

WHITE PAPER ON THE SEARCH ENGINE MARKET

FEATURES AND COMPETITIVE LANDSCAPE | MARCH 2021

ABSTRACT

DuckDuckGo is a privacy technology company that helps consumers stay more private online. DuckDuckGo has been competing in the search engine market since 2008, and it is currently the 4th largest search engine across North America and Europe. From the vantage point of a company vigorously trying to compete, DuckDuckGo can hopefully provide useful background on the search engine market.

Among the many search engines that exist, Google and Microsoft (Bing) are the only ones to own a fully independent infrastructure for globally indexing the web and providing an ad feed. Other global search engines, including DuckDuckGo, syndicate part of their search results and ads from either Google or Microsoft. A few other companies operate analogous regional infrastructure, such as in China and Russia.

To appeal to consumers, a search engine needs to provide high-quality search features in addition to organic web links, such as instant answers, images, maps, and news, not all of which can be syndicated from the major search engines. Put another way, to be competitive, a search engine needs its own technology to incorporate all these features and ensure they appear at the right times.

Three options exist for getting users to adopt a particular search engine: (1) be the default search engine on web browsers (which is massively expensive); (2) be the default on a browser developed by the search engine itself, like DuckDuckGo has done on mobile; (3) convince consumers to change their default settings (which may not even be possible on certain platforms). Preference menus, where consumers are able to select their default search engine, are well-suited for the search engine market because most browsers and operating systems are already controlled by search engine parent companies.

Measuring search engine market share is challenging because comprehensive and objective data sets are not readily available. For example, DuckDuckGo, as an all-in-one privacy solution, blocks trackers in its apps and extensions, including measurement tags used by market research firms. To measure market share, governments need to combine log data directly sourced from a wide sample of appropriately selected websites.

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I. FEATURES OF COMPETITIVE SEARCH ENGINES

ORGANIC WEB LINKS AND HIGH-QUALITY SEARCH FEATURES

A competitive search engine must offer a set of high-quality search features, and ensure they are shown at the right times. The set of mandatory high-quality search features includes:

- An up-to-date index of most web pages on the Internet (referred to as “organic web links”)
- Maps
- Local business answers (e.g., restaurant addresses and phone numbers)
- News
- Images
- Videos
- Products/shopping
- Definitions
- Wikipedia reference
- Quick answers (calculator, conversions, etc.)



Additional features may also be necessary to be competitive with particular consumer segments, such as:

- Sports scores
- Airplane flight information
- Question/Answer reference (e.g., for computer programming)
- Lyrics
- Stocks
- Recipes

When DuckDuckGo launched in 2008, not all of these features were required for successful search engines, and arguably just one item was mandatory: organic web links (sometimes referred to as “the ten blue links”). Over time, online search innovated, and consumers came to expect the other features (often referred to collectively as “instant answers,” “one boxes,” or “info boxes”). The trend toward instant answers is likely to continue because they more quickly get information to consumers.¹

Another reason for the increasing use of instant answers is the rise of smartphones, which now generate the majority of online searches.² On non-desktop/laptop devices, consumer website navigation is more difficult, making instant answers intrinsically more useful.

Nonetheless, organic web links continue to be a required feature. Despite their decreased importance, the financial outlay necessary to create and maintain those organic links has increased many-fold since 2008. The additional expense is because the web itself has grown so expansive.

One barrier for a startup search engine trying to generate useful organic web links (in addition to cost) is that many sites outright block the main tool for collecting organic web links: the link “crawler.” This block excludes already established crawlers such as the Google link crawler. Both small and large websites embed this blocking code.³ Some sites incorporate the blocking code because they have legitimate reasons to reduce the associated bandwidth costs. A December 2020 New York Times article explained that “websites often provide greater and more frequent access to Google’s so-called web

¹ DuckDuckGo incorporates content from approximately 400 sources, see <https://help.duckduckgo.com/duckduckgo-help-pages/results/sources/>. SparkToro adds perspective on these trends: <https://sparktoro.com/blog/how-much-of-googles-search-traffic-is-left-for-anyone-but-themselves/> and <https://sparktoro.com/blog/google-ctr-in-2018-paid-organic-no-click-searches/>

² Search Engine Land, May 5, 2015, *It’s Official: Google Says More Searches Now On Mobile Than On Desktop* <https://searchengineland.com/its-official-google-says-more-searches-now-on-mobile-than-on-desktop-220369>

³ See for instance Facebook’s blocking code: <https://facebook.com/robots.txt>

crawlers — computers that automatically scour the internet and scan web pages — allowing the company to offer a more extensive and up-to-date index of what is available on the Internet.”⁴

CLICK-AND-QUERY DATA

Another barrier facing a startup search engine is that it needs data, such as the most commonly clicked links for a particular query, in order to produce a useful ranking of organic web links, i.e., what link is displayed first, second, etc. For any given search query (e.g., “how to make cold brew coffee”), data specific to that query helps inform ranking decisions,⁵ although once a search engine has enough users consistently searching that specific query, having even more users do so provides little benefit. That is, network effects exist for search result ranking, but that network effect quickly dissipates once a critical mass of searches regularly occurs for that query. However, many of the queries that a search engine receives each day will be ones that the search engine has never previously seen, and those queries by definition will not have reached needed critical mass. As a search engine’s market share grows, the percentage of new searches on that search engine will diminish, but not to zero. Even at Google’s scale, approximately 15% of Google searches each day are ones that Google has never before encountered.⁶

INDEXING THE WEB

In the mid-2000s, many search engines crawled the web, producing indexes of organic web links, including many search engine startups and the by-then well-established search engines. Now all of those web-crawling search engine startups are defunct. In recent years, two new entrants attempted to create an index from scratch: FindX (from Denmark) and Cliqz (from Germany). Both went out of business due to the insurmountable barriers to entry.⁷

Today, only Google and Microsoft still produce competitive organic web link indexes. In some countries, a local player may hold a competitive position in producing organic web link indexes in the

⁴ The New York Times, December 14, 2020, Daisuke Wakabayashi: “*Google Dominates Thanks to an Unrivaled View of the Web.*” <https://www.nytimes.com/2020/12/14/technology/how-google-dominates.html>

⁵ Search Engine Land, September 15, 2020, *8 major Google ranking factors — SEO guide* <https://searchengineland.com/8-major-google-ranking-signals-2017-278450>

⁶ Search Engine Land, April 25, 2017, *Google reaffirms 15% of searches are new, never been searched before* <https://searchengineland.com/google-reaffirms-15-searches-new-never-searched-273786>

⁷ In its farewell message, FindX wrote that “Findx search index was incomplete and was not able to return results that were likely both relevant and good quality” because large websites block independent trackers. In a similar spirit, Cliqz wrote that it “failed to reach a scale that would allow our search engine to be self-financing.”



local language, such as in China (Baidu) and Russia (Yandex). As a result, other competitive search engines including Yahoo and DuckDuckGo must license the Google or Microsoft organic web links.

Yahoo and DuckDuckGo (and any other search engines hoping to be competitive in the search engine market) sign search syndication contracts with Google and/or Microsoft to purchase their organic web links. In exchange, the purchasing company agrees to show search ads next to the organic web links. The parties split the revenue generated by the search ads (according to percentages stated in the contract). In these syndication arrangements, the company providing the organic web links/search ads is called the “upstream provider” and the company receiving them is called the “downstream provider.”

While only Google and Microsoft produce the organic web links, their syndication contracts can authorize sub-syndication, which entails a second revenue-sharing contract. Yahoo (now owned by Verizon) historically had its own organic web links. But since 2009, Yahoo has purchased its organic web links from Microsoft.⁸ Microsoft is currently the primary source of organic web links (and the associated ad feed) for most search engines trying to compete in the search engine market (e.g., Bing, Yahoo, DuckDuckGo, AOL, Ecosia, Qwant, etc.).

Although Google, Bing, Yahoo, DuckDuckGo, and Ecosia are currently considered to be the only notable competitors in the search engine market across North America and Europe, many other syndication and sub-syndication “search engines” exist. Most are not generally considered part of the search engine market, however, because they lack the required set of features described above. Examples include Internet Service Providers (which display search results on a customer start page and when the customer misspells domain names; see for example search.xfinity.com), arbitrage players (which buy clicks or app installs and then send traffic to search result pages almost entirely comprised of ads; see for example ask.com), and vertical sites (which only provide niche search responses, see for example yelp.com).

Without a syndication contract with either Google or Microsoft or a sub-syndication contract with Verizon or another sub-syndicator, a company has no viable monetization path (see next section). The company can purchase access to Microsoft’s organic web link index via a simple online cloud signup,

⁸ CNN Money, July 29, 2009, *Microsoft and Yahoo: Search partners*, https://money.cnn.com/2009/07/29/technology/microsoft_yahoo/



but that does not incorporate the ad feed.⁹ Even with a syndication contract, a company may face growth challenges associated with the terms and conditions of the contract.¹⁰

II. MONETIZATION OF COMPETITIVE SEARCH ENGINES

The vast majority of search engines are free to consumers and monetize with ads. The search engine tries to show ads that are relevant to that search query (if the ads are not relevant, consumers will not click on them, and those clicks generate the advertising revenue on which the company relies.). Only two companies (again, Google and Microsoft) have an online advertising business that provides search ads of any significant scale (over half a million advertisers).¹¹ Similar to the organic web links, operating a search ads service at this scale is extremely costly, requiring massive resources for the sales network, support staff, and technology platform.

Also similar to organic web links, search ads benefit from network effects because ad pricing is based on an auction model. That is, search ads sell for a higher price when more advertisers are bidding for a given keyword, e.g., multiple bidders for the keyword “coffee.” To maximize bidders and therefore revenue, search ad suppliers are driven to merge, which happened gradually over time with #3 Yahoo/Verizon and #2 Bing/Microsoft, culminating in the 2019 announcement that Bing would thereafter operate all of Yahoo’s search ads.¹² Of the two remaining competitive search ad services (Google and Microsoft), Google has a larger advertiser base, and so is able to generate greater advertising revenue per search.

An aspiring search engine startup could attempt to earn money without the Google or Microsoft search ads, such as only showing product ads from companies like Amazon or travel ads from companies like Booking.com. However, these alternatives are not sufficiently lucrative to cover the costs of purchasing organic web links. In short, an aspiring search engine startup today (and in the foreseeable future) cannot avoid the need to sign a search syndication contract.

⁹ <https://azure.microsoft.com/en-us/pricing/details/cognitive-services/search-api/>

¹⁰ UK Competition and Markets Authority, July 1, 2020, *Online platforms and digital advertising, Market study final report*, pp. 96-98 – [Link to the report](#)

¹¹ <https://about.ads.microsoft.com/en-us/blog/post/april-2019/bing-ads-is-now-microsoft-advertising>

¹² <https://about.ads.microsoft.com/en-us/blog/post/january-2019/microsoft-and-verizon-media-strengthen-search-partnership>

III. GETTING CONSUMERS TO ADOPT A PARTICULAR SEARCH ENGINE: THE POWER OF DEFAULTS

THREE OPTIONS FOR GETTING CONSUMERS TO ADOPT A SEARCH ENGINE

To get consumers to adopt a particular search engine, three options exist.

- **Option One:** The first option is to be **the default search engine on web browsers**. In this situation, when a consumer starts using a web browser (either when setting up a new device or after installing the browser), that browser is already configured for the particular search engine.

Unfortunately for startup search engines, default search placement is not a practical option because the primary browsers are either already owned by a major search engine parent company (Chrome/Google, Edge/Microsoft, Internet Explorer/Microsoft) or charge hundreds of millions to billions of dollars for such placement (Safari,¹³ Firefox,¹⁴ Samsung¹⁵). Browser market share globally is 63.5% Chrome (owned by Google), 19.5% Safari (owned by Apple), 3.7% Firefox (owned by Mozilla), 3.5% Samsung, 3.2% Edge (owned by Microsoft), and approximately 6.5% by many small players.¹⁶ We explore below how to address this market challenge.

- **Option Two:** The second option is for **the search engine company to develop its own browser** and gain market share via that browser's adoption. For example, DuckDuckGo developed its own browser for Android and iOS. However, the same default placement challenges exist in the browser market, just one level up – with the device makers requiring millions or billions of dollars to become a default browser on a device.
- **Option Three:** The third option is **to convince consumers to change their default settings**, either manually or by downloading software that helps them to do that. Consumers must be highly motivated to take these steps, which vary in complexity from device to device and browser to browser. Even with a competitive differentiator like privacy, consumers are extremely reluctant to take such action because it can be technically challenging and time-consuming. On devices with the Android operating system, it takes over 15 clicks to change the search default

¹³ Lisa Marie Segarra, *Google to Pay Apple \$12 Billion to Remain Safari's Default Search Engine in 2019: Report*, Fortune (Sept. 29, 2018), <https://fortune.com/2018/09/29/google-apple-safari-search-engine/>

¹⁴ <https://www.cnet.com/news/google-firefox-search-deal-gives-mozilla-more-money-to-push-privacy/>

¹⁵ <http://www.theinvestor.co.kr/view.php?ud=20170816000718>

¹⁶ StatCounter, *Browser Market Share Worldwide*, January 2021, <https://gs.statcounter.com/browser-market-share>



on the home screen search bar as well as the default browser and search app.¹⁷ Moreover, even when the consumer is convinced to take that action, it can be only a temporary change – the consumer’s device and browser are often configured to roll back the search engine selection (e.g., with software updates) or nudge the consumer into doing so.

REMIEDIATING GOOGLE’S DEFAULT DOMINANCE

The dominant player in the search engine market, Google, also owns the dominant browser (Chrome) and the dominant mobile operating system (Android). The mobile operating system and browser are two essential ways that users access the Internet – and when Google does not control these ‘gateways’ to the Internet, it invests billions to buy default settings. The US Department of Justice, in its antitrust complaint against Google, stated that “Google pays Apple billions of dollars in advertising revenue each year, with public estimates ranging around \$8–12 billion.”¹⁸

In its 2018 Android decision, the European Commission sanctioned Google for abusively tying its Google Search app and its Chrome browser with the Android Play Store, in conjunction with setting Google Search as default on Chrome. It concluded that the tying “*helps to maintain and strengthen Google’s dominant position (...) in general search services, increases barriers to entry, deters innovation and tends to harm, directly or indirectly, consumers.*”¹⁹

A powerful way to correct default dominance is to present users with a preference menu for selecting a search engine on their device or browser. The Russian competition authority required Google to give users such a menu on both existing and new Android devices in 2017.²⁰ Subsequently, Russian search engine Yandex reported a 10% increase in market share on Android devices.²¹

The Commission’s decision, unfortunately, did not mandate a preference menu. The Commission only required Google to untie – specifically, Google had to cease bundling the Google Chrome browser and

¹⁷ DuckDuckGo’s SpreadPrivacy blog, October 14, 2020: *Dear Google: We Agree Search Competition Should Be “Only 1 Click Away” – So Why Is It 15+ on Android?* <https://spreadprivacy.com/one-click-away/>

¹⁸ Press release and court complaint from October 20, 2020 available [on DOJ website](#).

¹⁹ Case 40099, ‘Google Android’, see [official case page](#) on the European Commission’s website, paragraph (773), p. 168

²⁰ <https://www.reuters.com/article/us-tmt-conference-yandex/yandex-aims-for-50-percent-mobile-search-share-in-russia-cfo-idUSKBN1DG379> and <https://russiansearchmarketing.com/yandex-catches-google-on-android-in-russia>

²¹ <https://russiansearchmarketing.com/yandex-search-market-share-increase-during-q3> and <https://www.fool.com/investing/2018/09/07/yandex-overtakes-google-as-russias-top-search-engi.aspx>



Google Search with the Google Play Store on Android devices sold in Europe. The Commission order did not specifically set forth remedial requirements beyond the untying component. Predictably, Google implemented a self-serving remediation plan – a Google-designed search preference menu, applicable only for Android devices certified by Google after March 2020.

Google’s preference menu uses dark patterns and a per-selection auction-based mechanism to incentivize consumers to retain Google and reject search engines with alternative business models (like privacy-first DuckDuckGo and tree-planting Ecosia). For example, Google displays the preference menu only once (the user cannot get back to the menu unless he resets the whole device to factory settings). DuckDuckGo published a series of posts, backed by extensive user testing, detailing the flaws of Google’s preference menu and proposing a pro-competitive consumer choice architecture.²²

Google’s auction mechanism is particularly troubling because it imposes false scarcity (only three search engine alternatives are displayed despite the fact that many more alternatives can fit on the screen). Moreover, Google’s auction means alternative search engines will inevitably bid their profit per user selection, which results in Google taking all their preference menu profits.

In addition, because search engines pay Google for every user selection, this system favors search engines that maximize revenue per user, for instance through intrusive ads or misleading marketing claims. As a result, search engines that are disfavored by consumers are the ones who “win” the auction (for example, a German telecom provider, a Puerto Rican shell company). According to download numbers and ratings in the Google Play Store, consumers do not consider them real search engines; even Google itself does not list these pseudo search engine alternatives as options in Google Chrome settings (distinct from the preference menu).²³ While the preference menu can and should be a place where new search engines can introduce themselves to consumers, the preference menu should include all the search engines that consumers expect to be there.

Ironically, Google’s distorted preference menu further entrenches Google’s search dominance by reinforcing the widespread misperception that Google is the only legitimate search engine. Needless to say, search engine market share in the EU has not diversified at all since Google’s introduction of the preference menu.

²² <https://spreadprivacy.com/preference>

²³ *Choice Screen Auctions*, Professor Michael Ostrovksy, Stanford University, November 7, 2020. <https://web.stanford.edu/~ost/papers/csa.pdf>

IV. SEARCH ENGINE MARKET SHARE

PUBLISHER DATA BETTER MEASURES MARKET SHARE

Confusion exists around search engine market share because common data sources vary significantly and no public source is accurate. The oft-cited source of comScore and, to a lesser but still significant extent, StatCounter, have significant deficiencies.

comScore’s panel-centric approach means that its dataset suffers from a fundamental methodological issue: selection bias. The people in the panel are not representative of the online population. For example, DuckDuckGo users, who almost by definition value their privacy, are not likely to participate in a panel that surveils their online activity. Additionally, comScore excludes mobile searches, ignoring the largest increase in search traffic since the 2007 introduction of the iPhone.²⁴ Thus, the proportion of devices in the panel does not match the proportion used by the general population. comScore also hasn’t added any new search engines to its list in over a decade, failing to capture market entrants like DuckDuckGo or Ecosia.²⁵

By contrast, publisher data, such as that used by StatCounter, measures who visits publisher sites across all devices. No one needs to opt in except for the publisher. With enough publishers, the research will accurately determine search engine market share. StatCounter relies on a large sample of over 2 million publisher sites, which translates into “10 billion page views per month.”²⁶ However, StatCounter uses a tracking code to create its market share reports, which DuckDuckGo’s mobile browser and browser extensions block to protect user privacy. As a result, StatCounter’s reports dramatically understate DuckDuckGo’s market share.

A SNAPSHOT OF SEARCH ENGINE MARKET SHARE

Despite its flaws, StatCounter’s data gives a solid outline of search engine market share. In February 2021, Google held between 89.5% and 92.5% market share in North America and in Europe,²⁷ followed by Bing (close to 5%), Yahoo (between 0.7% and 2.5%) and DuckDuckGo (between 0.7% and 2%).

²⁴ <https://www.conductor.com/blog/2014/05/shouldnt-trust-comscores-numbers-search-engine-market-share-data/>

²⁵ <https://www.comscore.com/Insights/Rankings>

²⁶ <http://gs.statcounter.com/faq>

²⁷ Because StatCounter’s “Europe” region includes Russia, despite Russia being a distinctively different market, we looked at the figures in the United Kingdom and Germany. The full set of market share numbers is available here: [North America](#), [United Kingdom](#), [Germany](#).



To get the clearest picture of search engine market share, governments should directly gather data from a wide and balanced sample of website publishers. Inherent in how the Internet works and online traffic is routed, when a user visits any website, that site will know the user’s immediately preceding website (this is called referrer information). For example, if a user searches for “durable umbrella” on Google.com and clicks on UmbrellaStore.com on the results page, then the UmbrellaStore will know that user came from Google. If a government obtains referral information from high-traffic and appropriately selected (unbiased) websites (aka publishers), the government can readily determine search engine market share.

V. CONCLUSION

Search engines are gateways to the web and essential to an open Internet. Yet, competitive market conditions are non-existent, a victim of high barriers to entry, constraints inherent in syndication, and Google’s monopoly power across core access points to the Internet. Governments can and should take swift, high-leverage actions to tackle Google’s exclusionary practices, such as by mandating well-designed preference menus.

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