



The Business Models of Google

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Contents

Introduction	4
Google and Alphabet	5
Subsidiaries	5
Services	5
Google platform architecture	6
Google's ecosystem architecture.....	8
Value propositions	10
Value networks	12
Revenue models.....	14
Advertising revenue models	15
Search advertising.....	15
Mobile search advertising.....	18
Audience network advertising	19
Search partners	20
Transaction fees.....	21
Product sales.....	23
Cloud service subscription	24
Delivery model	25
The IPO letter and what happened later	26
To improve the world is a mission to serve the public	26
Purely technical solutions don't exist	27
Google engages in anticompetitive behavior	28
Is there a problem?.....	28
Anti-trust regulation	28
A surveillance capitalist must be transparent	29

Introduction

Google was founded in 1998 by Larry Page and Sergey Brin as a spin-off of their [PhD research](#) into scalable hypertext web search engines. Its [mission](#) was, and is, ***“to organize the world’s information and make it universally accessible and useful.”*** This sounds as grandiose now as it was then, as there is a lot of information in the world that is not stored in web pages.

In practice, the mission is to provide a scalable service to query the web that is usable by anyone who can type in a query in the form of search terms. This goal is colossal too, but within reach and Google has done a magnificent job achieving it.

Google search is a free service and to finance it, Google started to sell advertising space next to its search results in 2000. Twenty years later, in 2020, it generated US\$147B revenue from advertising ([SEC report over FY 2020](#), page 33). Google has become a juggernaut of advertising.

During these twenty years, Google expanded in many directions, including business and personal computing, cloud services, payment, entertainment, education, mobile OS, and autonomous driving, among others. The only common feature of these activities is that they are applications advanced information technology.

Some of these non-search activities have become extremely successful. Google search and Google maps are extremely useful time-saving services. Google scholar is used by researchers around the world. The Android operating system is used by most smartphone users and YouTube has become a replacement for TV for many people. As a result, Google has become an essential part of the online infrastructure of modern life.

In this white paper we analyze the structure of the ecosystem that Google has created and analyze the revenue models that it uses: advertising, transaction fees, product sales and cloud service subscriptions. We summarize the pillars of its delivery model, universal access and user profiling. We finish with an analysis of Google’s presentation as a creative company that develops technical solutions for the world’s problems, as well as an analysis of the rising critique on a privately owned public infrastructure company that answers to shareholders only.

This report has been assembled based on public information. If you find mistakes or have other comments, please contact us as info@thevalueengineers.nl.

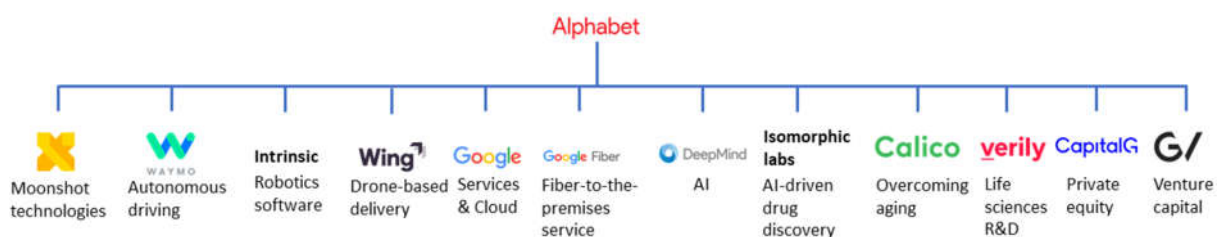
Google and Alphabet

Subsidiaries

As of 17th December 2021, [Wikipedia](#) listed 245 acquisitions by Google since 2001. Some of the more striking ones are the following.

- 2004 Where 2 Technologies: Web-based dynamic maps.
- 2004 Keyhole: Satellite and aerial images to create maps.
- 2004: ZipDash: Real-time traffic information.
- 2005 Android: Mobile operating system developer.
- 2006 YouTube: Online video sharing platform.
- 2007 DoubleClick internet ad serving services. Rebranded in AdSense.
- 2012 Motorola Mobility: To acquire patents in mobile and wireless. Sold to Lenovo in 2014.
- 2013 Waze: Satellite navigation software.
- 2014 DeepMind: Neural network AI software.
- 2015 Nest labs: Smart home products.
- 2021 Fitbit: Wearable physical fitness monitors.

To structure the activities of the company, the conglomerate holding company [Alphabet Inc.](#) was formed in 2015. The list of subsidiaries of Alphabet includes X, a lab for moonshot technologies that may be spun off as additional subsidiaries of Alphabet, and Google, which has many subsidiaries of its own. In addition, at the time of writing (December 2021), Alphabet had a few subsidiaries for autonomous vehicles, Google Fiber, two AI companies, two health sciences companies, and two investment companies. DeepMind, one of the AI companies, was not a spin-off of X but was an acquisition by Alphabet.



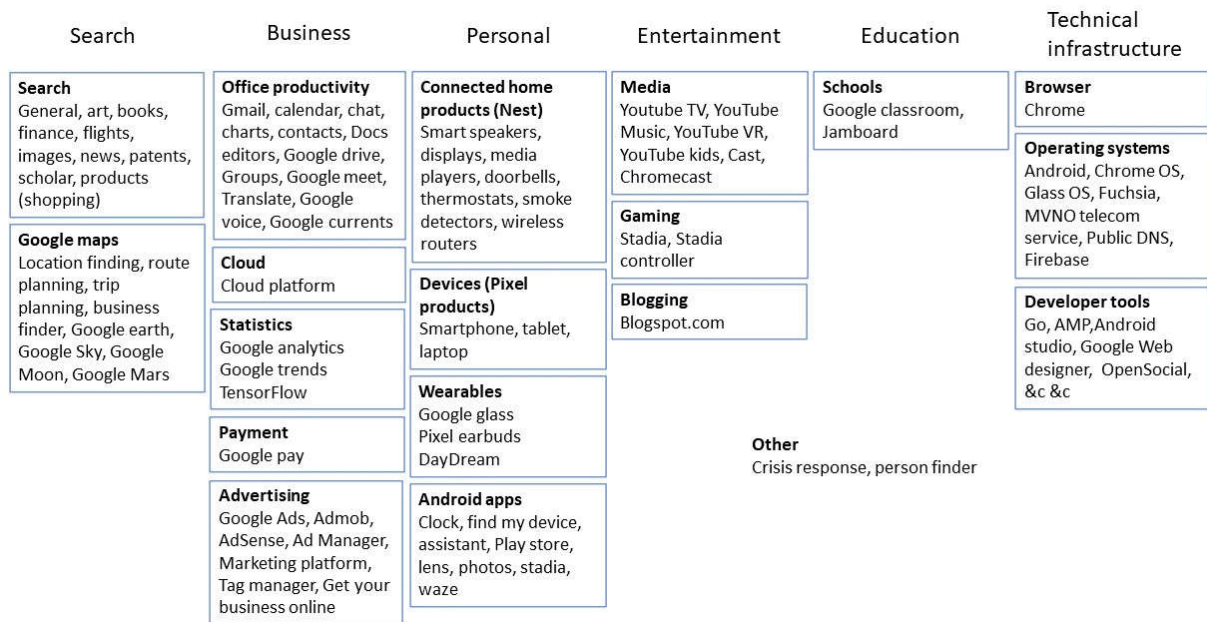
Recently, Sidewalk labs (smart cities) and FitBit (fitness wearables) were moved from Alphabet to Google.

The complete list of subsidiaries of Alphabet and Google is not known. [Kamil Franek](#) counted 377 in October 2019, 200 of which were Google subsidiaries.

Services

Instead of asking what subsidiaries Google has, we can ask what products and services Google offers. Google's [product page](#) lists 81 products but the [Wikipedia page](#) of Google products lists almost 150. And there are nearly [200 Google apps on Android](#).

Putting all of this together, we get six types of Google services: search, business services, personal products, entertainment, education, and infrastructure. And there are a few that fall outside this classification, such as crisis response services and a person finder in case of calamities.



Google has structured these services in just two groups: Google Cloud and the rest, called Google Services ([SEC 2020](#), p. 33). Google Services generated US\$ 169B gross revenue in 2020, most of which came from advertising. Operating income from Google Services was US\$ 55B in 2020 ([SEC 2020](#), p. 44).

Google Cloud generated US\$ 13B gross revenue in 2020, but with expenses of US\$19 to operate Google Cloud, its operating loss was US\$ 6B. The activities of Alphabet outside Google, called “other bets” by Alphabet, had a gross revenue of US\$ 1B in 2020 with an operating loss of US\$ 3B.

Clearly, Google Services are the core of Google. Glancing at the service bundle as a whole we see that it supports a full cycle of daily life. It provides news and satisfies our information hunger, it guides on our way to work, home and holiday, it supports office work, helps us at school, entertains us with games, music and videos at night, and is on its way to transform our experience of the physical world with intelligent glasses.

All these services are free for users. They are financed by collecting data about user behavior, which are then used to construct user profiles that are used to sell targeted advertising services to advertisers.

Google platform architecture

Instead of organizing Google’s services by activity domain, as we did above, we can organize them by layer, where lower layers provide services to higher layers. In the following diagram, lower layers provide services to higher layers. The Chrome browser runs on Android, which runs on Google hardware, among others.



Google maintains advertising platforms that are used by advertisers. They do not run on Google Chrome but they do provide services to higher layers, namely to all apps that show advertisements.

We classify all search and communication services as matching, regardless of whether the content searched for is a web page, music, or video, or location information. Google's content matching services include search (matching publishers, advertisers, and readers of web pages), YouTube (matching publishers, advertisers and consumers of music and video content), Gmail (matching senders and receivers of email with advertisers), and Google maps (matching publishers, advertisers, and users of geographic information). Advertising is part of all these matching services.

Gmail and Google classroom are communication services where senders and receivers are identified. Advertising is part of Gmail.

Classroom does not use advertising but draws young people into the Google ecosystem.

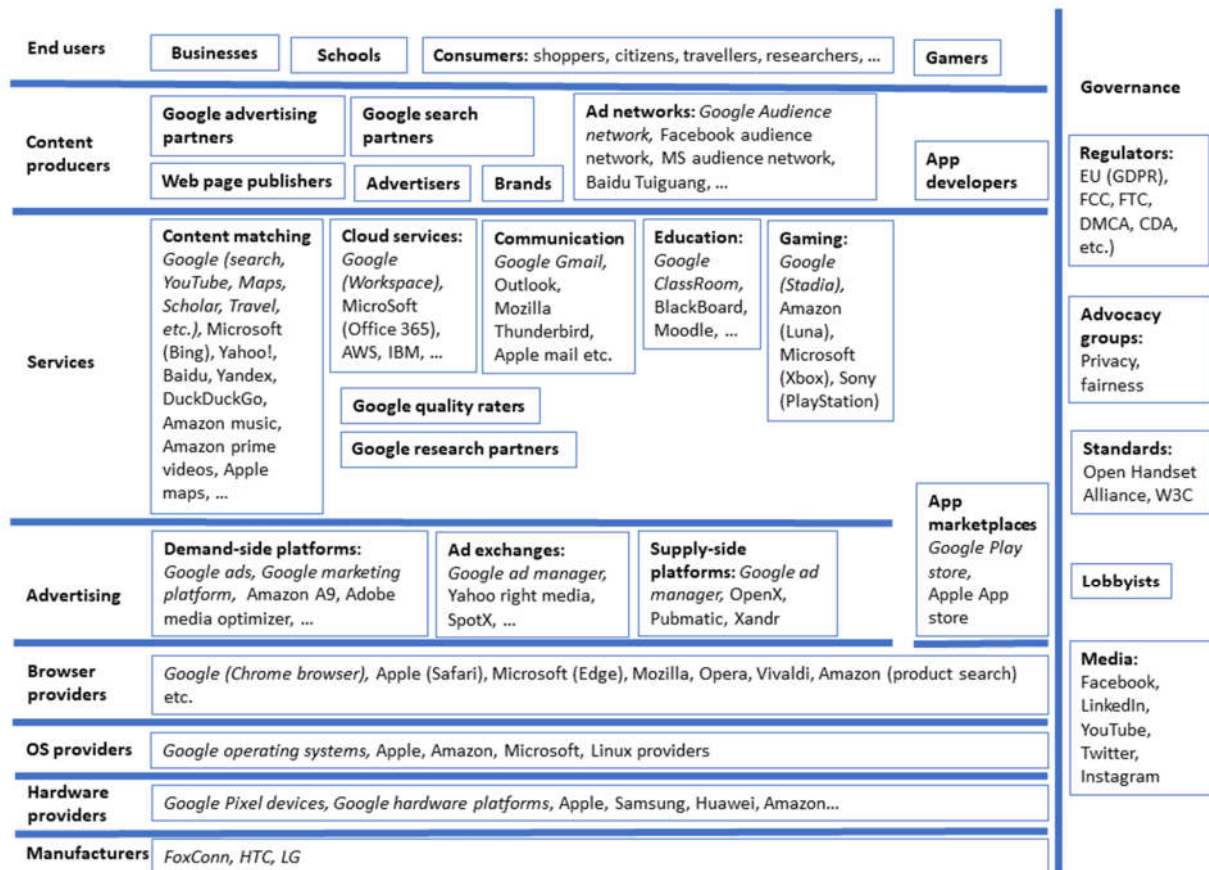
Google Workspace and Stadia use a freemium subscription model. Basic services are free, advanced services are paid.

Google's app store and Android apps use a transaction-based revenue model. We give these revenue models later.

We will use this service layer diagram to analyze Google's business ecosystem next.

Google's ecosystem architecture

The layers of *services* define layers of *businesses* who offer these services. The following diagram shows a few competitors for every business of Google. We also show a few governance actors that influence all layers.



Starting from the bottom up, FoxConn [manufactures Google's servers](#). It also [manufactures Pixel devices](#), along with HTC and LG.

Google's Pixel devices compete with devices from Apple, Samsung, Huawei and others. The universe of Google hardware also includes smart home devices and smart cars (Waymo) and it is best to see all of these devices as platforms that deliver services to the user and collect data about user behavior.

[87% of smartphones run Android](#), the rest are iPhones running iOS. Huawei has developed its own system. Amazon is running FireOS on its tablets, an Android fork that does not follow the Open Handset Coalition standard. Desktop operating systems are dominated by Microsoft Windows ([73% market share](#)), followed by MacOS (16%), Linux, Chrome OS and a few others.

Google competes with many browser providers and these browsers run on all operating systems on desktops, tablets and smartphones. Most of the services offered by Google run in browsers.

Google also dominates the advertising ecosystem. In online advertising jargon, content publishers own *property*, in the form of web pages, apps, games, videos and other digital objects. Property contains empty space, called *inventory*, where ads can appear. Advertisers bid for inventory of property owners in real time on online marketplaces called *ad exchanges*. Publishers use *supply-side platforms* for this, advertisers use *demand-based platforms*. [Pete Kluge](#) gives an excellent description of this ecosystem.

Google offers an ad exchange and services at the demand and supply side of the exchange. It is also an advertiser for its own services and has inventory to offer. It is present on all sides of the market as well as inside the market.

Like its competitors, Google supports an *ad network*, which is a network of property owners (content publishers) for which Google manages advertising. In the software stack, these are services offered by AdSense and AdMob.

Google also has an *advertising partner network*, consisting of companies who help advertisers and brands with advertising through Google. *Search partners* are publishers who use Google Search as search function on their site.

The online advertising ecosystem is huge. The global digital advertising market [reached a value of US\\$374B in 2020 and is expected to grow to US\\$ 764B in 2025 at a growth rate of 15.7%](#). Google and Facebook [own most of this market](#). And together with Amazon, they made up [64% of digital ad spending in the US](#) in 2021.

In its services ecosystem, Google competes with search engines, communication providers, providers of educational environments, cloud service providers, and gaming providers. It maintains close relationships with research institutions and pays free-lance quality raters to assess the quality of search results.

All of this is subject to decisions made in a governance ecosystem that contains a host of regulators in the US and EU, who are issuing laws such as the Digital Millennium Copyright Act (DMCA) and the Communications Decency Act (CDA), the Digital Markets Act (DMA) and the Digital Services Act (DSA).

It also deals with standardization committees, such as W3C and the Open Handset Alliance founded by Google itself to maintain the Android standard.

There is a growing number of advocacy groups worried about privacy of content and bias in search results. Google spends [in the order of US\\$ 10M per year](#) on lobbying. And it maintains an image on many online media, including its own.

This picture is not complete. Each box in the diagram can be extended with more competitors and alliances and the supply chain of Google has hardly been mapped in this picture. But the diagram makes clear that Google's entire ecosystem is huge. In the space of about 25 years, Google has turned into a global online infrastructure for individuals and businesses.

Value propositions

Let's now turn to Google's business model. Using the [TVE business modeling template](#), we divide the business model in four parts:

- Value proposition. What value is offered to the market?
- Value network. With whom is this value offered?
- Revenue model. What revenues and expenses are generated in this value network?
- Delivery model. How is value delivered to the customer?

Google serves a number of stakeholder groups (in addition to shareholders). Here are the value propositions for these groups.

For Consumers

- Free search: simple and fast search of web pages, geo info (locations, businesses, routes), videos, photos, music, scientific articles, news, books, products, flights, patents, financial information. Some of this content is delivered in a freemium model, i.e. a free ad-based service and an adless paid service.
- Free email service, financed by ads.
- Freemium cloud-based gaming services

For businesses

- Cloud-based productivity and collaboration tools financed by subscription.

For schools

- Free collaboration and teaching tools.

For advertisers

- Targeted search-based advertising.
- USPs:
 - Search engine [market share of 91%](#). 80K searches per second,
 - integration of ads in search results,
 - self-service,
 - customer tracking in customer journey.

For developers

- App development and run-time environment
- App marketplace

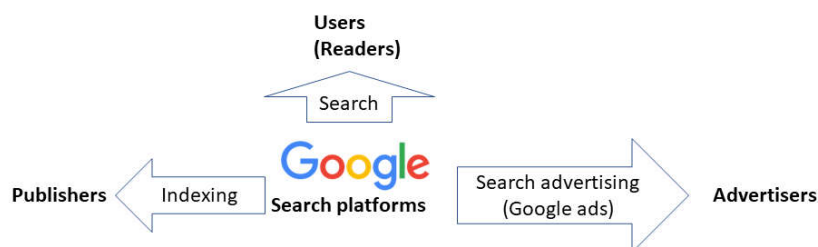
Since Google lives from advertising, let's give a bit more detail about its advertising value proposition.

- Google offers several campaign types:
 - Search: show in search results
 - Shopping: display online and local inventory
 - Display campaigns: display visual ads
 - Video: display video ads
 - App promotion
- It offers a wide variety of placement locations
 - Search results: text ad, callout extensions, map, shopping results
 - Youtube: pre-, mid-, endroll video ads, display ads
 - Google play: app installs
 - Gmail
 - Google maps
 - Google ad network members' properties: display or video ads on 3rd party properties.
- It allows the advertiser to specify different kinds of target profiles:
 - Audience targeting
 - Location, gender, age, device type
 - Custom intent
 - Remarketing (targeting users that already have interacted with an ad)
 - Similar audiences
 - Affinity, e.g. Media, movies lovers, shoppers, technophiles, business travelers, etc.
 - Content
 - Target certain topics
 - Placement on selected websites
 - Content keywords
 - Display expansion: Google's AI will target based on ROI optimization.
 - Devices
 - Desktop, laptop
 - Smartphones
 - Tablet
 - TV screens for video campaigning
 - Measurement
 - CPM, CPC, CPA etc.

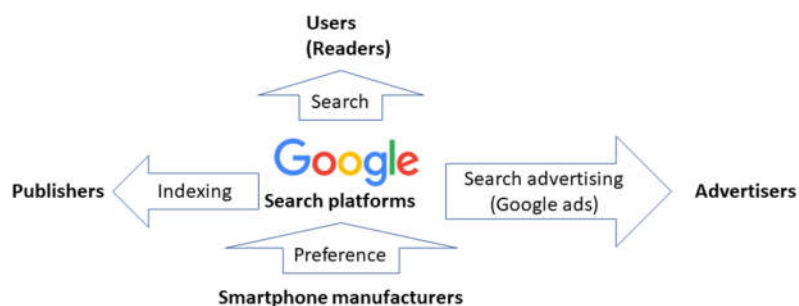
Value networks

Google offers its services in a few value networks. The nodes in the following diagrams represent economic actors, the arrows represent services.

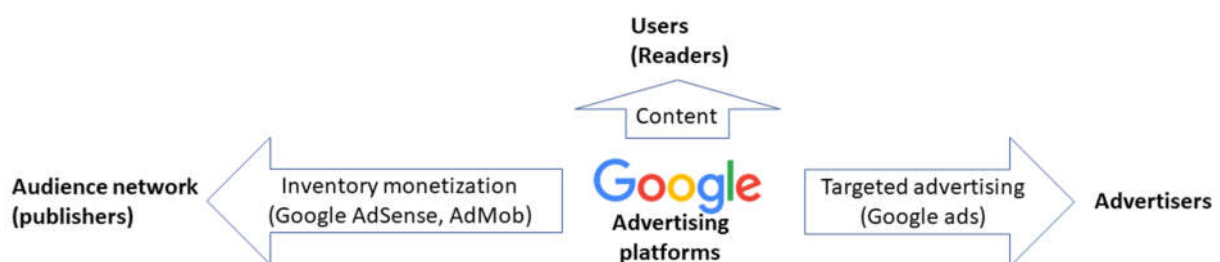
Google Search offers advertising on the page with answers that Google delivers to searchers. To do this it offers three services: For publishers, it makes content of their web pages available by indexing the pages; for searchers, it shows this content to searchers who enter search keywords; and for advertisers, it shows targeted advertisements on relevant answer pages. These services are made available the different search engines that Google offers (general search, YouTube, Maps, specialized search engines for scholars, patents etc.)



If the search runs on Android, there is an additional party in the value network. Smartphone manufacturers set Google Search as exclusive default on their phone, a service for which Google pays them.



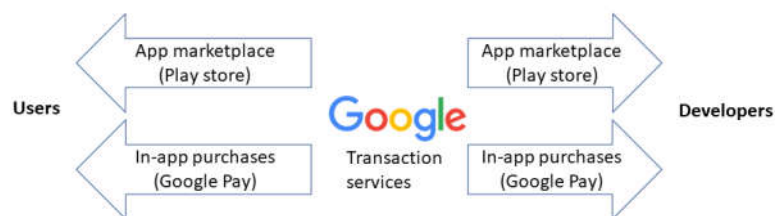
Google maintains a network of web page publishers, called an audience network, for whom it manages advertising. Publishers monetize the inventory on their pages, users read it, and advertisers show advertisements on this inventory.



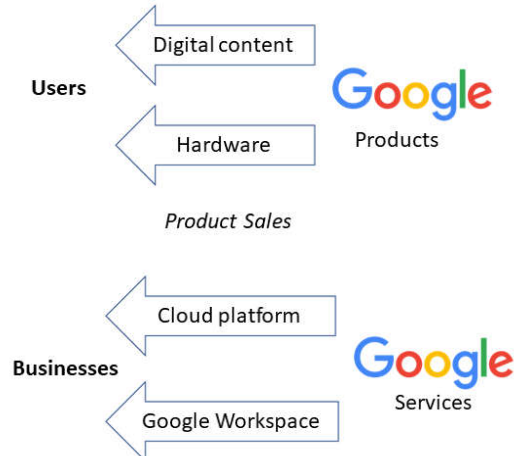
In addition, Google offers its search infrastructure as a service to third parties, shown next. This extends the properties on which Google can sell targeted advertising.



In the app economy, Google operates a marketplace for apps (the Play store) and handles in-app purchases.



Google also sells products to consumers, such as its Pixel hardware, and cloud services to businesses.



Revenue models

Let's now refine these value networks into revenue models. This requires stating exactly what transactions take place, who delivers what value to whom, and what each actor receives in return for what it delivers.

Google has four revenue models: advertising, transaction fees, subscription, and product sales.

- Advertising is a revenue source for all services where it matches content with users. YouTube and Stadia have a freemium model, where the free service is advertising-based and the premium version is subscription-based.
- Google asks transaction fees for apps in Play Store and for in-app purchases of those apps.
- Cloud services have a subscription model. Google Workplace has a freemium subscription model, with a free public version and a paid enterprise version.
- Google sells some physical products, such as Pixel devices.

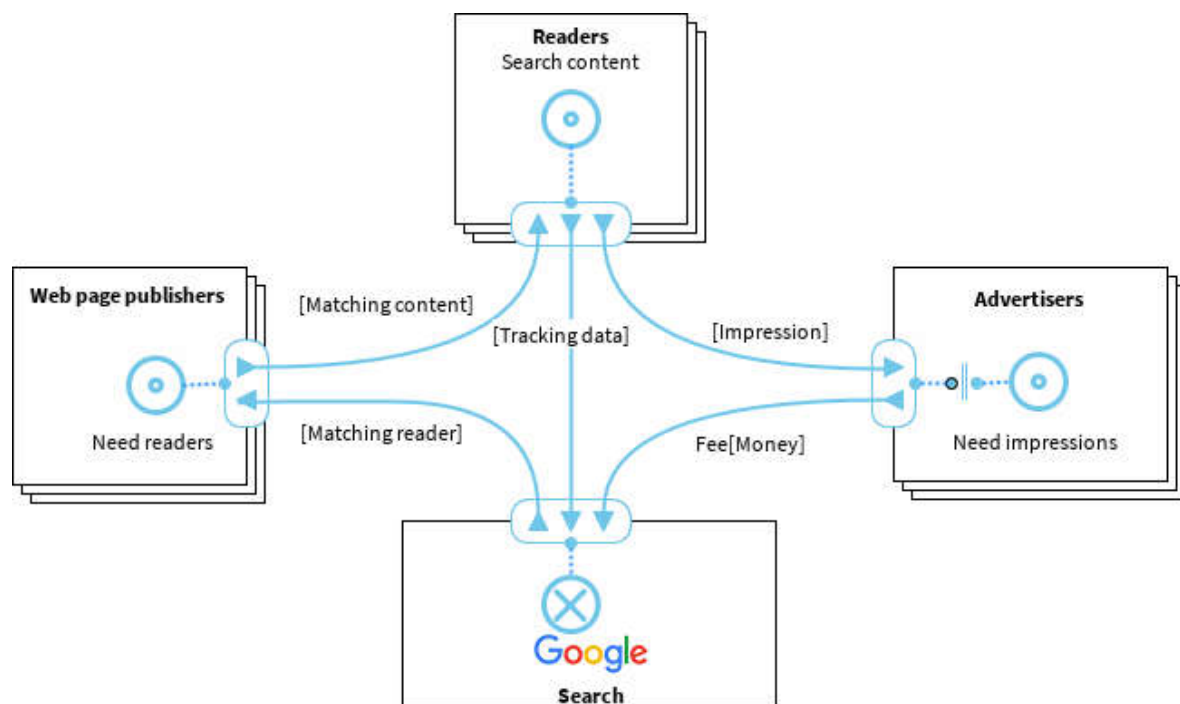
Advertising revenue models

The advertising revenue models involve transactions among four partners. Here is the model for search-based advertising on desktops.

Search advertising

Google search advertising revenue story.

When a reader searches content, Google Search provides matching content to the reader and impressions to advertisers, who pay Google Search for this. Google collects user data to enhance the profile it has of the user.



Publishers publish content on the web, in YouTube, or on maps, which is indexed by Google. The value object that Google delivers to content publishers is not an index, but possible readers interested in their content.

Google matches a search query with indexed web pages and with advertisements. In this three-way transaction, Google provides content to users, users provide an impression to advertisers and tracking data to Google, and advertisers pay Google. The two vertical bars in Advertisers represent the fact that there will be several advertisements on one downloaded answer page.

Google thus uses the content published for free by publishers to earn advertising money. Publishers are happy because they get a public for their content. Readers are happy because they get content for free. Google is happy because it gets money from advertisers and data from users.

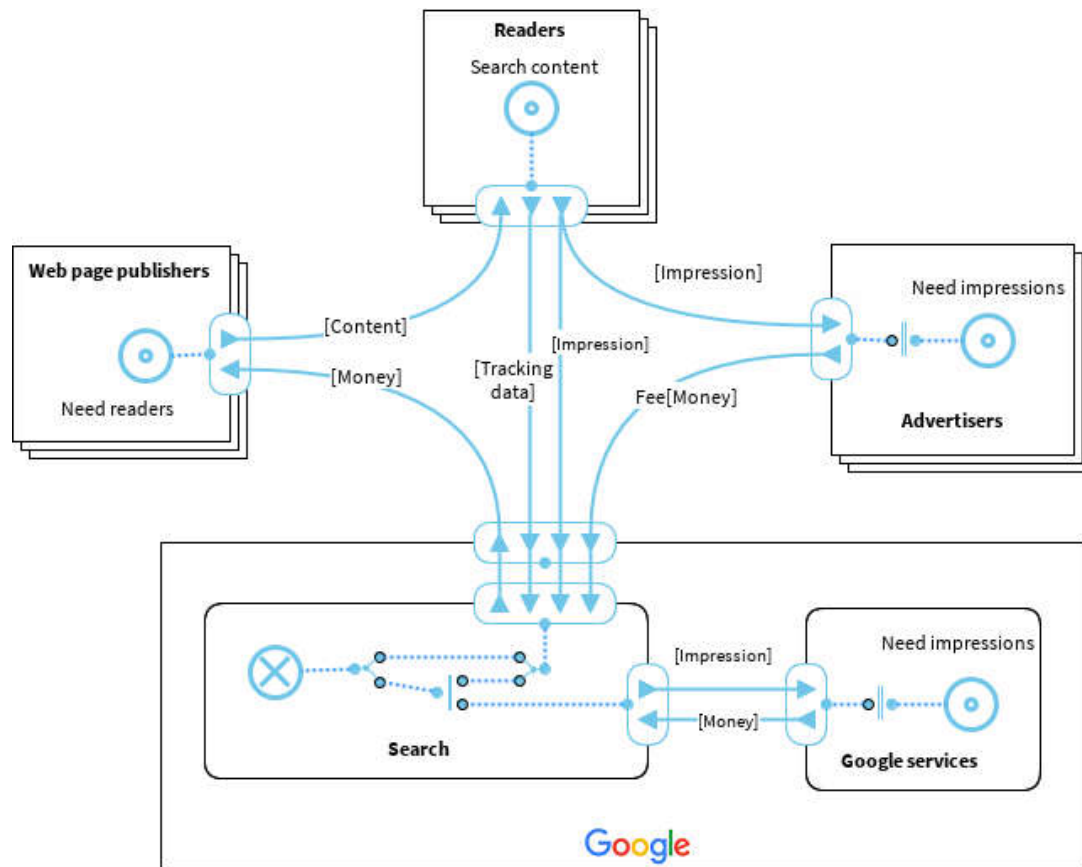
This model shows the essence of what critics see as the core problem of the surveillance economy: Readers are tracked in their behavior. Search engines DuckDuckGo and StartPage have a different revenue model, in which readers are not tracked. The rest of their business models is the same as Google's model: They offer targeted advertising, but only based on search keywords and not on user behavior on the web. Where Google can follow people with targeted advertisements on different web pages, DuckDuckGo and StartPage cannot do that.

There is a second problem, which is hidden in this revenue model: Google is an digital advertiser as well. It can show relevant Google services on the first answer page, such as YouTube, Google Travel, and other services. This puts Google on a par with other advertisers, even though its services will not be shown as advertisements on the answer page.

The following revenue model illustrates the conflict of interest.

Google search advertising revenue story.

When a reader searches content, Google Search provides matching content to the reader and impressions to advertisers, who pay Google Search for this. Google collects user data to enhance the profile it has of the user. Relevant Google services are shown as organic results on the answer page.



We expanded the value activity to Google Search, which includes putting relevant content and advertisements on the answer page. In particular, Google Search puts relevant Google services on the answer page. The construction inside Google Search means that Search has the choice of putting only advertisements on the answer page or also relevant Google Services. The choice is made by Google.

The model shows a conflict of interest because Google Services has a need for impressions and answers this need by Google Search. To make this explicit we represent a money payment flow between Services and Search. How this is handled in reality, we do not know.

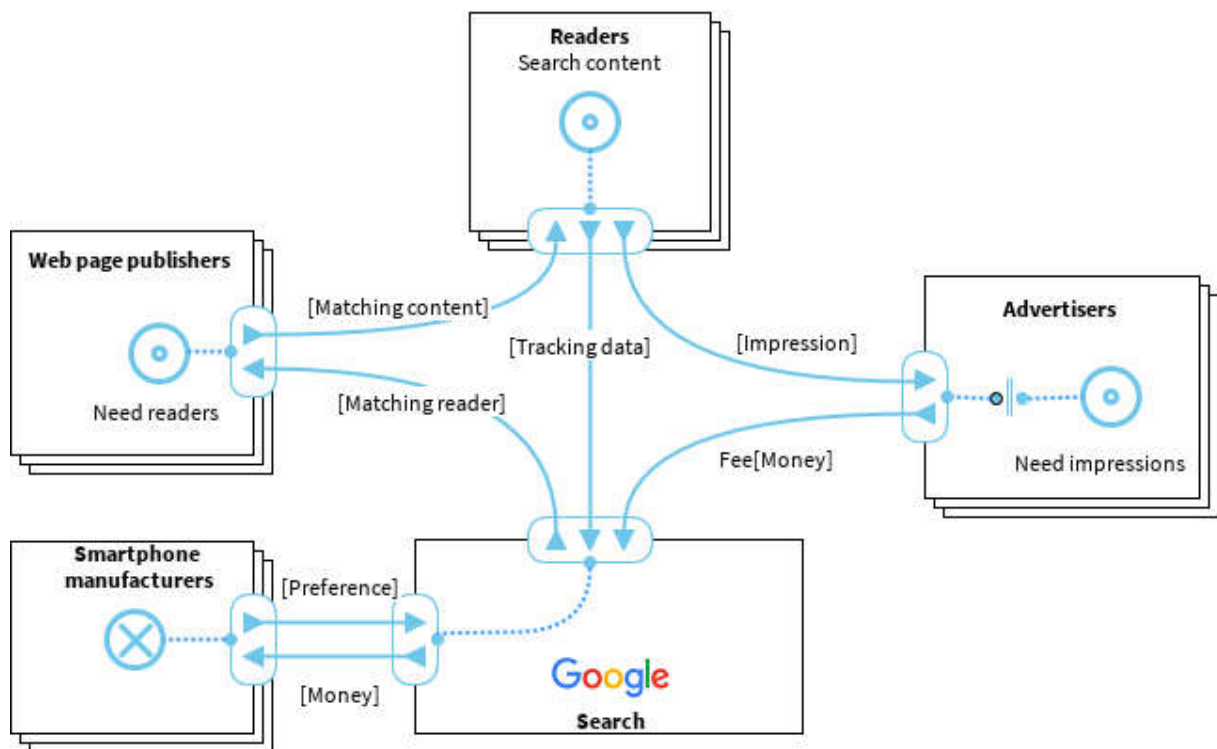
Although Google Services are in a similar position to advertisers, Google is not *competing* for inventory with advertisers: Google services appear in other parts of the answer page than advertisements do. This emphasizes the conflict of interest.

Mobile search advertising

On Android, the revenue model has another partner, smartphone manufacturers who get some of the revenue of advertising in return for pre-installing Google search as default and exclusive search engine on the manufacturer's devices ([Competition in digital markets](#), page 213). To keep it simple, we show the model without including Google Services, but here too they may appear on answer pages.

Google mobile search advertising revenue story.

When a reader searches content, Google Search provides matching content to the reader and impressions to advertisers, who pay Google Search for this. It shares this with the mobile manufacturer who set Google Search as exclusive default on the smartphone, and it collects user data to enhance the profile it has of the user.

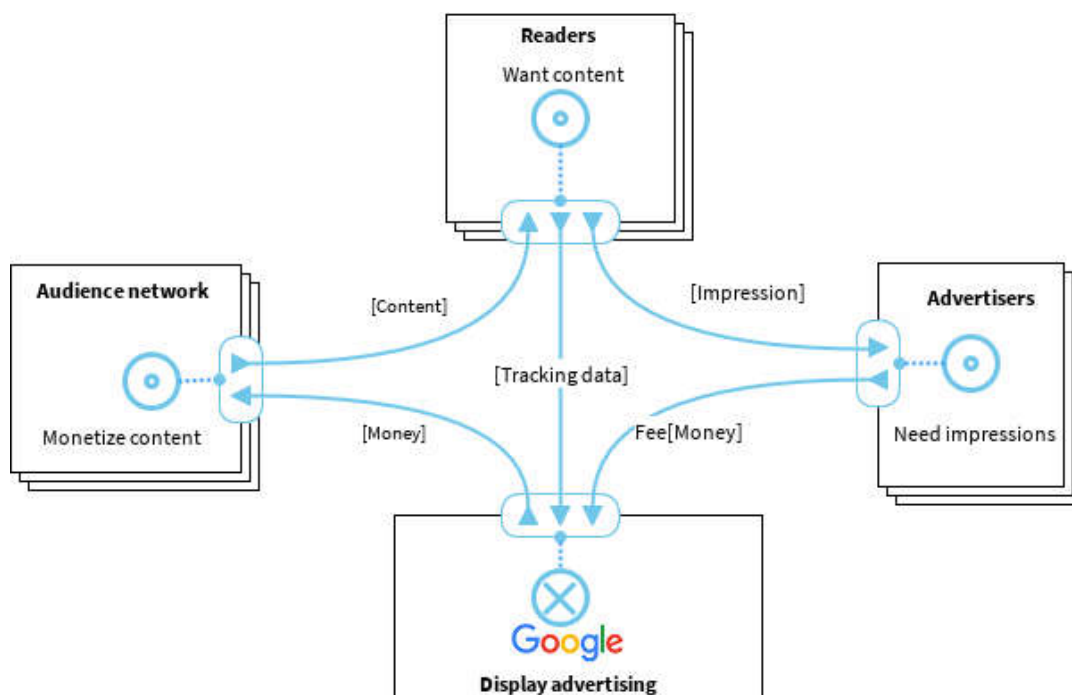


Audience network advertising

Google's audience network consists of web sites for which Google fills the ad inventory. This extends the audience considerably. The difference with the search advertising revenue model is that Google now shares revenue with ad network members, who provide the inventory on which to place an ad, as shown in the following diagram.

Google audience network advertising revenue story.

When a reader reads content on the audience network, Google sells impressions to advertisers, who pay Google Search for this. Google shares this revenue with the web page publisher and collects user data to enhance the profile it has of the user.



The matching activity is now aimed at matching the profile of the reader and of the web site that contains the inventory with the target of the advertisement. Google matches the need of ad network members for readers with the need of readers for content and the need of advertisers for impressions. It shares the money received from advertisers with the ad network member on whose inventory the ad is shown.

This model illustrates another problem with Google's business model. If a user downloads a web page, Google Display advertising conducts an auction to place ads on this page. But Google itself also sells inventory on its own property, such as YouTube, Google Shopping, Google Travel etc. If the user downloads one of Google's properties, such as a YouTube or vertical search page, then Google can place ads there too. Google Display advertising therefore serves a need of Google properties, which is a conflict of interest. To all intents and purposes, Google properties are part of Google's Display network. This is an issue in the antitrust cases now raised against Google.ⁱ

Search partners

The third revenue model in advertising is with search partners, which are partners that use Google's search function on their web site. Now the search partner is a front-end between Google and the publishers and readers of content. This is exactly the same revenue model as that of search-based advertising that we showed above, but this time the set of indexed pages is not the entire web but the web pages of the search partner.

Search partners are a way to monetize infrastructure by providing API's so that third parties can use the infrastructure. This is similar to the way Amazon is in the habit of monetizing infrastructure that it first developed for its own use, such as Amazon Marketplace (first used by Amazon Retail) and AWS (first used by Amazon Marketplace). Google monetizes Maps by providing API's for businesses, such as Uber and Lyft. [Kamil Franek](#) estimated that this generates US\$ 0.8B per year.

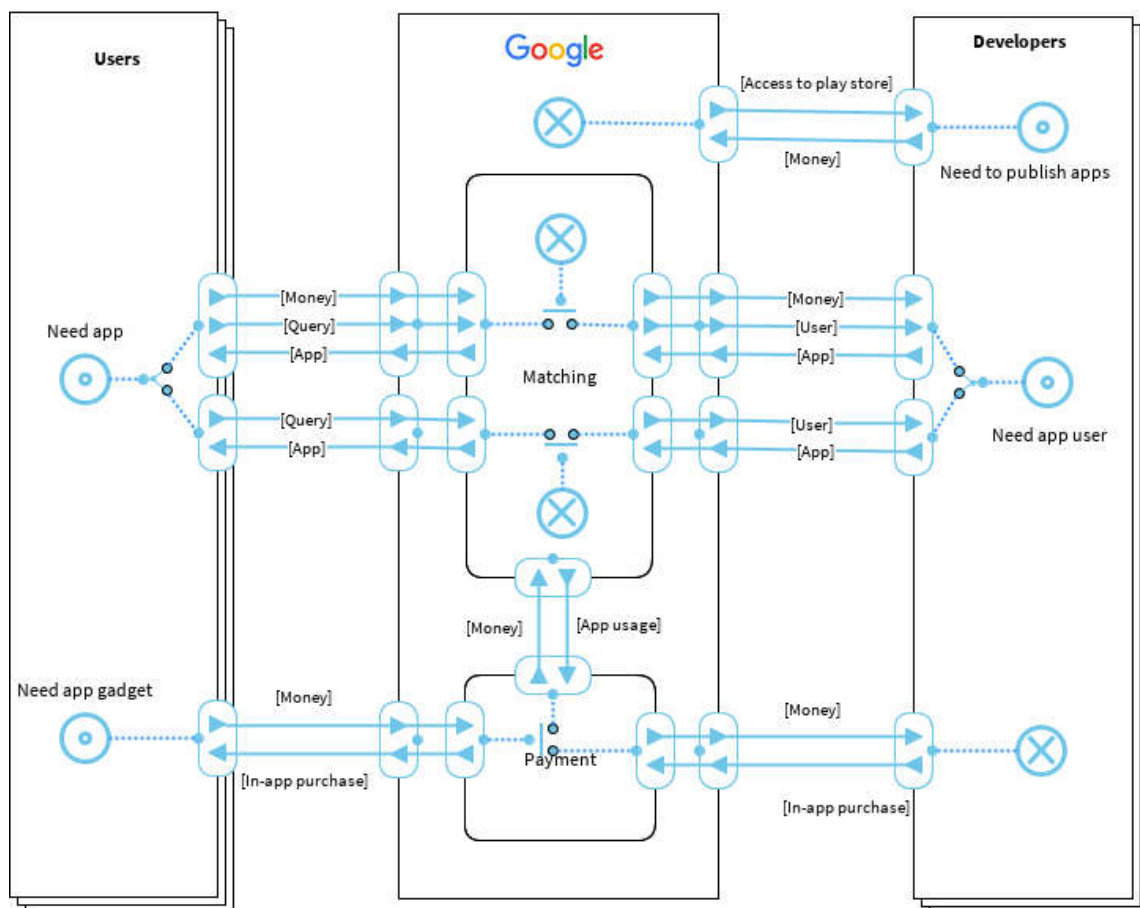
The exact size of the ad network and search partner market segments is not known outside Google. Neither are the money flows known exactly, but we know that this generated US\$ 147B in 2020, up from US\$ 135B in 2019.

Transaction fees

In the Play Store, Google offers two services, one to match supply and demand of apps, and the other to handle in-app purchases. Developers must register against a small fee before they can upload apps to the Play Store. Users can download most apps for free, but some apps must be paid for. In most apps there are in-app purchases possible. Developers receive money for app purchases and in-app purchases, [after Google takes 30% transaction fee.](#)

Google Play Store revenue story.

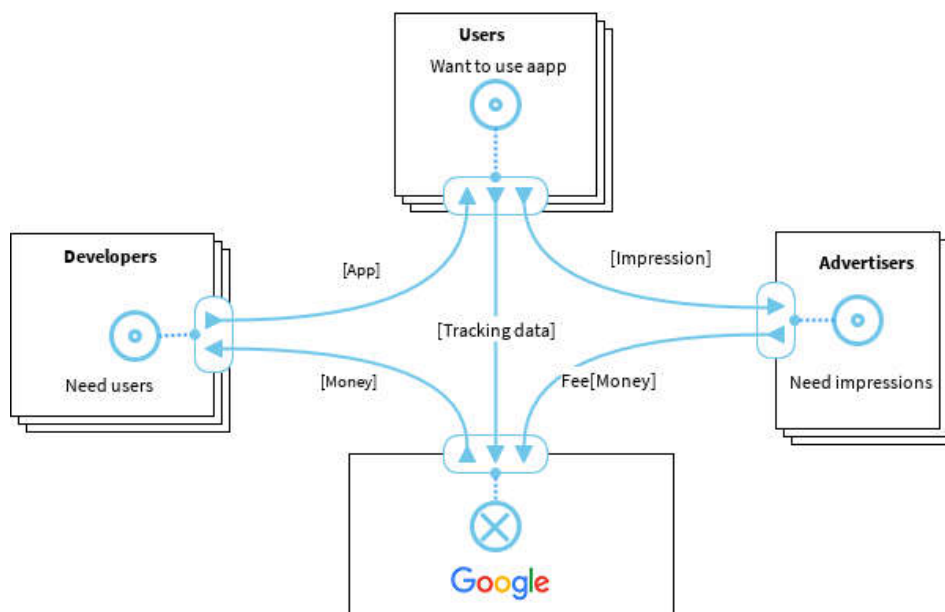
The Play Store provides users exclusive access to paid and free apps. If a user does an in-app purchase, Google gets a 30% transaction fee.



Google also shows in-app advertisements, using a revenue model of the same structure as their ad network revenue model, shown next. They split the proceeds with app developers.

Google in-app advertising revenue story.

When a user uses an app, Google provides impressions to advertisers, who pay Google for this. Google shares this revenue with app developers and collects user data to enhance the profile it has of the user.



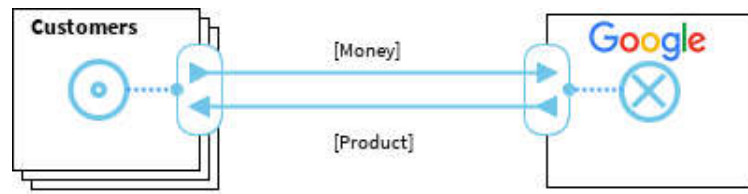
Play Store revenue is not reported separately by Alphabet. [Kamil Franek](#) estimates Play Store revenue in 2019 at US\$ 9.1B.

Product sales

Google sells hardware with a simple product sales model, shown next.

Google product sales revenue story.

Google sells hardware devices and digital content to customers.



Google products include Pixel hardware devices and digital content.

For digital services such as Stadia cloud-based gaming, Google uses a freemium subscription model, similar to the cloud subscription model shown below.

Gross revenue from Google Services as a whole in 2020 was US\$ 167B and operating income was US\$ 57B.

Cloud service subscription

Google Cloud has a subscription service, shown next.

Google cloud services revenue story.

Google sells cloud services against a subscription fee.

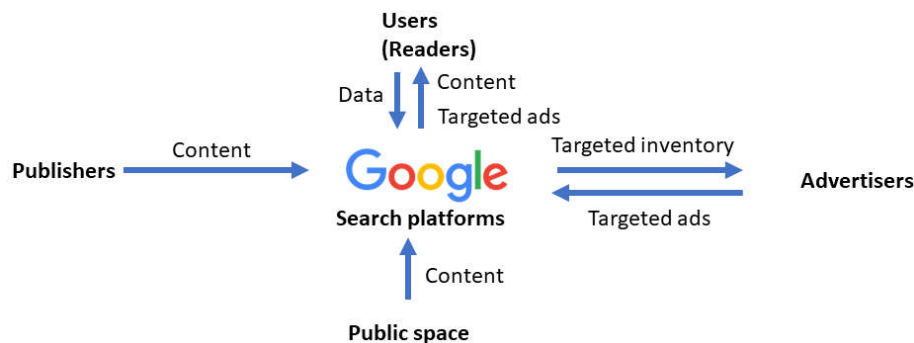


Cloud services include storage and computing services as well as Google Workspace and Stadia gaming. YouTube has an ad-free subscription model too, but it is not clear whether this is counted with Google Services or Google Cloud revenue. Cloud services generated US\$ 13B revenue in 2020, up from US\$ 9B in 2019, but generated an operating loss of US\$ 6B.

Delivery model

Google is an infrastructure company and users expect reliable performance everywhere every time. Google's business model is founded on two concepts: universal access and user profiling. Universal access means the following.

Underlying its advertising revenue model there is a delivery network that has the following high-level structure. The arrows represent the flow of data.



Google search platforms (Google search, Youtube, Maps, Scholar, etc.) collect data from publishers on the Internet, from the physical world (for Maps) and from users who search for content. It constructs user profiles by which it makes targeted inventory available to advertisers and displays those advertisements to users.

To offer users high quality of service, it operates about [23 data centers world-wide](#), which together contain millions of servers that replicate content close to the user. Google uses [peering](#) to provide users fast access to its servers.

To offer targeted advertisement services, it operates demand-side and supply-side servers, as well as an ad exchange to dynamically sell inventory when a web page downloads to a user's device. We gave an overview of Google's advertising ecosystem earlier.

Jointly, this gives universal and reliable access to Google's services. Continuation of this access is a precondition for Google's success ([SEC 2020](#), page 16).

The second pillar of Google's business model is user profiling. This in turn is implemented by embedding tracking code on web pages. Web sites who use Google Analytics put some tracking code on every web page that is indexed. The code sends data about the user's device and the page to a Google server, where it is combined with other data about this device and page. If the user is logged into a Google account, this data is added too. This way, Google can keep track of user behavior on the web. A non-technical explanation of how this works is given [here](#) and explanation for developers is given by Google [here](#).

The IPO letter and what happened later

To improve the world is a mission to serve the public

In their [IPO letter to Google shareholders](#), dated 2004, Larry Page and Sergey Brin express the ambition “to make Google an institution that makes the world a better place.” Their goal was “to develop services that significantly improve the lives of as many people as possible.” This sounds like an NGO with a mission to improve the world.

As an example of their good intentions they explain that to have a positive impact on the world, Google makes its services “as widely available as we can by supporting 90 languages and by providing most services for free.” However, the reason to make search freely available to as many users as possible is not to serve the public, but to enlarge the market for paid advertisement, which serves shareholders.

Since its founding, Google has built a global public infrastructure for online search, geographic information, scientific information, flight information, video and music streaming, and more. It has entered our office with Google Cloud and Google Workplace. It has entered our homes with Nest smart home devices, Google TV and the Stadia gaming service. Since its acquisition of FitBit, it accompanies us when we do our running. Google has entered schools with Google Classroom and it sits in the pockets on almost 90% of smartphone owners world-wide. Waymo will drive us where we want, and the Android Auto operating system will follow us in other cars. What could possibly go wrong? Google does no evil.

Google’s share value has increased from US\$ 85 at IPO in 2004 to [almost US\\$ 3000 today](#). Its market cap has exploded by a factor of 1000. The company is now worth [almost US\\$ 2000B](#). Its revenue in 2020 was US\$ 183B, up from US\$ 162B in 2019. This is bigger than the [government revenue of Denmark](#) and rising. Google has a near-monopoly on online search, dominates the online advertising market, and is under scrutiny from regulators for monopolistic behavior. Advocacy groups protest its violation of privacy and intellectual property rules.ⁱⁱ

And still it sounds like an NGO. In its [2018 SEC report](#) it says that “Our vision is to remain a place of incredible creativity and innovation that uses our technical expertise to tackle big problems” (pages 3-4).

A year later: “We’re focused on building an even more helpful Google for everyone. We aspire to give everyone the tools they need to increase their knowledge, health, happiness, and success.” ([SEC 2019](#), page 5).

Another year later: “We see tremendous potential for devices to be helpful, make your life easier, and get better over time, by combining the best of our AI, software, and hardware.” ([SEC 2020](#), pages 5, 6).

These statements are muted by US\$ 147B revenue from advertising alone. Services are free for users, but Google is definitely not free for advertisers. You can try to improve the world with the best of intentions, but with a US\$ 2T valuation you tend to feel more responsible to shareholders than to the non-shareholding public. Google’s revenue does not come about without generating social and economic cost.

Purely technical solutions don't exist

Part of the cost of doing business for Google follows from a second aspect of Google's origin myth, after the professed goal to improve the lives of as many people as possible: Google solves big problems by purely technical solutions.

This is unbelievably naïve. One characteristic of technical problem solving is that any solution will consist of a technical and a social component. If you introduce online search in society, this will impact people's behavior. Big Tech can introduce social networks, games and streaming in our homes, and this affects the way we communicate with each other and entertain ourselves. This is not different from the way that computers and networks changed our economy in the past 50 years and the introduction of railways and the telegraph transformed the economy in the 19th century.

The technical component of a solution can be designed, but the social component cannot, at least not completely, and not in the same way. We can try to influence people, we can guide them, instruct them, or force them, but people will always surprise us in their responses. We cannot design social systems as we can design technical systems.

We can try to *predict* what people will do with devices and algorithms, but these predictions are usually inaccurate, and we do well to study the impact of innovations after they are implemented so that we can improve our solutions to deal with undesirable "side" effects.

And when we do that, we usually find unforeseen and undesirable behavior. The [Campaign for Accountability](#) found that Google places ads against fake news. [Fake news spreads faster and wider](#) than real news and so tends to generate more ad impressions, which generates ad revenue for Google.

In addition to placing ads against fake news, there are ways to generate fake ad impressions. Fraudsters acquire legitimate apps [to train bots on the way humans use apps](#). The trained bots are then used to generate ad impressions on fraudulent web sites, as if human beings rather than bots viewed those sites, thus raking in advertising dollars for the fraudster — and for Google.

Google Search has been accused of delivering results biased against [women, black people, or political conservatives](#). This has been attributed to bias among algorithm designers, bias in user behavior summarized by the ranking algorithm, or bias induced by advertisers who want their products visible on top of the answer page.

This takes Google into difficult discussions about politics, morality and censorship that are a lot more specific than the slogan "Don't be evil".

Wikipedia defines bias as ["disproportionate weight in favor of or against an idea or thing"](#) but this shifts the problem. What is *disproportionate*? Since we do not know the total set of URLs out of which Google Search selects and ranks the ones we see on the answer page, we cannot know if the selection is disproportionate with respect to the total set.

What remains is our judgment whether search results are *appropriate*. Even if Google's search results would be proportionate to the total set from which they are selected, the total set may be very

inappropriate with respect to the norms of some of us. It may contain a lot of racist, xenophobic and illiberal results that we find inappropriate.

This is a moral discussion with political implications. For a global service such as Google's, it turns out that there are few ways to resolve bias that we can globally agree on.

Which leads to the problem that some governments find some search results, or queries even, inappropriate. They demand censorship of search results. At the request of the Russian government, [Google and Apple are reported to have removed Navalny voting apps](#) when Russian elections began. Google was [reported to develop a censored search engine for China](#) but [apparently this has been withdrawn](#).

Tech solutions are always part of sociotechnical solutions. The bigger the scale of implementation, the harder it is to predict and manage the social part of the solution. Big solutions to big problems may create big surprises.

Google engages in anticompetitive behavior

The goal "to develop services that significantly improve the lives of as many people as possible" was executed without bothering too much about privacy violations, fake news, ad fraud and censorship. But it was executed with a lot of attention to gaining a dominant position in search and advertising.

The report published in October 2020 by the House Committee on the Judiciary of [competition in digital markets](#) contains numerous examples of anti-competitive behavior by Google. The UK Competition and Markets Authority published a damning [report](#) about anticompetitive behavior in digital advertising, which provides [material for an anti-trust case against Google](#). Here are a few of the findings.

Google search tends to prefer Google services by listing them on top of the answer page. Google pays smartphone manufacturers to be the exclusive default search engine, giving it a command of the market. By a variety of exclusionary techniques, [Google may rake up as much as 42% of the fee that advertisers pay for digital advertisements](#). This far exceeds its cost of capital, estimated to be 9%.ⁱⁱⁱ

Through its control of Android, it has exclusive access to the usage of apps that compete with Google's apps. Through its control of all levels of the ad stack, Google controls the digital advertising market and is able to exclude competitors.^{iv}

Is there a problem?

This may be viewed as market dominance necessary to improve the world for a lot of people, including shareholders and users. However, in practice this leads to higher prices for advertisers, which end up as higher prices for consumer products. It leads to lower revenues for publishers, which results in lower quality of content that they can publish. It forecloses technological rivals, which reduces innovation. And it reduces choice for consumers, even though Google has less incentive to show the best possible search results.

Anti-trust regulation

Google's professed mission to improve the world through technical solutions detracts attention from privacy violations, bias, self-preferencing, ad fraud, censorship, anti-competitive behavior, and nonreciprocal exercise of market power.

Much of Google's market dominance and anti-competitive behavior comes from its presence on several layers of the search tech stack and from its presence on several layers of the ad tech stack, which gives it unfair information and control advantages in both stacks. Governments are now working hard to update anti-trust law to the age of digital platforms, and we may see Google's dominance of the market curbed in the interest of competition.^v

A surveillance capitalist must be transparent

But this will not be enough. Google is not just a dominant digital infrastructure; it is a dominant digital *content-delivery* infrastructure. Google extracts data from people to generate revenue. [As I argued elsewhere for big tech platforms](#), it should be transparent about the data they collect about their users, about the beneficiaries of the data, and about the way they generate revenue from this. Google should provide comprehensible meta-information about advertisements, be transparent about what they do to combat misinformation on its platforms and allow researchers to analyze its network.

Google may argue that these are trade secrets. But there should be nothing secret about what a company does with our data. Data is not like oil. Oil is extracted from rocks, but data is extracted from people and the data-extracting company is answerable to these people.

Google should also accept auditors who check the veracity of Google's transparency reports. And a government agency should check the comprehensibility of the reports. If Google's privacy pages are a guide, they should be forced to be comprehensible on issues they'd rather be silent about.

Google has become part of the digital content infrastructure of [billions of people in hundreds of countries](#). With great size comes great responsibility. There is nothing wrong with a bunch of tech optimists trying to improve the world. Without technology, we would still be collecting berries on the savanna. To solve today's problems, we need technology, optimism, and perseverance. And honesty about the impact of our solutions.

But when the idealistic drive to improve life is taken over by the monetary drive to generate value for shareholders and this succeeds on a scale never seen before, without due attention to the social part of these solutions, then public governance is required to guard the interests of the public. Google surveils the public and it serves the public. In both these roles, it is answerable to the public.

ⁱ Congressional Research Service. *The Big Tech Antitrust Bills*. <https://csreports.congress.gov>, August 13, 2021. Digital Markets Act, https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-markets-act-ensuring-fair-and-open-digital-markets_en.

ⁱⁱ Rana Foroohar. *Don't Be Evil. The Case Against Big Tech*. Currency, 2019.

ⁱⁱⁱ Fiona M. Scott Morton & David C. Dinielli. "Roadmap for a digital advertising monopolization case against Google." Omidyar Network, May 2020. <https://omidyar.com/wp-content/uploads/2020/09/Roadmap-for-a-Case-Against-Google.pdf>

^{iv} Fiona M. Scott Morton & David C. Dinielli (2020).

^v Congressional Research Service. *The Big Tech Antitrust Bills*. <https://csreports.congress.gov>, August 13, 2021. Digital Markets Act, https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-markets-act-ensuring-fair-and-open-digital-markets_en