CSP 587 - Software Quality Management

Team Project #1 - Report

Team Madison

Brave (High Quality) vs Edge (Low Quality)

Section 1: Description

Brave:

Purpose: Brave is a privacy-focused browser that disables ads and focuses on privacy and security.

Functionality: Brave has a built-in ad tracker system that disables all ads. It also has an inbuilt video conferencing integration. It has an inbuilt VPN and firewall. It also has a crypto-currency-based reward system.

History: Brave Browser was launched in January 2016. They acquired the Link Bubble web browser application and rebranded it as Brave browser for Android. In 2018, they launched a Pay-to-surf test version which included rewards for watching ads. In 2018, Brave partnered with HTC to make the Brave browser the default browser for HTC phones. By 2020, brave had 20 million monthly active users and by 2021, brave had 36 million monthly active users. In November 2021, Brave became the first browser to be added to Epic Games Store.

Target Audience: Brave is mostly used by privacy-conscious users, tech-savvy users, crypto-enthusiasts, ad-haters, and digital content creators.

Platforms: Windows, MacOS, Linux, Android, IOS, IPadOS.

Edge:

Purpose: Edge is a browser developed by Microsoft which is integrated into Windows. It is built as a successor to Internet Explorer which was the default browser for Windows.

Functionality: It has inbuilt integrations for Microsoft apps like Outlook, OneDrive, Teams, Microsoft Office, and Co-pilot.

History: Microsoft Edge was launched in the year 2015. Microsoft's Edge browser was built using its own browser engine and edge HTML, Chakra JavaScript engine. In the year 2018, Microsoft announced that it would redesign Edge as a Chromium-based browser. It was built using Blink and V8 Engine and released in January 2020, codenamed 'Anaheim' which offered improved compatibility and performance. Microsoft Edge is the successor to the older version of Windows default browser, Internet Explorer.

Target Audience: The target audience for Microsoft's Edge is mainly the users of Windows ecosystem.

Platforms: Windows, MacOS, Linux, Android, IOS, IPadOS

Section 2: Summary

Brave:

Ease of Use: Brave offers a clean and minimalist design with a simpler website, which will be better and more convenient for users who prefer simple searches. Brave has built-in privacy features that help in automatic ads and tracker blocking without additional setup and are enabled by default. Brave is known for its fast page loading times, with the help of its built-in ad blocking which results in smoother browsing, especially on heavy websites.

Brave is generally more efficient with a system of resources which can lead to better performance on low-end devices and improved battery life. Brave also has built-in cryptocurrency features with an integrated crypto wallet for managing digital assets and also offers a Brave rewards program that allows users to earn Basic Attention tokens.

Brave offers a more consistent experience compared to Edge. Brave is most liked by content creators because of its user-friendly interface.

Utility:

In terms of Utility, Brave is ahead of Edge browser. The users can use Brave's built-in additional plugins instead of downloading them from third-party websites. This blocks data tracking by those websites, hence reducing the chances of targeted advertising. Secondly, Brave has a rewards program, which gives the ability to earn Basic Attention Tokens (BAT), by viewing ads from trusted websites. These tokens can be used as a tip to favorite content creators, which would increase the interaction between the user and the content creator. Brave also has integrated Tor support, which adds additional privacy for private tabs, allowing users to browse anonymously within the browser itself. This feature is especially useful for users who focus particularly on privacy and want to avoid websites from tracking IP addresses.

Moreover, Brave has a built-in VPN which provides additional security for the users, without spending extra money on other VPN providers. Last but not least, is Brave's Ad Blocker, this feature is the main reason for users to switch to Brave browser, as it is highly effective at blocking ads and cookies by default, meaning users don't need to rely on additional extensions to block ads. This leads to faster page loads, a smoother experience, and clean interfaces.

Performance:

Brave stands out mainly for its speed and performance. One of its main features is blocking ads and trackers automatically, which allows us to use the browser without any disturbance in the bandwidth and also makes the browser faster. It improves the browsing experience by stopping background processes. This helps users who frequently use streaming platforms like YouTube. Along with this, Brave provides us with high-speed video streaming and privacy at the same time. Brave also auto-upgrades the connections to HTTPS, which makes it more secure to browse, and it uses less RAM compared to Edge, which helps in faster responses from the browser.

Additionally, Brave performs so well because of its built-in Chromium engine and advanced features like Network State Partitioning and Query Parameter Filtering. Network State Partitioning helps enhance privacy by isolating network-related data (such as cookies and cache) between different websites, which prevents unnecessary background requests and usage of more resources, making the Brave browser more

optimized. Similarly, Query Parameter Filtering not only improves security by removing tracking identifiers from URLs but also reduces background resource consumption, further enhancing performance efficiency. With this optimization, Brave is three times faster than Edge.

Privacy and Security:

Third - party Ads: Brave blocks third-party ads that target users. This will prevent invasive user tracking and save customized user data. Brave blocks third-party cookies by default which are used by advertisers to gather user data and help users protect their privacy. It also automatically blocks all non-essential cookies in the background.

Cross-site Trackers: Cross-site tracking is monitoring and recording users' activity when they are online across multiple platforms and websites. With cross-site tracking, advertisers collect data about users' interest, browsing habits, preferences and use the data for customized targeting. Brave blocks cross-site scripting which is used by advertisers to track users across various websites. Since the brave browser blocks them, the user will remain anonymous online.

Fingerprinting: Fingerprinting is an invasive form of online tracking that makes an individual profile for each individual based on their online activity in the form of a digital fingerprint. Brave includes anti-fingerprinting that doesn't allow websites to gather data and create unique fingerprints based on the user's activity. This will safeguard users from being individually identifiable.

Global Privacy Control: Global Privacy Control(GPC) is a browser setting that intimates the websites about users' privacy settings such as not selling or sharing user's personal information without their consent. When GPC is enabled, it sends a signal to each website when the user visits. Brave supports GPC which gives users more control over their privacy.

Query Parameters: Query parameters are a defined set of parameters that are attached at the end of the URL and are used to provide additional information when the website is sending a request. Brave actively filters out these query parameters embedded in the URLs which can be used to collect additional information when users navigate between websites.
Example: http://example.com?product=1234&utm_source=google
Here, we can see the utm_source as Google which is used to track the source of the traffic.

Bounce Tracking: Bounce Tracking is how third-party trackers follow users across websites even when the browsers have privacy protection. Bounce tracking works by placing hiding trackers in links that the users click which can be used to set cookies and build browser fingerprinting. Brave automatically prevents bounce tracking thus avoiding hidden data collection.

Customizability:

Other than its privacy, Brave is also well known for its browser customization. It allows users to customize their browsers with their preferences, like adjusting privacy settings or enhancing the visual layout. Brave's privacy feature, Brave Shield, helps users block ads, and trackers and prevents fingerprinting. You can use this precise management on all the sites. This per-site customization helps you choose the level of protection of each site as per your requirements. For example, while browsing social media platforms like Twitter, you can block trackers and cookies. The Brave Shield also provides you with the auto upgrade of HTTPS for a more secure connection. Additionally, Brave Shield has private browsing with Tor, which adds extra protection for our privacy.

It also has a crypto wallet, allowing users with digital assets (cryptocurrency) to store and manage their Basic Attention Tokens (BAT) or Ethereum directly in the browser. Brave also offers visual customization options, allowing users to modify their themes, backgrounds, and fonts; we can create a personalized browsing experience based on your own preferences. This flexibility allows users to create a customized browser that fits their specific habits and needs, whether it’s for work or personal use. The night mode enhances low-light browsing comfort. Toolbar buttons can be rearranged or hidden for a cleaner interface.

Brave supports Chrome extensions, which help users enable tools like password managers, grammar checkers, and translation tools in Brave as well. The unique sync feature in Brave uses encryption instead of login accounts and also ensures secure and convenient syncing across devices without compromising privacy.

Unique Features:

Brave offers several unique features that make it stand out among other browsers.

Tor Integration: Integration of TOR with a private tab, allows users to browse anonymously within the Brave browser. This completely prevents websites from tracking the activity of users, hence increasing the security and privacy standards of a browser.

Native IPFS Support: Brave comes with built-in support for the InterPlanetary File System (IPFS), which operates by breaking down files and data into smaller blocks and distributing them across multiple computers, instead of fetching content from a single server like HTTP-based browsers. This not only leads to an increase in speed browsing but also improves the availability of content that may be blocked or removed from some websites.

Built-in Ad Blocker: Even though other browsers have this feature, Brave's ad blocker stands out among them as this automatically blocks every ad and every tracker without third-party extension. This not only increases the browsing speed but also saves time for the users.

Built-in Video Conference: Another interesting and useful feature is built-in video conference tool known as Brave Talk, which requires no additional software download to host or join meetings.

This shows us the effort behind Brave's team to not only provide unique features but with high-security within the browser.

Edge:

Ease of use:

Microsoft Edge comes pre-installed on Windows devices, which requires no setup and offers a more futuristic main page with quick access to the links and is readily available. And seems busier due to more options on the main page it provides better integration with Microsoft services and the Windows ecosystem. Edge does not come with the privacy features enabled by default and might need users to download privacy extensions to keep the browsing safe. Edge is ad-friendly which allows ads to be played on the main interface.

Microsoft Edge includes a discovery feed on the main interface, Though it offers easy customization of the main interface it is likely that privacy settings constantly change with the cookies from websites. whereas Microsoft Edge is compatible with Chrome extensions it also includes an internet explorer mode which is aimed to fix the compatibility issues. Microsoft Edge features a built-in PDF reader and supports web assembly.

Utility:

The main problem with the Edge browser is for users who are out of the Microsoft ecosystem, as it heavily promotes Microsoft services like Microsoft 360, Bing search, and OneDrive. If the users rely on these services, then Edge can be useful as these services are directly integrated with Edge. However, if users did not invest in the Microsoft ecosystem or were not interested in using these services, then users might not use Edge for a long time.

For instance, if the users do not like the default search engine of Edge, which is Bing, they can change it to other search engines, but still, the Edge browser is designed in such a way that it pushes users to use Bing. Also, it constantly promotes Office 365, Outlook, etc., which leads to less user retention. Additionally, the Edge browser's interface is filled with multiple ads, which reduces user satisfaction as it increases browsing time and also makes the interface very confusing. Even though Edge has improved a lot since its release, it is still slow in terms of browsing compared to other browsers and 3 times slower than the Brave browser.

When it comes to extensions, just like Brave, Edge also supports Chrome extensions, so users can get a better experience using these extensions, without just getting restricted to Edge Add-ons. Finally, because of the pre-configured features, users cannot customize Edge according to their preferences.

Performance:

As we know, Edge provides fair speed and resource management, but it struggles with background processes and ad loading, which can slow down your browsing. Unlike Brave, which automatically stops ads and trackers, this can make websites take longer to load on Edge and use up more of your internet data. Edge also consumes more RAM compared to Brave, especially when using multiple tabs, which can lead to slowdowns during high-demand tasks such as streaming or multitasking.

While Edge offers some performance improvements, such as sleeping tabs that save memory, its dependence on background processes and external ads reduces its overall efficiency. Users who prefer a smoother, faster experience are likely to find Brave's optimizations better suited for their needs, making it a more attractive choice for those focused on speed and performance. Edge's performance is satisfactory but doesn't match the efficiency and speed that Brave offers, making it a less appealing option for users looking for a high-quality browsing experience.

Privacy and Security:

Third-party Ads: Microsoft's targeted ad data mostly comes from Edge and Bing search engine. Microsoft Edge is designed to collect browsing activity, search activity, location, brand preferences and as much as data as possible and uses the data for its advertising system. This extensive tracking without the user's direct awareness raises privacy concerns. The home page of Microsoft Edge is filled with ads which clearly shows that Edge is ad-centric.

Cross-site Tracking: Edge allows cross-site tracking which allows advertisers to follow all the actions of the users across different websites so they can build a detailed profile which is customized for each user for targeted ads.
Edge has an option to block cookies. But even if we block cookies, it will allow third party cookies to track user activity. This will help advertisers to track data even when we blocked the cookies.

Global Privacy Control: Edge doesn't enable GPC by default. Since every user who uses the website doesn't know about this policy, they don't know that they have to enable it so as to keep their data safe. Edge doesn't actively filter out these query parameters which can be used to collect additional information when users navigate between websites. Edge doesn't provide bounce tracking by default and because of these users are redirected through tracking domains which will allow advertisers to gather data.

Customizability:

When it comes to customizability, Brave definitely has an upper hand because Edge's customization options are very limited and they are mainly focused on integration with the ecosystem of Microsoft instead of focusing on user's privacy and providing a good personalizing experience to the user. Edge only allows a basic customization like adding or removing buttons from the toolbar and changing the themes of the browser. These customization options are very limited especially when compared with the customization options that brave provides. Edge has a sidebar which is not as flexible as Brave's. It only allows users to add particular apps and websites to the sidebar but the options are very restricted and are mostly aligned with the ecosystem of Microsoft. Edge doesn't give us the same level of privacy control that Brave gives us. It has very limited options in case of privacy.

Edge customization primarily focuses on integration with Microsoft 365 and its services. This might be beneficial to the users who are well connected with the ecosystem of

Microsoft but it doesn’t make any sense to the users who are not into the ecosystem of Microsoft. Also, edge doesn't have any integration with crypto currency like brave does. Absence of emerging and new technologies, when compared to other browsers makes users feel restricted and outdated. So, Microsoft’s Edge does offer some level of customization to the users with many restrictions when compared with the customization of brave.

Unique Features:

Forced Shortcuts: Instead of showing the shortcuts of applications which is most used by users, Edge comes with pre-added shortcuts, which compromises user customization.

Bing Search Integration: Even though it’s a unique feature for the Edge browser, instead of increasing user satisfaction, it leads to user dissatisfaction as the Google search engine is way better.

Information Cards: The main objective of this feature is to provide weather, news, etc. information to the user in the form of blocks on the home page. Some users might like it, however, if any user does not like this feature and disable this feature in settings, those blocks will be replaced by ads instead of making the interface clean.

Section 3: Best Practices:

Now, let us have a look at the best practices of what to do and what not to do in the viewpoint of SQM.

What to do:

Whenever we want to develop a high-quality web browser, we must make sure that it is very important to prioritize user privacy by implementing strong techniques so that users can have control over their privacy. The optimization of performance should be kept in the first place which ensures that the load times of the webpage is fast and the memory is efficiently used across different platforms. A good browser must provide a maximum level of customization to the users so that the users can customize according to their usage. In this competitive and emerging tech world, we must consider implementing innovative features such as ad-blocker which was implemented in Brave browser. The browser must be consistent and perform the same across all the various platforms. Most

importantly the security team must release frequent security updates to protect users from malware attacks and ensure that the browser is secure and trustworthy. Finally, user feedback is very important for a product to match the expectations of the user. User feedback must be taken for each and every new version of the product.

What not to do:

Now, let us look at what not to do when considering developing a browser that aligns with the best practices of SQM. The most important lesson learned from the above example which we considered is, not to limit users' ability to control their privacy. We must give maximum ability to control their privacy. We must focus on cross-platform customization instead of just focusing on a particular company's ecosystem. We should not neglect the performance of the browser on other platforms. It will be a big drawback for the product. We should make sure that the browser’s interface is free of clutter. It should not limit users' ability to freely customize their browser as this leaves us behind our competitors in the current market. We must not wait too long to implement new and updated technologies into our browsers. Microsoft delayed the transition to Chromium which resulted in a huge loss in the market share of browsers which explains us the importance of staying updated in integrating emerging technologies.

Section 4: Status Report

The entire team organized various meetings for selection of the topic by analyzing various applications across wide range of platforms and we finally came to a decision to go ahead with Brave and Edge Browsers. Here, after analyzing both Brave and Edge we came to a conclusion to proceed with Brave as High-Quality Software and Edge as Low-Quality Software mainly because many of us (team members) had, edge as default browser in their system but most of us switched to brave browser because of the analysis we have presented above. We divided the work among us equally and below are the contributions of each team member.

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   Section 1:
   Brave (Description)
   Section 2:
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   Section 1:
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