching. Google has fully integrated their services into chrome as we can see the users can access Gmail, Maps, and other companies' services, if the user signed into their chrome browser.
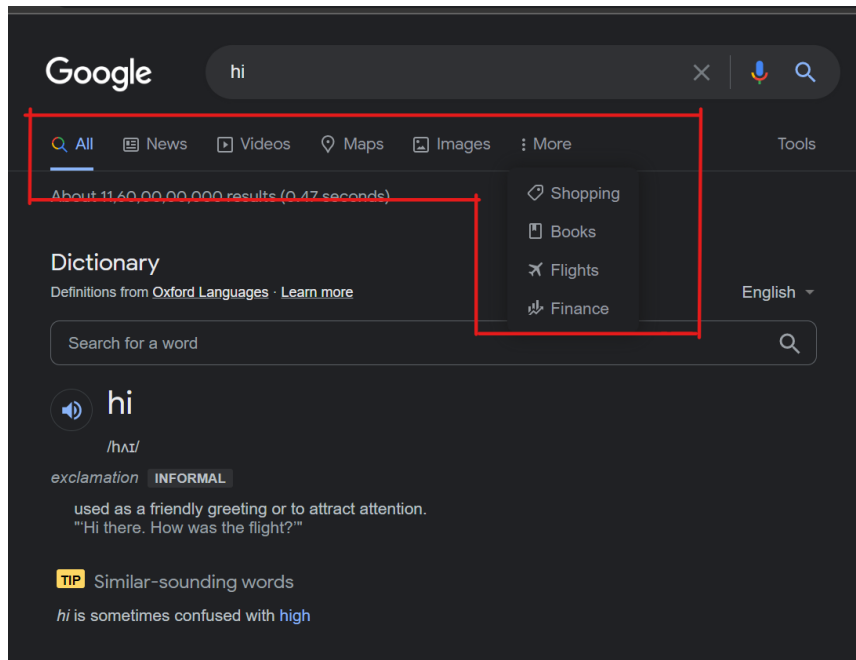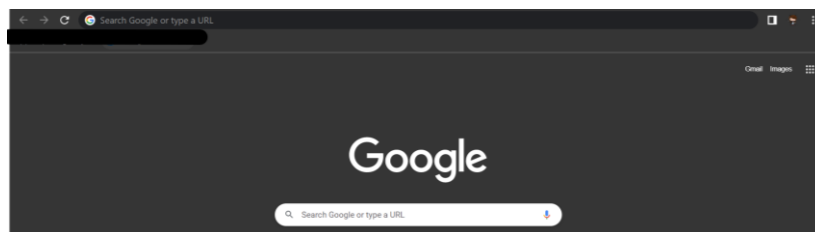
Fig 3. Example
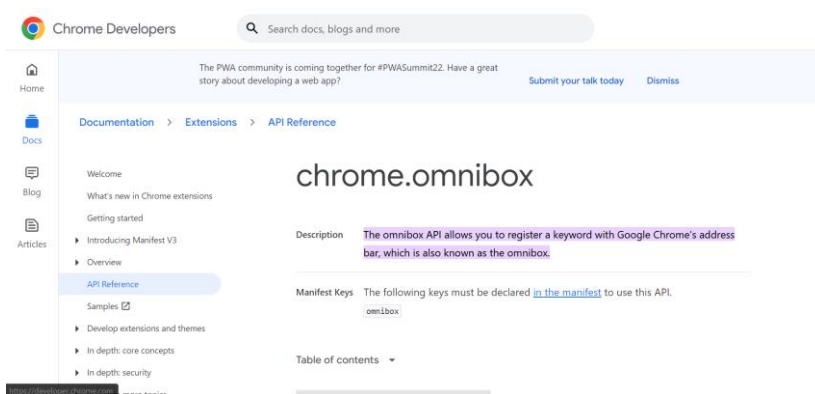

Fig4. The Omnibox

Fig5. Explanation given by chrome developers.

6. Cross browser and multi-platform compatible

Chrome is a cross browser. [6] Cross browser means the ability of a website, HTML construct, application or even client-side script to work in several different environments, ones that provides required features. Although there exist many other cross browsers, taking comparison with safari, the exclusive apple browser which can only work in iOS devices while chrome is able to work under any circumstances in any devices.
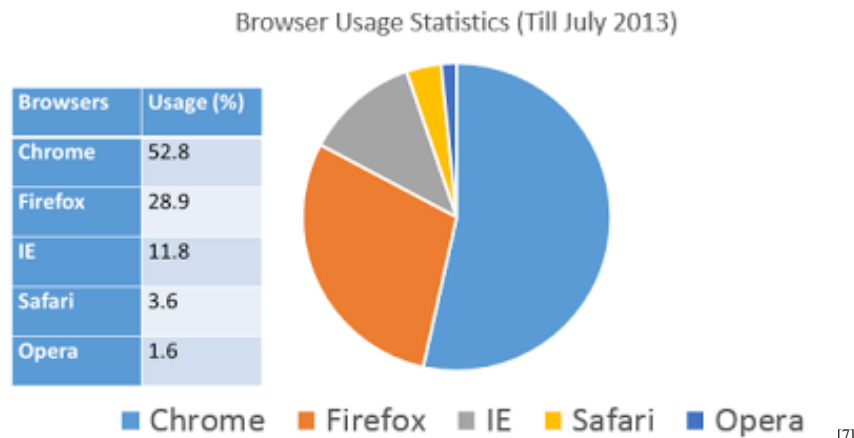
Fig6. Chart showing the usage statistics.

7. Performance

Chromium an open-source project which aims to build a safer, faster, and more stable way for all users to experience the web developed by google. It helps run some of the popular web browsers in the world, including the google chrome and Microsoft edge. There are different devices used by the user, google aims to make the users to use this browser in all devices. Even the low power consumed devices are included in the chromium project. This project includes mainly 3 sub projects.

- Chromium Browser
- Chrome OS
- Blink

Chromium browser is for low powered devices, even the raspberry pie can use the google chrome. If we use the regular chrome in such devices then it wont load and the user will not get a good user experience. Followed by that the chrome OS is for the low spec devices to create android experience. Google gives a huge importance to their user and that made it more popular. Additionally, the search rendering engine blink. In 2008, when the google chrome was introduced, they used Web Kit as their browse engine. Web Kit is an open-source project. In records google officially announced that they switched their browsing engine to blink since web kit was growing too complex.

Even though google chrome have many merits, still the users need to realise the fact that it is using huge RAM. The usage of RAM varies from device to device. In low power consumed devices chrome is not using much RAM. For speed testing, we can run browser through the Jetstream benchmark. The RAM used by google in an i5 laptop is shown below.
Safari doesn't run on Windows, note that some browsers (Edge in particular) use sleeping tabs, meaning they unload the content of tabs user is not viewing from memory. In truth, higher memory usage here can result in snappier performance since user do not have to wait for sleeping tabs to get reloaded.

8. Comparison of browser engines – the story of blink

In 2008, google came up with google chrome during the early age they depended on apple web kit as the rendering search engine. Later in 2021 google announced a switch to blink, an open-source project under project chromium by google.
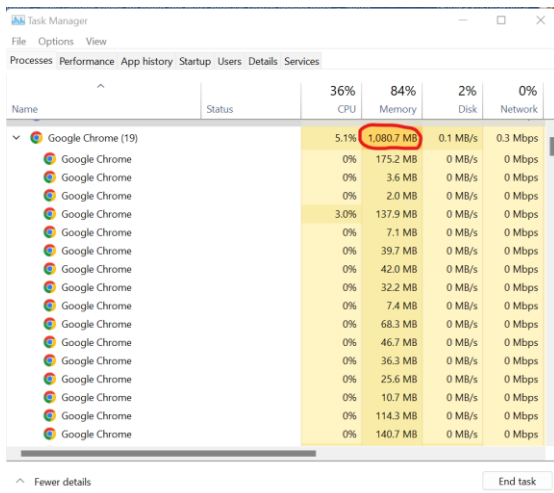
Fig 7. The task bar showing the memory usage of chrome.

Many of users got confused about the sudden drift made by google. The explanation given was that Web kit was growing too complex and by shifting the rendering engine to Blink it could contribute to the chromium project. There arises a question that is blink better than web kit. A rendering engine is software that draws text and images on the screen. The engine draws structured text from a document (often HTML), and formats it properly based on the given style declarations (often given in CSS).

[8]*"Chromium uses a different multi-process architecture than other Web Kit-based browsers, and supporting multiple architectures over the years has led to increasing complexity for both the Web Kit and Chromium projects."* writes Adam Barth, software engineer at Google.
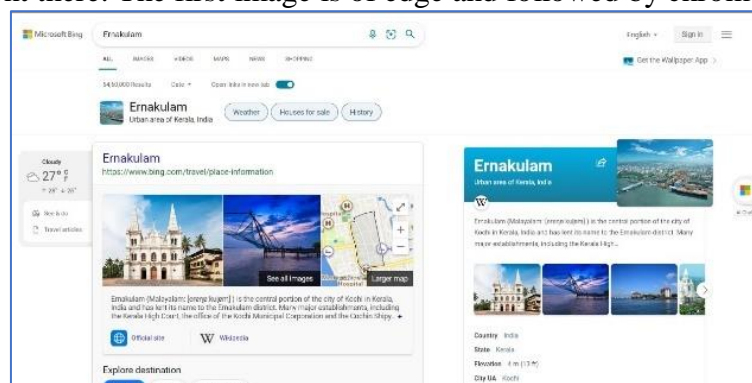
9. A comparison between Microsoft edge and google chrome in real time- case study
In the case study this paper is mainly focused on top 2 browsers the Microsoft edge and Google Chrome. The categories of comparison will be

- UI/UX and Data relevance
- Privacy
- Impact of mobile devices
- Extensions and store

9.1. UI/UX and Data Relevance
The user interface and user experience are always a hot topic, because for user satisfaction both these should be kept perfect. Below shows the search result of same keyword in both edge and chrome and the result is so evident there. The first image is of edge and followed by chrome:
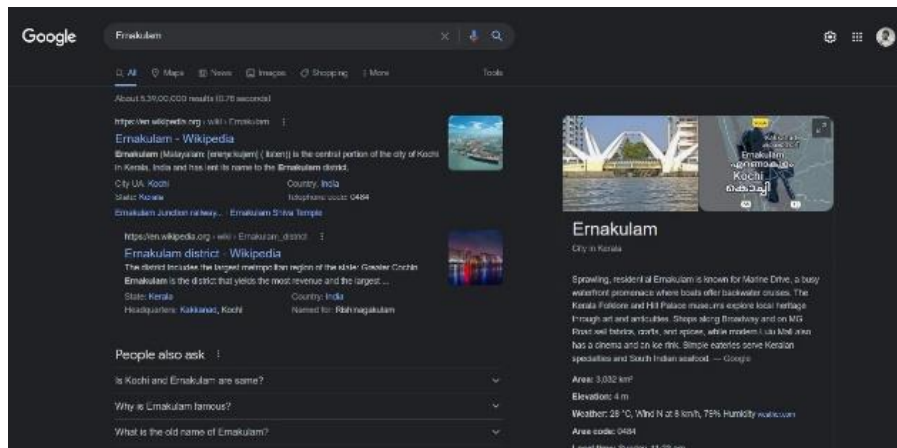
Fig8. The comparison of edge and chrome.

In the first screenshot it is very evident that all the information is given in a scattered way also they UI is not much user friendly. When the user come to know any details and can get distracted easily. In side it has given the temperature and weather details and on the other side there is a bot chat option where an ordinary user can get fantasised and can get deviated from the purpose of their visit.

Also, when comparing both the picture the alignment is another major factor that makes the chrome to stand out from the crowd. Google is perfectly packed with relevant data. Taking other examples here is another search result of both Bing and chrome.
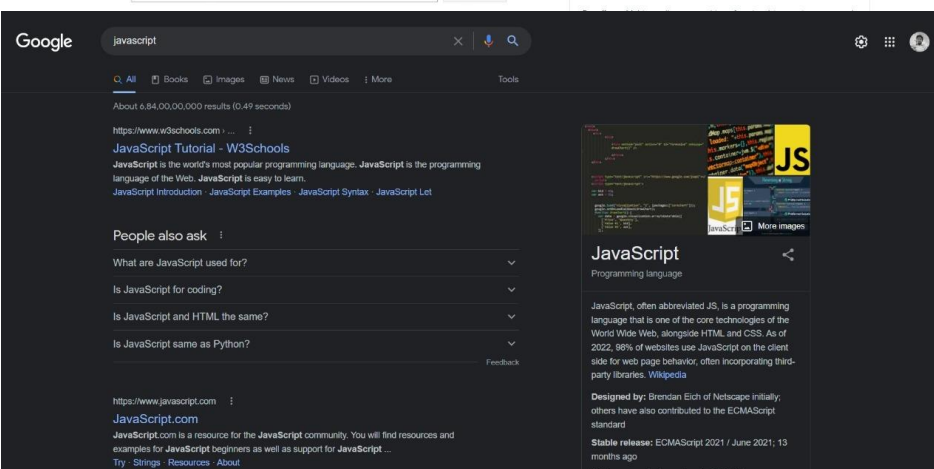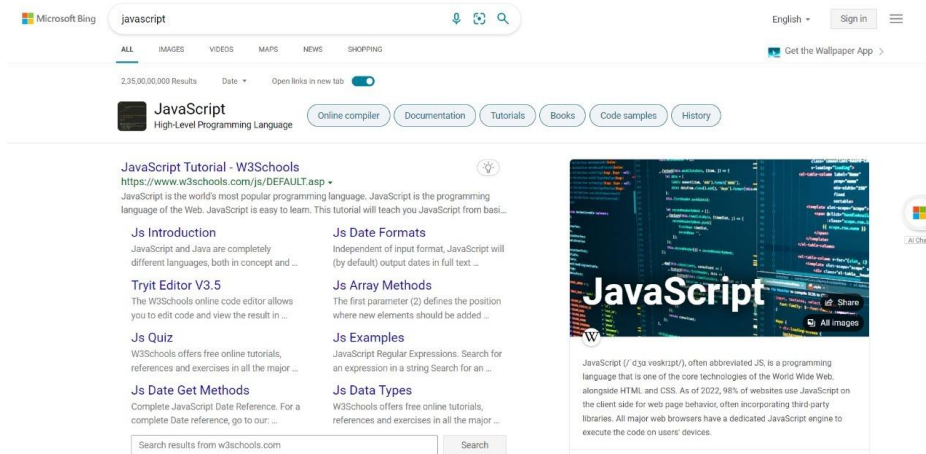

Fig9. The comparison of edge and chrome.

This another great example of how google is giving better user experience. Here when the user search for JavaScript in both the browsers the results are different. Edge gives more importance to w3 schools and the features was given under it, on the other hand google given details about the w3

schools and other details was given as redirect links and followed by relevant doubts asked by other people. Although edge also has 'People Also Ask' feature still when compared with google, google gives more accurate search results with better user experience.

9.2. Privacy

Privacy is an important factor that all users are worried about. There are web browsers like brave which do not store the user data, the user has a choice whether to share their history with their browser. Similar is the case of edge when the user signed in to their account the history will be synced to account automatically.

But google chrome is very transparent about the server privacy information. Below is the screenshot of server log privacy information.
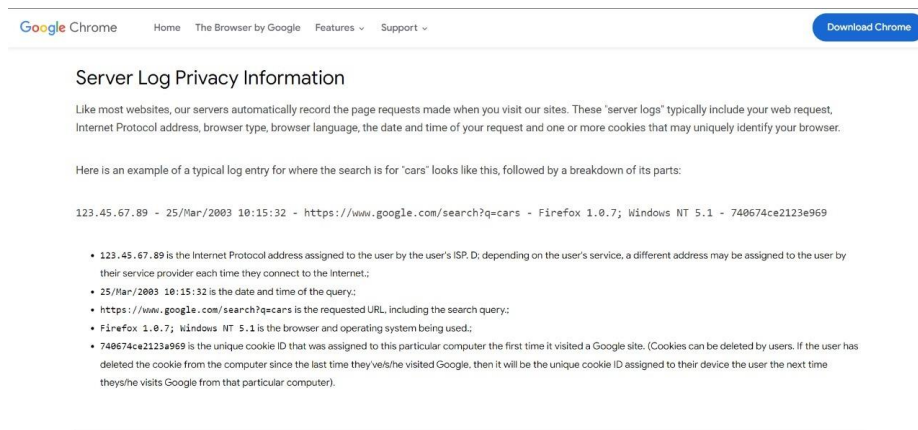

Fig 10. The server log information

Google chrome automatically record the page request made when the user visits the sites. It included web requests, internet protocol address, browser type, browser language, the date and time of your request and one or more cookies that may uniquely identify your browser.

9.3. Impact Of Mobile Device

In todays' era the most commonly used web browser is google chrome in mobile application when compared to another web browser. Many surveys have shown it. The main reasons are discussed above.
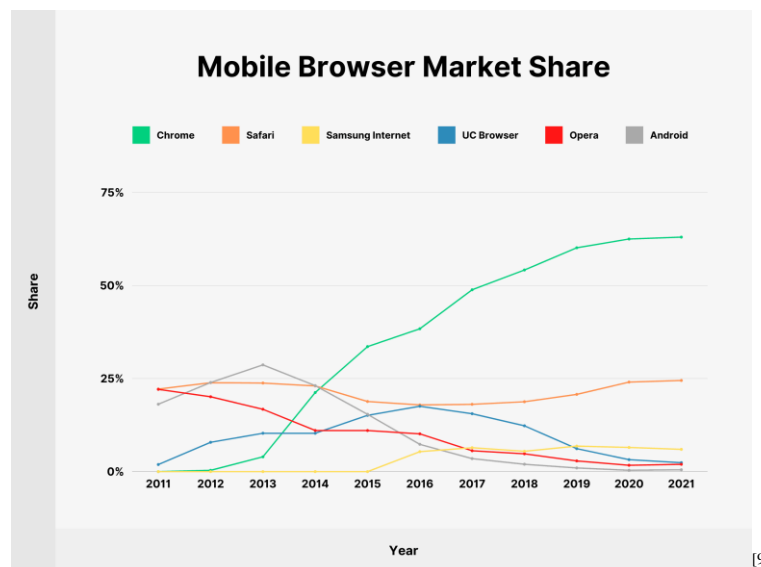

Fig 11. The graph of market share from 2011-2021

9.4. EXTENSION AND STORE

Chrome has its own market place and its extensions are cool features when compared with other browsers. There is web store where the user can buy extensions. Web extensions are software programs, built on web technologies like HTML, CSS and JavaScript which helps the users to customize the browsing experiences.
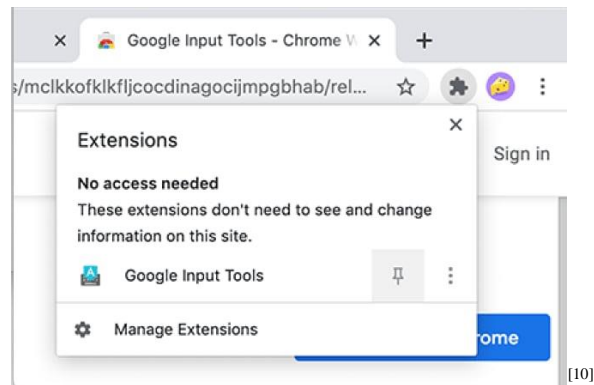

[10]

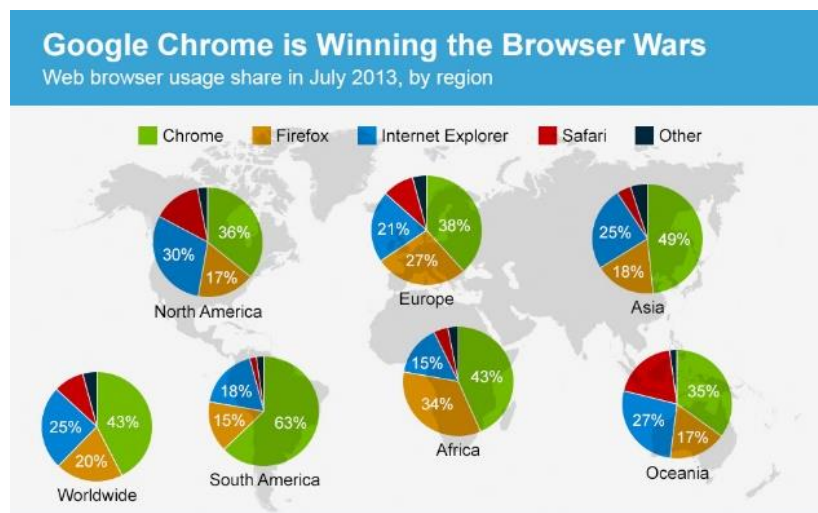**Fig 12. The extension**

CONCLUSION

Fig 13. The international survey between different browsers

So far, many points have discussed and as summing up it is very clear that for better user experience google chrome is the option. Still the users who really wish for privacy and not experience then google chrome is not the option. The main reason why google is giving accurate search results for its user is because, it collects the search histories and having a big data sample within its server which makes the search engine to predict the user's needs. As a reminder everything has its positives and negatives, using everything carefully helps in better future. Always it is the user's choice to select what they want and need.

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