The Humans Behind the Google Money Machine
Miguel Helft

If Google were the United States government, the data that streams onto Nicholas Fox's laptop every day would be classified as top secret.
Mr. Fox is among a small group of Google employees who keep a watchful eye on the vital signs of one of the most successful and profitable businesses on the Internet. The number of searches and clicks, the rate at which users click on ads, the revenue this generates — everything is tracked hour by hour, compared with the data from a week earlier and charted.

"You can see very, very quickly if anything is amiss," said Mr. Fox, director of business product management at Google.

Mr. Fox and his "ads quality" team can also quickly see whether something is working particularly well. His group's mission, to constantly fine-tune Google's ad delivery system, has one overriding objective: show users only the ads they are most likely to be interested in and click on.

Google runs a complex auction-based system that determines which ads will appear where, and in what order. Every time the team alters the formulas that select and rank ads, Mr. Fox can run a test and quickly see the effect of the changes on users, advertisers and Google's revenue — which, in this year's first quarter, came in at the rate of more than $2 million an hour.

The job has given Mr. Fox, a soft-spoken 29-year-old with an obvious affinity for nuance and numbers, a detailed understanding of the complex dynamics at work inside Google's ad-driven economic engine.

Mr. Fox, who graduated from Harvard with a degree in economics and spent two years at the management consulting firm McKinsey & Company before joining Google in 2003, also helped organize its Revenue Force. This select group of engineers, sales and finance people, product managers and statisticians from across the company is charged with keeping top executives apprised of the forces that make Google tick.

Google reveals little of these forces to the outside world. Even on Wall Street, many experts describe Google as a giant black box that they struggle to comprehend.

In recent months, for instance, analysts and investors grew increasingly worried about reports of a decline in clicks on Google ads in the United States, which they interpreted as a sign that Google's business could be suffering from the economic slowdown. But inside Google, Mr. Fox and others were growing confident that the company would do just fine.

"I wouldn't quite go so far as to say we are recession-proof," said Hal R. Varian, Google's chief economist. "But we are recession-resistant."

Google's financial results for the first three months of the year surpassed expectations. Still, some analysts point out that Google's growth is slowing, especially in the United States. The extent to which that slowdown is the fault of the economy or just the size and maturity of Google's business remains a matter of debate on Wall Street.

Mr. Fox acknowledged that searches and clicks in some areas, like real estate and travel, have grown more slowly recently. But he noted that there is not an exact correlation between clicks and revenue: "Clicks are only part of the story."

The idea of linking ads with search results was first developed not by Google but by GoTo.com, which later changed its name to Overture Services and then was bought in 2003 by Yahoo. Overture ranked ads based on how much advertisers were willing to bid for a certain keyword. The higher the bid, the better the placement.

As Google's engineers developed their own search advertising system, they understood early on that giving top billing to the highest bidder would have little benefit for Google if that ad did not attract clicks. That is because advertisers typically pay Google only when a user clicks on their ads.

So Google decided to rank ads based on a combination of bid price and "click-through rate," the frequency with which users click on a given ad. Mr. Fox's team took things from there and gradually became better at figuring out what ads would work with users.

Yahoo tried to catch up by building a new search advertising system that works more like Google's. It helped increase revenue, but by Yahoo's own account, Google still earns 60 percent to 70 percent more on average than Yahoo on every search. Microsoft has also lagged, in part because it lacks enough advertisers. It acknowledged as much with its recent attempt to buy Yahoo.

Mr. Fox said Google's ability to constantly fine-tune its operations was intricately linked with its obsession with measuring just about everything that happened on its system.

The tools to do so, however, were not always there. About four years ago, when revenue was more than doubling every year and profit was growing even faster, top executives became concerned that Google's business could be riding a bubble in online advertising.

Traffic was growing rapidly, as was the average price that advertisers were paying for clicks. But Mr. Fox and others realized that measuring the average cost-per-click was not good enough. Users might be clicking on more high-priced ads and fewer lower-priced ads. That would cause the average cost-per-click to rise, but it would say little about the health of the overall system.

So Mr. Varian and Diane Tang, principal engineer in the ads quality group, helped devise what they call a basket of keywords. Much like the consumer price index, a basket of goods and services that economists use to track inflation, the measure is made up of a broad sample of keywords and is weighted to make it statistically accurate. This internal benchmark helps Google get a clearer picture of its performance.

As measurements improved, Mr. Fox's team unleashed a stream of experiments meant to optimize the ad system. They evaluated changes to things like the clickable area and background color of ads, and the criteria for placing ads above search results rather than beside them.

Over time, the company also looked beyond click-through rates to rank ads. Google now takes into account the "landing page" that the ad links to, and, for example, gives low grades to pages whose sole purpose is to show more ads. Soon, the loading speed of a landing page will also be considered, Mr. Fox said.

These factors contribute to an ad's "quality score." The higher that score, the less the advertiser has to bid to secure top billing. For example, an advertiser who offers to pay $1 per click to attract those searching for "vacation rentals in Colorado" may receive more prominent placement than another who bids $1.50 for the same query but has a lower quality score. An advertiser with a very low quality score may have to bid so much for placement as to make it uneconomical.

Quality scores work as an incentive to advertisers to improve their ads, which benefits users and, in turn, benefits Google, Mr. Fox said.

Not all advertisers like Google's approach. Many say that despite efforts by Google to be more transparent, they remain in the dark about what goes on inside the company's ad machine.

“To the extent that Google is a black box, it is not a good thing for advertisers,” said Anil Kamath, co-founder and chief technology officer of Efficient Frontier, which runs search ad campaigns for marketers.

Mr. Kamath said Google still offered the most effective system for search marketers, but said many advertisers complain that the company was, in essence, deciding who can and cannot advertise on its system.

By the nature of their work, Mr. Fox and other members of the Revenue Force have a front-row seat to the sometimes peculiar relationship between world events and Google’s business.

In mid-February, for instance, the group was taken aback when they saw the number of searches drop unexpectedly. With their antennas keenly tuned for any sign that the economic slowdown could be hitting Google’s business, members of the team rushed to come up with a diagnosis. That meant poring over statistics, calling field offices and checking data centers e to ensure none were afflicted by bugs.

The team determined that Google had suffered from a series of unrelated minor ailments. Mardi Gras and the Chinese New Year kept people away from their computers, while bad weather knocked out electricity in parts of China, Mr. Varian said.

Other events have given Google unexpected increases in traffic because they kept people at home, like heavy rains and flooding in England last summer and a strike in France last fall.

“Bad weather is good for Google, as long as it is not too bad,” Mr. Varian said.

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