



**CENTER FOR RESEARCH
ON INFORMATION
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**Strategic Use of Information Technology
- Google**

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INTRODUCTION

Arguably the most popular search engine available today, Google is widely known for its unparalleled search engine technology, embodied in the web page ranking algorithm, PageRankⁱ and running on an efficient distributed computer system. In fact, the verb “to Google” has ingrained itself in the vernacular as a synonym of “[performing] a web search.”¹ The key to Google’s success has been its strategic use of both software and hardware information technologies. The IT infrastructure behind the search engine includes huge storage databases and numerous server farms to produce significant computational processing power. These critical IT components are distributed across multiple independent computers that provide parallel computing resources. This architecture has allowed Google’s business to reach a market capital over \$100 billion and become one of the most respected and admirable companies in the world.

MARKET ENVIRONMENTS

Search Engine

Internet search engines were first developed in the early 1990s to facilitate the sharing of information among researchers. The original effort to develop a tool for information search occurred simultaneously across multiple universities is shown in Table 1. Although functionalities of these systems were very limited, they provided the foundation for future web-based search engines.

TABLE 1. Early Search Engines

Search Engine Name	University	Year	Inventor
Archie	McGill University	1990	Alan Emtage
Veronica	University of Nevada	1993	Many students
WWW Wanderer	Massachusetts Institute of Technology	1993	Matthew Gray

Source: Battelle, 2005.

Search Industry

During the 1990s, the Internet experienced exponential growth with thousands of new web pages being created daily. Online document search became the chief method of navigating the ever-expanding World Wide Web, as Internet users sought useful information among the largely disorganized pages. As a result, the online search industry was born.

Early web-based search engine had roots in university-based research, with the exception of AltaVista (Table 2). WebCrawler was known as the first search engine to perform full-text web search as opposed to searching library indices. In 1996, increased competition between search engines triggered the search engine size wars, as the companies competed to index the largest

ⁱ PageRank was named after co-founder Larry Page. The PageRank patent (U.S. Patent # 6,285,999), granted in 2001, and belongs to the trustees of Stanford University rather than Google with Larry Page as the inventor.

number of textual documents over the Internet. AltaVista was the first forefront search engine winner, becoming the most successful and widely adored search engine in the mid 1990s.

TABLE 2. Web-based Search Engines

Search Engine Name	University	Year	Inventor
WebCrawler	University of Washington	1994	Brian Pinkerton
AltaVista	Digital Equipment Corporation	1994	Louis Monier
Lycos	Carnegie Mellon University	1994	Michael Mauldin
Excite	Stanford University	1994	Six alumni
Inktomi	University of California at Berkeley	1996	Eric Brewer and Paul Gauthier
Google	Stanford University	1997	Sergey Brin and Larry Page

Source: Battelle, 2005.

Many start-up search engine companies were founded by technically brilliant academic researchers and graduate students. However, many of these founders were young, arrogant, and lacked business knowledge and experiences necessary to run a company. In addition, most of these start-up companies were impacted by the dot-com bubble and failed to remain operational. Some search companies tried to raise capital by going public, but failed on most occasions, as in the case for AltaVista. The majority of web-based search engine companies went through a series of acquisitions one after another, and some, such as Excite, Lycos, and AltaVista, were acquired by companies outside of the search industry. For example, Google's main competitor, Yahoo, acquired or licensed technology from a number of other search engine companies including AltaVista and Inktomi.

The lack of focus on core products in many search engine companies led to the decline of quality search results, driving users to hunt for better alternatives. Many found their way to Google.com because of the positive user experience. Google's popularity spread quickly by free advertising and by the word of mouth. Google was not the first company to enter the search industry, but it produced search results that were the most relevant to its users. The co-founders of Google had a vision of a distinguishing search engine from other platforms by providing fast, accurate and reliable search results. However, during the early stages, Google tried unsuccessfully to license its PageRank system to AltaVista, Excite, Yahoo, and other search engines. These companies were too focused on selling advertisements and were not interested in funding new "search" tools. Google then turned to other sources of capital, first from angel investors and later, venture capitalists. As the number of queries on Google.com grew, Google became a popular brand name that attracted additional investors.

Search Engine Market Share

Prior to the dot-com bubble in 2000, the search engine market was highly fragmented with fierce competition in the market space. However, after undergoing industry consolidation, the search engine industry was led by Yahoo, and followed by MSN, AOL, and Google. At the time, Google had less than 1% market share in 2000 but quickly gained momentum in 2001 and 2002. In 2001, Yahoo still led the search industry market share. Toward the end of 2002, Google surpassed Yahoo as the market leader in search engine, and has never looked back since,

claiming more than 50% of the market for the past three years (Table 3). As of 2006, major players in the search industry market include Google, Yahoo, and MSN, with Google maintaining its market dominance.

TABLE 3. Search Engine Market Share

Company	2004	2005	2006
Google	57.81%	63.16%	66.63%
Yahoo!	18.24%	16.51%	14.74%
MSN	13.83%	12.06%	10.92%
AOL	0.68%	3.81%	3.93%
Ask Jeeves	1.24%	1.13%	1.31%
Others	8.20%	3.33%	2.47%

Source: Netapplications.com, statistical data

GOOGLE'S BUSINESS MODEL AND STRATEGY

Business Model

Since its beginning as a research project from two Computer Science doctorate students at Stanford University, Google has continued to follow its mission "to organize the world's information and make it universally accessible and useful."² From Google's founding in 1997 until 2000, the company did not have a well-defined business model to generate revenues. In 2001, Google's two co-founders hired Eric Schmidt, the chairman and CEO of Novell and former CTO at Sun Microsystems, as the new CEO of Google to help drive the effort in creating a business model for Google.

With new management leadership, Google created a core business in online advertising, enabled by the millions of users using its search engine everyday. Revenue generation and profit growth in online advertising came from both Google's search engine homepage and partner websites that display Google sponsored advertisements. Google created a cost-per-click pricing scheme for sponsored advertisements such that advertisers only pay a base fee, and for the number of referrals to their site.

Equation for calculating Google's Revenue

$$\text{Revenues} = \text{Users} * \frac{\text{Queries}}{\text{User}} * \frac{\text{Ads}}{\text{Query}} * \frac{\text{Clicks}}{\text{Ad}} * \frac{\text{Revenue}}{\text{Click}}$$

Source: Varian, 2005.

From the metric above, Google's revenue is affected by three factors: quantity (users * queries/user * ads/query), quality (clicks/ads), and price (revenue/click). Quantity is dependent on the number of keywords, advertisers, and users. Quality is based on advertisements relevant to users and is determined by the click-through rate. Lastly, price is affected by the conversion

probability between the click-through rate and the consumers actually purchasing products or services on the advertiser's site.

The ability for advertisers to determine the value per click can be computed using Google's conversion tracking or internal tool to calculate online advertising retention rate. Furthermore, advertisers can bid on the maximum price they are willing to pay per click for their specific advertisements. Minimal value of the bid starts from \$0.01 cost-per-click with an upper limit of \$100. To control costs, advertisers can set an upper bound dollar limit they are willing to spend for online marketing. Once cost-per-click reaches the budget limit set by the advertiser, their advertisements are taken offline.

Business Strategy

Google is generally secretive about its business strategy, but it is evident that Google is building the foundation for all of its products and services under the central theme of leveraging advanced search technology and personalized advertising. For example, Google's popular web-based email service called Gmail, allows users to store and search old emails rapidly using text search integrated into the email client and then placing sponsored advertisements on the side based upon email content a user is currently reading. The Gmail client is also able to identify email contents in which it can link information onto Google Maps and track packages from UPS and USPS.

Existing search results are primarily textual-based. More advanced search technologies will allow users to search for other information besides textual data, such as multimedia content (e.g. audio, image, video). To maintain its reputation as a forefront technology leader and innovator, Google has been aggressively acquiring software start-up companies that can be easily integrated into its existing solutions, and can instantaneously gain visibility through Google's leverage. However, this strategy of growing through small acquisitions is also used by Yahoo, one of Google's major competitors, although the underlying methodology of the acquisitions is different. Yahoo's acquisitions have been focused on acquiring search technology companies having specialized search functionalities. For example, Yahoo acquired Inktomi, Overture, and Stata Labs to perform web search, locating advertiser key words, and retrieval of Yahoo email client, respectively. Yahoo has a group of search technologies for different products and services, while Google has only one search technology.

Over time with greater competition, an online advertising network may be commoditized and Google will need to develop new business models to entice new customers and enhance relationships with existing ones for customer lock-ins (Elgin, 2004). For existing customers, Google has Advanced Tools & Reporting to support sophisticated advertisers, and Google plans to tighten integration with other Google related products in advertising. Since Q4 of 2005, Google is offering Google Analytics as a free service. Google Analytics, formerly called Urchin, is a web-based service that provides log analysis and web statistics that lets advertisers know about their visitors and how they interact with their site. Google Analytics is integrated with AdWords and allows advertisers to optimize their keywords so they can better target resources for their marketing campaigns and deliver higher return on investment. This has served well for many small and medium size businesses using AdWords as the primary marketing tool for reaching to the customers.

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