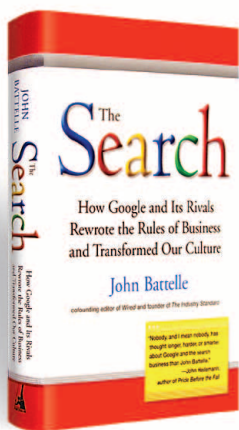


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By John Battelle

**How Google and Its Rivals
Rewrote the Rules of Business
And Transformed Our Culture**

THE SEARCH

THE SUMMARY IN BRIEF

Jumping into the game long after Yahoo!, AltaVista, Excite, Lycos and other pioneers, Google offered a radical new approach to search, redefined the idea of viral marketing, survived the dot-com crash, and pulled off the largest and most talked-about initial public offering in the history of Silicon Valley.

But this summary is much more than the inside story of Google's triumph. It also takes a big-picture look at the past, present and future of search technology and the enormous impact it is starting to have on marketing, media, pop culture, job hunting, international law, civil liberties, and just about every other sphere of human interest.

The information contained in this summary draws from interviews with more than 350 people, including Google co-founders Larry Page and Sergey Brin; Google CEO Eric Schmidt; key executives at rivals such as Microsoft, Yahoo! and AOL; early pioneers; scientists working on the future of search; venture capitalists; and even entrepreneurs whose fortunes rise and fall with every tweak in the Google search algorithm.

Through the story of the start and rise of Google, this summary attempts to explain the history of search.

In addition, you will learn:

- ✓ *Who created Google?*
- ✓ *How does a search engine work?*
- ✓ *How did Google and its rivals rewrite the rules of business and transform our culture?*
- ✓ *What happens to privacy when every word ever written about you is saved forever and searchable?*
- ✓ *Is the government going to get its hands on search databases?*
- ✓ *If companies can track every click you make online and send you highly targeted ads, is that a good thing or an invasion of privacy?*
- ✓ *The founders of Google declared that their motto is "Don't Be Evil" — but do they really act that way when the big money is at stake?*
- ✓ *Where will search technology be in a few years?*
- ✓ *What might search tell us about ourselves and our global culture?*

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Who, What, Where, Why, When and How (Much)

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the process works, what are they searching for? Herein lies the beauty and the potential of search: It is driven by the unimaginable complexity inherent in the human language — nearly infinite combinations of dialects, words and numbers. Investment bank Piper Jaffray estimates that the world conducted about 550 million searches each day in 2003, a figure it expects to grow at about 10 to 20 percent a year.

Where and Why

So far we've reviewed how search works, who is searching, and what they're searching for. But where are they going and why are they going there in the first place? In the aggregate, most searchers stick close to home: 85 percent use one of the big four engines — Microsoft, Yahoo!, Google or AOL. And they tend to stick with them once they've started: Market share among these giants has fluctuated in the past years, but even with major moves by both Microsoft and Yahoo! to improve their search engine results, Google remains the market leader.

As to the question of why we search, the answer is more complicated than it might seem. Sure, we search to find information on all manner of things, or to locate something to buy, or to simply find the shortest route to a site we already know exists (the practice of typing in a word you know so as to yield a site you wish to visit, also called a navigational query). In short, we search to find.

When

The rather mundane question of when we search can be boiled down to one straightforward fact: We search from both home and work, with our searches pretty much evenly broken up between them. Search traffic tends to increase in the morning and peaks again in the evening, as we all fire up our home computers and look for movie tickets, homework help, or a local plumber to fix the dripping sink.

The Money Shot

All those searches, and all those searchers, have translated into a major business opportunity, in fact, the fastest growing media business in the history of media. Why the extraordinary growth? In short, paid search works. Lining up short, text-based advertisements against the queries of those hundreds of millions of searchers results in extremely efficient marketing leads. Search, a marketing method that didn't exist a mere five years ago, provides the most efficient and inexpensive way for businesses to find leads. ■

Google Is Born

Search Before Google

As the search economy deepens and proliferates, there will be countless innovations built upon the basic breakthrough of the paid search model. But before we head into the economic implications of Web search, or the story of Google, its brightest star, it's wise to consider a bit of history. For while it seems that the words "Google" and "search" are now nearly one and the same, the truth is, search has been around for decades, in one form or another. Google is currently our culture's grandest declaration of the power of search — but it's by no means the first.

There were other search engines — had their timing been better or their owners wiser — that could have been Google instead. These companies include Lycos, AltaVista, GoTo and Yahoo!. The reason why Google was able to emerge ahead of them was that they had to concentrate on doing search well and not becoming a portal. The Internet bust actually helped them focus on what became one of the best business models on the planet.

Heirs to Tesla

Larry Page always wanted to be an inventor. When he was 12 years old, Page read a biography of Nikola Tesla, one of history's most prodigious inventors. Tesla discovered or developed the foundational technologies for an astonishing array of innovations, from wireless communication and X-rays to solar cells and the modern power grid. But despite his extraordinary invention, Tesla remains a minor figure — in particular when compared to Thomas Edison, a man Tesla worked for, fought with, and competed against for much of his career.

The 12-year-old Page was struck by this fact: Regardless of how brilliant and world-changing Tesla's work had been, the inventor received little long-term fame or fortune for his efforts.

It's fair to say that Page and his partner, Sergey Brin, have managed to avoid Tesla's fate. They've gotten their inventions into the hands of hundreds of millions of people. Along the way, they've made thousands of people very rich, improved the businesses of hundreds of thousands of merchants, and fundamentally changed the relationship between humanity and knowledge. In the process, Page and Brin have become wealthy and famous. And it did not take them a lifetime to do so. It took as long as the average doctorate in computer science — five years, give or take.

It Began With an Argument

Larry Page first met Sergey Brin in the summer of 1995, before he had decided to accept Stanford's offer

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of admission. Like most schools, Stanford invites potential recruits to the campus for a tour. But it wasn't on the pastoral campus that Page met Brin — it was on the streets of San Francisco. Brin, a second-year student known to be gregarious, had signed up to be a student guide of sorts. His role that day was to show a group of prospective first years around the City by the Bay.

Page ended up in Brin's group, but it wasn't exactly love at first sight. "Sergey is pretty social; he likes meeting people," Page recalls, contrasting that quality with his own reticence. "I thought he was pretty obnoxious. He had really strong opinions about things, and I guess I did, too."

"We both found each other obnoxious," Brin counters when he is told of Page's response. "But we say it a little bit jokingly. Obviously we spent a lot of time talking to each other, so there was something there. We had a kind of bantering thing going."

The Audacity of Rank

Page says that it had never been his intention to create a search engine — indeed, he and Brin had no idea what useful things the project might turn up.

Page hypothesized BackRub — a system that would discover links on the Web, store them for analysis, then republish them in a way that made it possible for anyone to see who was linking to any given page on the Web.

But in order to create BackRub, Brin and Page had to crawl the Web. Crawling the entire Web to discover the sum of its links is a major undertaking, but simple crawling was not where BackRub's true innovation lay. Page was naturally aware of the concept of ranking in academic publishing, and he theorized that the structure of the Web's graph would reveal not just who was linking to whom, but more critically, the importance of who linked to whom, based on various attributes of the site that was doing the linking.

If BackRub knew the importance of a site, it could give that site a relative ranking. For any given site, one could see not only who was linking to that site, but the ranking of those links as well. Certainly, that might be useful, Page thought.

Being useful was an extremely important aspect of Page and Brin's research (and has become a mantra for all of Google's product development since). They hadn't yet decided that there was a company in BackRub, but the lessons of Tesla were never far from Page's mind. He says, "My goals were to work on something that would be academically real and interesting."

Once Page and Brin had crawled the Web and stored a graph of its links, they needed to determine a ranking

methodology. Inspired by citation analysis, Page theorized that a raw count of links to a page would be a useful guide to that page's rank. He also theorized that each link needed its own ranking, based on the link count of its originating page. But such an approach creates a difficult and recursive mathematical challenge — you not only have to count a particular page's links, you also have to count the links attached to the links. Very quickly, the math gets rather complicated.

Math Gifts

Fortunately, Brin's prodigious gifts in mathematics could be applied to the problem. Brin, the Russian-born son of a NASA scientist (his mother) and a university math professor (his father), emigrated to the United States with his family at the age of 6. By the time he was a middle-schooler in suburban Maryland, Brin was a recognized math prodigy.

Page and Brin's breakthrough was to create an algorithm — dubbed PageRank after Page — that manages to take into account both the number of links into a particular site, and the number of links into each of the linking sites. This mirrored the rough approach of academic citation counting, and it worked. This is a simplified view, to be sure, and Page and Brin had to correct for any number of mathematical cul-de-sacs, but the long and the short of it was this: More popular sites rose to the top of their annotation list, and less popular sites fell toward the bottom.

Page and Brin quickly noticed that BackRub's results were superior to those of traditional search engines like AltaVista and Excite, which often returned irrelevant results. And not only was the engine good, Page and Brin realized that it would scale as the Web scaled — PageRank worked by analyzing links, so the bigger the Web got, the better the engine would be. That fact inspired the founders to name their new engine Google, after "googol," the term for the number 1 followed by 100 zeros. They released the first version of Google on the Stanford Web site in August 1996.

Among a small set of Stanford insiders, Google was a hit. Due to its size and scale, the project grew into something of a legend within the computer science department and the campus network administration offices. At one point, the BackRub crawler consumed nearly half of Stanford's entire network bandwidth, an extraordinary fact considering that Stanford was one of the best networked institutions on the planet. And on at least one occasion, the project brought down Stanford's Internet connection altogether.

"We're lucky there were a lot of forward-looking people at Stanford," Page recalls. "They didn't hassle us too much about the resources we were using."

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A Company Emerges

As Brin and Page continued experimenting with search, BackRub and its Google implementation were gaining buzz, both on the Stanford campus and within the cloistered world of academic Web research. Back in the early days, Page and Brin weren't sure they wanted to go through the travails of starting and running a company. But as Brin's adviser described it, if Google pans out, then great. If not, come back to school and finish your thesis.

By late 1998, the service was serving more than 10,000 queries a day, and it was clear to Page and Brin that the service would quickly outgrow their ability to beg resources to support it. Starting a company became the only viable alternative. They turned to faculty adviser David Cheriton for advice. He told them to contact Andy Bechtolsheim, a founder of Sun who was active in early-stage investments.

Page and Brin gave a laptop demo to Bechtolsheim at Cheriton's home. Andy then asked many questions. Then he said that he didn't want to waste a lot of time. "I'm sure it'll help you guys if I just write a check." He wrote them a check for \$100,000 dollars.

Press coverage of Google often glosses over this fact,

Search Engine Bias

Brin and Page were deeply suspicious of blending advertising and search. In their academic paper introducing Google, they wrote:

"In our prototype search engine one of the top results for [the search term] "cellular phone" is "The Effect of Cellular Phone Use Upon Driver Attention," a study which explains in great detail the distractions and risk associated with conversing on a cell phone while driving. The search result came up first because of its high importance as judged by the PageRank algorithm, an approximation of citation importance on the Web. It is clear that a search engine which was taking money for showing cellular phone ads would have difficulty justifying the page that our system returned to its paying advertisers. For this type of reason and historical experience with other media, we expect that advertising funded search engines will be inherently biased towards the advertisers and away from the needs of the consumers."

Over time, the Google founders have clearly made peace with their reservations about advertising, but back in the early days, they were adamant that their company not fall into the same trap as had the companies that spurned them. Google would never put advertisers ahead of its users.

but the truth is that the company was bereft of a viable plan for making money until early 2001. "There was a genuine concern about where the revenues were going to come from," said early Google employee Ram Shriram. Mike Moritz, another early Google team member, says, "As 1999 trickled by and we were burning cash without a clearly illuminated path to revenues, there was considerable concern."

The story of how Google found its business model — and its subsequent rise to glory — requires a diversion into the history of another company, GoTo.com. For while Page and Brin struggled with the notion of turning search into a business, the founder of GoTo.com, Bill Gross, saw in search the seeds of an economic revolution. ■

A Billion Dollars, One Nickel at a Time

Had he just stuck to his guns, he'd be the one hailed as the revolutionary, the one on the cover of every business magazine, no, the cover of *Time* magazine, with a guest chair on *Charlie Rose* to boot: Bill Gross, founder of the company with the most anticipated IPO in the history of Wall Street, the mad genius who rewrote the rules of business and rewired the way our culture understood itself.

Indeed, had Bill Gross not given up his argument, had he just followed his gut, there might not even be a Google. Brin and Page might have sold out to Yahoo! or Excite or Microsoft, or merged with Ask Jeeves or gone the way of AltaVista — sinking slowly into the dark oceans of corporate mergers and acquisitions. Imagine that, *a world with no Google*. A world where Brin and Page are no more than forgotten footnotes in a much grander story — the story of a serial entrepreneur with a mottled past who finally proved himself beyond all possible doubt. Indeed, had this version of history come to pass, this very summary would be talking about how GoTo.com changed everything.

Only it's not. Bill Gross has not created tens of billions of dollars in market value, at least not yet, and the trail of lawsuits and querulous press clippings littering his past are proof he failed in his quest to get each and every one of his investors very, very rich. But Bill Gross can quite legitimately claim to have created the business model that made Google possible, in the process reinventing pretty much the entire economic cardiopulmonary system of the Internet. And at the end of the day, that's certainly something.

Very, Very Rich

Wiry, manic and bespectacled, Gross is philosophical

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Search, Privacy, Government and Evil

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Nearly everyone with a computer will Google someone else. If you are a knowledge worker, chances are you Google someone nearly every day, if not more often. Have a job interview? Google the prospect. It's probably even a good idea to Google yourself often just so that you get a good idea of what picture the world sees of you.

The China Question

Google's mantra of "Don't Be Evil" has been put to the test by the requirements of the nation's PATRIOT Act. Even now, the government is suing the company in order to access the nation's surfing records. But at least we don't live in China. In response to the perceived threat the Internet represents, China has gone to extraordinary lengths to censor the Internet — to the point of building what is known in academic circles as the Great Firewall of China: a technological infrastructure that automatically filters out banned sites — political opposition sites in Taiwan or Tibet, for example — from the walled garden of the Chinese Internet.

A Dilemma for Democratic Businesses

China represents a dilemma for democratic businesses — its political and moral cultures are repugnant, but its market is far too rich to ignore. Google can't afford to not be in China, according to one eminent Chinese expert. "They are facing a hard choice. They really don't want to be seen as doing something that is evil, but no one goes into China on their own terms." In China, Google may have finally found a situation in which its Don't Be Evil motto cannot stand.

It is odd to think that seven years after they started a company to "organize the world's information and make it universally accessible and useful," Brin and Page find themselves pondering a role as the morality police for the global economy. And it's doubly odd to think that the decision that they make will have a significant impact on literally billions of people's lives, not to mention hundreds of billions of dollars in economic value. ■

Perfect Search

Where does Google go from here? Now that Google is public, and revealed to be mortal, now that almost every major media and information technology company in the world has declared search integral to its future, what might come next? Can anything possibly match the cultural thunderclap of the early Web, or the singular epiphany we all felt the first time we used Google?

Of course it can. When it comes to search, as with the Internet itself, the most interesting stuff is yet to come. Search is at best 5 percent solved. We're not even into dou-

ble digits of its potential. And search itself is changing at such a rapid pace — in the past year important innovations have rolled out once a week, if not faster — that attempts to predict the near future are almost certainly doomed.

So let's instead imagine a world of perfect search. What might that look like?

There are a number of trends that are pointing toward fulfilling at least some part of that larger vision. Those trends are ubiquity, personalized search (the application of your personal Web toward a more perfect answer), the rise of the semantic Web (the tagging of information so as to make it more easily found), domain-specific search, and the Web time axis. But how does it all fit together?

The World at Your Fingertips

Google aside, there's no single moment when all these trends converge. Think back to your first Google epiphany, or if you've been searching the Web for a while, your first AltaVista epiphany. Think about what that felt like — how you suddenly realized that all of the world was at your fingertips. Or maybe it was the time you found the perfect CD due to a recommendation made by Amazon's search algorithms. Or maybe it was the first time you installed a desktop search program and found that obscure e-mail thread that you'd forgotten about.

The Search for Perfection

Whatever your first perfect search moment was, there will be many, many more as the space evolves. Search is no longer a stand-alone application, a useful but impersonal tool for finding something on a new medium called the World Wide Web. Increasingly, search is our mechanism for how we understand ourselves, our world and our place within it. It's how we navigate the one infinite resource that drives human culture: knowledge. Perfect search — every single possible bit of information at our fingertips, perfectly contextualized, perfectly personalized — may never be realized. But the journey to find out if it just might be is certainly going to be fun. ■



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