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A Strategic Perspective on Search Engines: Thought Candies for Practitioners and Researchers

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Abstract

Search engines, such as Google and Yahoo! Search, are more than just portals or information tools. In fact, they are agents of a transformation that is making the business environment more transparent, and thus, potentially more competitive. This new environment is creating opportunities and challenges for businesses of every stripe. In this paper, we explore the following topics: (1) what are search engines exactly, (2) what businesses can do with search engines, (3) how are, and how should, senior executives be viewing the strategic impact of search engines, and (4) what are some important research issues for academics and practitioners that would help us gain a better understanding of the strategic impact of search engines.

Keywords: Search engines; Business impact

Introduction

Just fifteen years ago, most people could not have imagined the crucial role that search engines would play in facilitating today's commerce. Now search engines can be used to find every conceivable kind of information about people, places, things, and more. Some of the searches conducted on search engines are purely for learning, enjoyment, or entertainment. But many searches are imbued with purpose, and search results can influence important decisions about someone's life, health, or a major purchase, or an entrepreneur's quest for an acquisition target. And, search engines are evolving to become trusted guides that enhance the entire online experience, instead of being mere signposts that point the way to a lost traveler on the Internet landscape. A 2005 Pew Internet study showed that the number of searchers and searches was increasing and many were satisfied with the results obtained, though most were unaware of how search engines operated (http://www.pewinternet.org/PPF/r/146/report_display.asp). A 2008 Pew Internet study found that about 50% of Internet users use search engines on a typical day.

The main objectives of this paper are to articulate the strategic implications of search engines and offer some action insights for managers and researchers. Search engines are no longer just convenient information tools. In fact, they are powerful agents of a transformation that is making the business environment more transparent, and thus, potentially more competitive. This environment is creating new opportunities and challenges as highlighted by the following examples.

Business model transformation

In September 2007, *The New York Times* made most parts of its Web site NYTimes.com, which is the most popular news site in the world, accessible free of charge. A primary motivation for this decision was the growing traffic routed via search engines and links from other sites (e.g., blogs), rather than from subscribers coming directly to NYTimes.com. The company now believes that with free access, the ad revenue generated by visitors would far exceed paid subscription revenue. The search words used by the visitors would enable NYTimes.com to link the visitor directly to the appropriate pages within its Web site, rather than to the home page (Pérez-Peña 2007). Therefore, searchers find what they want quickly, and at the same time, advertisements that are consistent with the contents of the page (i.e., contextually relevant ads) can be shown to the visitors. *Wall Street Journal* and *Financial Times* are also exploring the possibility of abandoning their paid subscription models.

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These developments are harbingers of fundamental changes to the traditional business models of media, entertainment, and publishing companies.

Source of new product ideas

National Instruments Corp., a maker of software and hardware for engineers and scientists, had for years sold products that required buyers to install circuit boards on their desktop computers. Research suggested that when someone searches for those products online, there was growing use of the word "USB" (Universal Serial Bus) in the search term. Recognizing this trend, National Instruments decided to sell new versions of its products with USB interfaces, which eliminated the need to install circuit boards. These new products turned out to be among the fastest-growing and most-successful product launches ever for the company (Delaney 2007).

In a similar vein, Dr. Ian Ayers, the author of the book *Super Crunchers*, had originally planned to title his book, *The End of Intuition*. He did an inexpensive A/B[1] test with the two titles using Google's AdWords service which randomly chose which of the two advertisements for the book to display. "Super Crunchers" got 63% more clicks than his original choice (Economist, September 13, 2007).

Monitoring and risk reduction

Expert ASA is a consumer electronics retailer with over 900 stores in Nordic countries. It operates in a fashion similar to "Best Buy" in the U.S. As part of its business model, it offers a lowest price guarantee and 150% rebate if the same products are sold at lower prices elsewhere. To minimize its financial exposure resulting from the guarantee, the company needed to monitor competitive prices, taking into account the fact there are many sub-branded versions of similar products. Its solution was to use a search engine developed to work with its "enterprise search platform" that scoured the Web to find prices offered by competitors and alerted managers to any price discrepancies on specific models (Source: FAST).

In a similar vein, the U.S. Department of Agriculture as the steward of America's 192 million acres of national forests and rangelands, needs to constantly monitor online activities oriented toward sales of illegal or endangered plants and animals (Source: FAST).

Turning expertise into revenue

Amit Agarwal, a computer science engineer, had a successful career working for such firms as Goldman Sachs and Merrill Lynch. In 2004, noticing the growth of blogging, he took the unusual step of quitting his job and becoming a full-time blogger for "Digital Inspiration." Since the launch of Google AdSense,[2] several online resources, including bloggers, have been providing information and advice to Web site owners to help them maximize their ad revenues. People looking for such advice typically go first to search engines. As a technology analyst and an ardent blogger, Agarwal had a good understanding of how AdSense worked, and he was able to put together a number of tips and tricks for potential visitors. Traffic coming to his Web site, primarily from search engines, averages about 2 million page views per month and is growing (www.labnol.org/stats.html), and the ad revenue he realizes from his blog site is substantially more than what he earned as an analyst. Search engines helped him convert his unique talents into success as an entrepreneur. Others with unique skills should also be able to replicate Amit Agarwal's experience.

Competitive advertising

In a TV ad released for the Super Bowl in early 2006, General Motors urged viewers to Google "Pontiac" to get more information about the Pontiac G5 sedan ("Don't take our word for it. Google 'Pontiac' to find out!"). The aim was to create a traffic surge for the Pontiac Web site. However Mazda made this experiment backfire by setting up a "Mazda versus Pontiac Solstice" Web page, and using Pontiac and Pontiac Solstice as keywords in its online advertising. (A keyword is a word or phrase used for performing a search). This resulted in Mazda getting as many hits as Pontiac for an ad campaign that was paid for by GM! (Additional details about this story are available at http://blog.searchenginewatch.com/blog/060130-160823).

The above examples show that search engines can have a wide range of impacts on businesses. A search engine is not merely a tool that searchers use for finding information on the Internet. It also offers a way for businesses to advertise, and to acquire new customers. And, more importantly, search engines can play a significant role in how organizations relate to their stakeholders and to the marketplace in general. In the next two sections, we explore in greater detail the business implications of search engines.

Search engines: what they do, and what managers can do with them

In this section, we (1) provide an overview of search engine technologies and their capabilities today and in the near future, and (2) articulate how search engines help both users and providers of content to accomplish numerous business-related functions and processes (particularly those related to marketing).

[1] An A/B test refers to an evaluation of the performance of two different versions of a Web page called the "Original" (the current page to be tested) and the "Challenger" (an alternate version) to choose the version that performs the best on specified outcome metrics (e.g., clicks). In the online environment, A/B tests are relatively easy to conduct.

[2] AdSense is a service offered by Google which enables Web site owners to display text, image, or video advertisements at their sites. Google directs traffic to those sites and decides which ads will be displayed. In return, the Web site owners get revenue from Google either based on the number of impressions, or number of clicks.

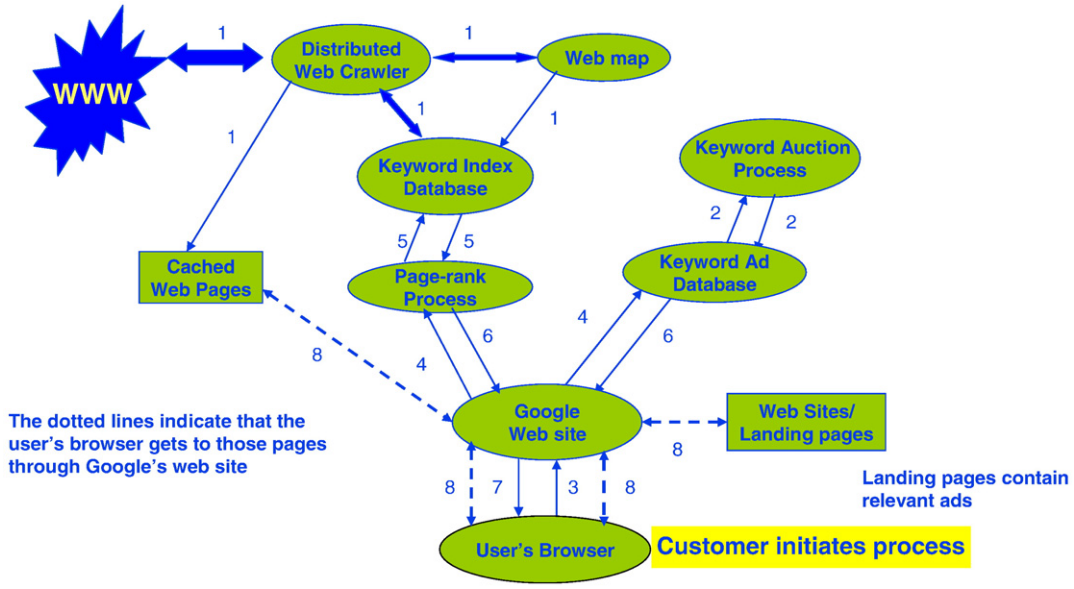

Fig. 1. An overview of how Google works. Numbers represent typical sequence of events as they occur, from 1 to 8. Activities 1 and 2 are on-going and take place in the background.

What can search engines do (today and tomorrow)?

At the outset, it is important to understand what exactly a search engine does because there are a number of misconceptions about search engines. It is commonly believed that when a user submits a query to a search engine such as Google, (1) the search engine searches the Web, and (2) produces results that the user wants. Neither assertion is fully correct, as described below.

A search engine does not search the Web

To improve responsiveness (usually a response takes less than 100 ms), search engines actually search an internal index containing a taxonomy of the appropriate elements of the content domain covered by the search engine. If the domain of coverage is the World Wide Web (as is the case, for example, for Google), the index contains information from Web sites and other knowledge sources from all over the Web. If the domain of coverage is the knowledge resources of an enterprise, the index contains a database and taxonomy specific to that enterprise. In broad terms, a search engine consists of three components: (1) a crawler, (2) an indexer, and (3) a reporter. In addition, commercial search engines now contain several additional components to manage the bidding process for sponsored links, also called "paid placements." Fig. 1 provides an overview of the structure of Google.

In simple terms, the crawler starts from a selected set of Web servers called the root set (e.g., cnn.com) and asks them for a specific Web page link and then uses the hyperlinks on that page to link to other servers from which further pages are retrieved. The scanning proceeds in this manner until all the relevant pages (documents) are "crawled" and the resulting pages stored. The pages are then parsed to create the "Keyword Index Database" which essentially catalogs the documents associated with each word or phrase. The system also stores several other pieces of information that help it determine the "importance" of each page for satisfying a user query. Typically, search engines use an algorithm for assigning importance to indexed items. A popular algorithm for importance is PageRank (Page et al. 1998). The actually implemented PageRank algorithm (a closely guarded secret at Google)[3] computes the reputation of the page and its relevance for addressing the user's query, by incorporating several factors including data on the "freshness" of a page, how many other pages cite a page containing the user's query word, and the "quality" of the citing pages. Visit http://www.google.com/librariancenter/articles/0512_01.html/ for additional details about how search engines operate.

In the keyword auction process, advertisers bid the amounts they are willing to pay for a specific keyword (e.g., "knowledge management") and whenever a user query contains this keyword, the search engine creates and displays an ordered set of links to the Web pages where keyword-relevant content can be found. The main set of links is called an "organic listing" which appears on the left-side of the screen. In addition, Google displays sponsored links to the Web sites of the advertisers who have bid for that keyword. The sponsored links are typically displayed on the right side of the screen (or sometimes at the top), separate from the organic list. Google takes into account the bid amounts, the clickthrough rates (CTR) as well as the quality of the corresponding Web page (called a landing page) in determining the order in which sponsored links are listed. Advertisers can continuously monitor how many clicks they get for their listings and other associated metrics, and make updates to their bids in real time. They can also limit the total amount

[3] The algorithm is kept a secret to reduce the possibility that some Web sites will use unscrupulous methods to get a high rank in the organic listing (see below).

they want to spend in a given period — when their budget is exhausted the sponsored link for the advertiser will not be displayed until the budget is replenished.

To complete the description of Fig. 1, when a user initiates a query (arrow 3), it is sent to Google, which compiles the appropriate list of search results and sponsored links (if any) and displays those on the user's browser (arrow 7). If the user clicks on any of those links, the corresponding landing page is displayed on the user's browser. Finally, if a Web page is not active for any reason (e.g., the server is down), then the user has the option of retrieving a cached version of the Web page if that is available on Google's servers.

Search engines are still poor at serving what users want

In spite of their remarkable success,[4] search engines are still poor at helping people find exactly what they want, much less what they need, especially when users do not have a clear idea of what they are looking for. Search engines simply attempt to find the "best match" between what users ask for and what is available in their indices. Search engines do not do a good job of assessing exactly what the user wants because they lack knowledge of the context that made the user generate the search query. Further, the ambiguities of language make it difficult to know the exact intent or meaning of the user's query. In some sense, people don't want search results. Rather than want answers. They want to travel. They want a lawn mower. They want to find meaningful relationships in life. They want to get rich. Searching is simply a means for them to get to what they want.

Search requires effort, and typically searchers will do a mental cost-benefit assessment to minimize the amount of effort needed to obtain the information they are seeking. For example, Klein and Ford (2003) hypothesize that those searching for product information will spend more time searching online if the importance of remote search attributes (e.g., objective information about warranty, or the actual prices paid by others) is greater than the importance of attributes that need to be evaluated personally (e.g., style, reliability). Padgett and Wu (2004) evaluated user satisfaction with nine different search engines on several criteria. Accuracy of results and ease-of-use were the most important drivers of user preference for search engines, and the search process was less important than search outcomes in influencing satisfaction with a search engine.

Search engines are getting to be ever more sophisticated at fathoming user intent so as to minimize search effort. For example, Google will automatically recognize that a misspelled search phrase "Jonathn Hive" should probably be "Jonathan Hive," but "Be hive" should probably be "bee hive." More sophisticated approaches to improving the quality of search results is to contextualize the search process through better tagging of Web pages (e.g., social tagging of pages; automated metadata[5] extraction of context information) and developing improved understanding of the semantic links between words (i.e., schemas based on how each word relates to other words and data). In social tagging, users can attach tags denoting the metadata pertaining to specific content, such as a song or Web page, which are then used by the search engines to appropriately characterize those contents.

An emerging approach is contextual search, where the search engine performs automated semantic analysis and refinement across structured and unstructured data and rich media relevant to the search query, and dynamically interprets the contextual meaning of the contents. For example, to gain a better understanding of the context, a search engine could restrict itself to specific paragraphs that contain the search terms, rather than exploring the complete document. Overall, contextual search results in improved discovery, schema exploration and reduction of ambiguities. Cuil (www.cuil.com) is a new search engine that not only identifies popular Web pages in which a search keyword appears (as does Google), but it also determines the different meanings associated with those keywords in those pages. The results are presented to the user grouped under different categories corresponding to the different contexts in which the keyword appears on the various pages. For example, results for the keyword phrase, "celtic cross stitch" are organized around two categories, namely, embroidery and "cross symbols."

In spite of the new developments in contextual search, the most common approach currently available for getting good results via a search is to use good keywords, which, of course, one doesn't always know beforehand. Thus, a search today is an iterative "research process" in which a user learns via trial and error the queries that work best for the issue s/he is trying to resolve. Facts are easier to obtain from search engines (e.g., Who sells ball bearings? Where is the nearest post office?) than insights and guidelines that are context-dependent or require some user-analysis of the results to "discover" the answers to the search query (e.g., What new developments in ball bearings technology should I be worrying about? How is the organization chart of Google different from that of Proctor & Gamble?).

The potential value of the results generated by a search engine depends on the comprehensiveness and currency of its indices as well as its ability to rank the Web pages in a way that correspond to a user's intent. We now elaborate on these characteristics.

Comprehensiveness. It might surprise most people to know that search engines only index a small percentage of the knowledge resources available online (see, for example, Lawrence and Giles 1999; Price and Sherman 2003). This occurs because many Web pages are stored behind password protected sites, pages are dynamically created and disappear once they serve their purpose, and several types of information are in formats that are not useable by search engines. In fact, roughly only 20–

[4] According to comScore Networks, U.S. internet users conducted an estimated 11.75 billion searches in July 2008, which is 63% percent higher than in July 2007. Typically, about half of those searches display ads. An indicator of the value of search is given by the market capitalization of $125.7 billion for Google (on 10/2/2008), which is higher than those of other successful online businesses such as Amazon (29.4 billion), eBay (25.65.billion) and Yahoo! (22.3 billion) combined.

[5] Metadata is data about data, and captures, for example, the nature of the information available at a Web site. Is the information at the site about "blinds" or is it a site that has resources for blind people?

30 billion pages out of the potential 500 billion to a trillion pages available online are indexed by a search engine (http://en.wikipedia.org/wiki/Deep_web).

Currency. Most information is not like wine whose value increases with time (up to a point). Rather much of the value of what is on the Web (e.g., blogs) is ephemeral, like the proverbial snowflake. Its value melts fast, especially in the "hot environment" that we have in today's competitive markets. Some crawlers do better than others in keeping the index current. For example, Technorati, which indexes blogs, constantly listens to notifications about updates at every one of the millions of blogs it tracks and updates its own index in real time. Thus, its index is perhaps just a few seconds out of date.

User intent. Search engines have a long way to go before they can succeed on this criterion, if at all. Google's ranking algorithm, PageRank, arguably the best among public search engines, still needs continuous tweaking to ensure that search results are relevant to the users. Currently, the interplay between search engines and their human users is what makes it possible to "connect the dots" and make sense of search results. In some sense, search engines have pursued the goal of helping users find the proverbial needle in the haystack by reducing the size of the haystack so that the needle appears bigger. But sometimes, the best way to satisfy users' intent is to guide them to a different haystack, or even to a different needle in a different haystack. Good search engines will get better at doing all of these.

Over time, search engines will evolve so they can be used anytime, anywhere, and with many different devices, thereby creating new opportunities for mobile marketing, discussed in more detail in Shankar and Balasubramanian (accepted for publication). Browsers will just be one of the options to conduct search. Embedded search tools will be capable of doing autonomous or on-demand searches (e.g., a search engine in a car that automatically searches for the location of the nearest towing station in case there is a breakdown). Moreover, the lines separating the online and offline worlds will become more blurred because search engines will provide results that are relevant to both worlds. For example, users can find something offline that corresponds to an online search result. A search for an "exciting place to visit" could result in a set of links to Morocco or Jamaica or "where is my GPS-enabled car key?" could give the exact longitude and latitude where the key is located. Likewise, search could enable a user to find something online that corresponds to an offline experience. For example, with improved image search capabilities, it would be possible for a user to upload a photograph to the search engine and then search for a "product similar to the one I saw at a store," or "find a date who looks like someone I know." Search engines also are moving toward universal search, where information entities in different forms (e.g., music files, videos, tables and images, blogs, market research reports, stock quotes, chemical and mathematical formulae, and weather forecasts) can be accessed with a single query. Finally, personalization (i.e., search results that vary by users based on such factors as their demographics and past search behavior — see, for example, igoogle.com) and customization (i.e., search engines designed for a particular domain, such as chemical formulae or travel planning) are additional ways search engines will evolve to deliver more value to their users. Battelle (2005, Chapter 10) summarizes some interesting future opportunities for Google.

What can companies do with search engines?

Search engines can do more than just find information for their users. Fig. 2 summarizes the potential value of search engines for both users and providers of information and other content (e.g., music).

In the top left box of Fig. 2 is the most visible role played by search engines, where they help users connect with relevant information that is available in the public domain. There are

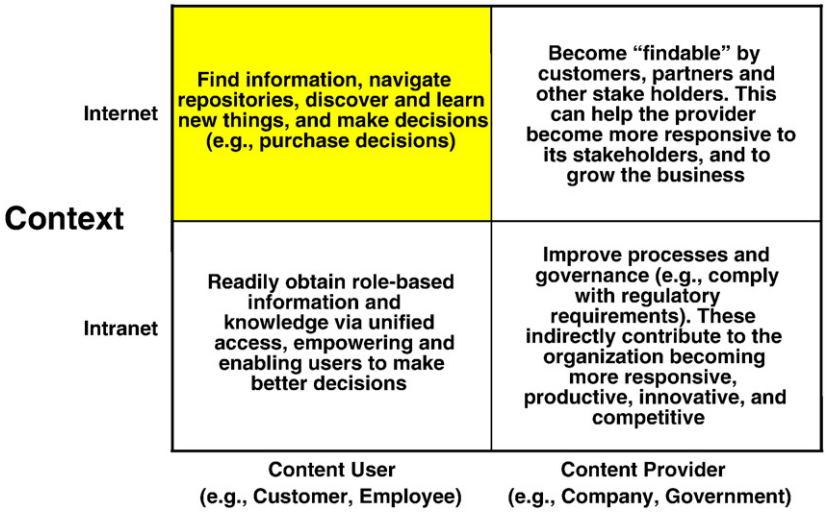

Fig. 2. The many things that search engines can do for the users and providers of content. The Intranet uses the same standards and protocols as the Internet for content generation, access, and display, but access is restricted to users within a well-defined domain (e.g., only to users who access a company's Web site from within the company).

many reasons why people search the Internet. For example, Jansen, Booth, and Spink (2007) find that about 81% of the queries are informational, 10% navigational, and 9% transactional. In a study of its panel members, comScore tracked their searches and related purchase behaviors from November 1 to December 31, 2005. One unique aspect of this study was the ability to track both the online and offline purchases of the panelists. In the study, 25% of the searchers purchased a product (at some point during this period) directly related to their searches, with 37% of the purchases occurring online and the remaining offline. Thus, online searches had a significant influence on offline purchases as well. These statistics underscore the reason that advertisers want to reach potential customers at the point of search. Studies of B2B buyers also indicate the growing role of search engines in influencing the buying process, sometimes over the course of several months. For example, search engines were more influential than even trade shows for technical buyers across all phases of the buying process (Enquiro Study 2007, p. 23–25).

Consider now the top right box in Fig. 2. What can providers of information (and associated products and services) do to increase their visibility in search engines so that they become "findable" by their stakeholders, particularly customers and partners? Morville (2005, p. 109) suggests that providers will become more findable on the Internet by offering content that is useful, usable, desirable, accessible, credible, and valuable. Commercial entities may find it hard to develop content that satisfies all those criteria. However, such entities, they can use paid placement services, which is the primary source of revenue for search engines. In fact, search engines are really in the business of finding customers for their clients (the advertisers) by helping their users find information. In this sense, search engines are no different from traditional media companies which provide free content (e.g., TV programs) to their audiences but are paid by advertisers trying to reach those audiences. One measure of success of the search engines in attracting audiences is the total number of people conducting searches online and the total number of searches they conduct. According to comScore, Americans are now doing nearly 12 billion searches per month, and according to www.alexa.com, Google alone has a daily reach of 28% of all Internet users.

There is emerging research in marketing exploring the effects of different types of keywords on the purchases made by consumers. In one study, Bucklin (2007) finds that the average cost per conversion of branded keywords (e.g., Hilton hotel) was $2.8, which was much lower than the average cost of $61.7 for unbranded keywords (e.g., cheap hotel).[6] However, unbranded keywords may help build brand awareness, i.e., unbranded search activities lead to branded search, but not vice versa.

In the past few years, there has also emerged a vast, but fragmented industry, focused on "search engine optimization" (SEO) to help companies reach top positions in the unpaid (organic) listings. Obtaining top listings in search results for free greatly increases the effectiveness of the efforts and expenses borne by companies to set up their online presence. According to an iProspect study (www.iprospect.com/premiumPDFs/iProspectSurveyComplete.pdf), 72.3% of Google users picked an organic listing (i.e., not a sponsored link) as the one they found most relevant for a sample query. Also, a Jupiter Research study in 2006 found that 62% of search-engine users generally clicked on a link to a site on the first page of results (www.iprospect.com/media/press2006_04_11.htm).

Some optimization strategies and tactics developed by SEO companies are clever, but many are questionable. A questionable tactic is the creation of link farms[7] with the intent to increase the PageRank of a page, but without providing any valuable content for the user — recall that a high PageRank results in a top listing. In February 2007, Google blacklisted BMW and Ricoh for using questionable practices to increase their PageRank.[8] However, because there are many legitimate reasons for various Web sites to link to each other, it is not clear whether problems associated with questionable links can be eliminated. In fact, the algorithmic approach used by search engines to determine PageRank has created a "link economy" where links are bought and sold. There is also a growing number of consultants that can help companies to design the appropriate "landing page experience" so that a top listing can be converted into a favorable business outcome when a user clicks on the link generated by a search engine. In our view, the surest way for an organization to get sustained top listings is to generate valuable content for users (e.g., provide detailed, but layered, information, be clear about prices, provide links to honest product reviews, etc). Building a strong and trustworthy brand (via both online and offline advertising) also helps in gaining and maintaining a top listing online.

One of the primary benefits for a company that garners a top listing is that it can find new customers. There are many examples of small online firms that were able to grow their businesses substantially because of traffic directed to their Web sites by search engines (e.g., 2bigfeet.com, fridgedoor.com, ftd.com, ostrich.com). Without search engines, these companies may have remained small and served a local community. Hansell (2007) notes that online stores get a quarter to a half of their visitors, and most of their new customers, from search engines. However, for media companies, there could be a substantial downside from search engines — users coming to the site via search engines go directly to the pages of interest,

[6] The cost per conversion is typically computed as the total cost of a campaign divided by the number of customers who purchase the product. Thus, if the cost for attracting 100 customers to a Web site is $40 (based on a cost-per-click model), but only 4 out of the 100 customers actually buy the product, then the cost-per-click is $.40 and cost per conversion is $10. In 2007, the average cost-per-click at Google was $.81 and at Yahoo! it was $.74 (2008 digital outlook report by Avenue A and Razorfish).

[7] A link farm refers to tactics such as when a group of Web sites hyperlink to every other site in the group, with the intent of artificially increasing the PageRank assigned to the pages at those Web sites.

[8] There are also complaints that search engines are selling trademarked keywords to boost advertising revenues. However, in a settlement reached between Google and Geico, it appears that Google's sales of keywords based on a competitor's brand name, is not by itself, an infringement of trademark laws (see, also, Klein 2006). This issue may yet come up in legal battles in the future.

rather than to the home page or other prominent pages, for which ad revenues from display ads (e.g., banner ads) are higher.

Because of the immense growth of the Web, it is becoming difficult to stand out in the vast ocean of information. According to a study sponsored by EMC, the total volume of digitized materials in 2006 was 161 billion GB (http://www.emc.com/about/destination/digital_universe/). The study also predicts that the volume of information will grow to 988 billion gigabytes in 2010, representing a CAGR of 57%. Thus, even as search engines improve searchability, findability could decline. To enhance findability in such environments, companies should re-double their efforts to become more unique (e.g., unique name, more differentiated offerings). The greatest dangers in a searchable world are obscurity and similarity,[9] and uniqueness offers a way to minimize both dangers. Without easy-to-use and appropriate tools for search, much of the content on the Web would be nothing more than "noise" (i.e., content without context).

Now consider the lower left box of Fig. 2. This is the realm of enterprise search engines, whose aim is to provide company employees with a single point real-time access platform to most (if not all) of a company's recorded information regardless of the format, structure, or location of the information. Enterprise search engines are in some ways substantively different from public search engines used on the Internet. For example, the importance ranking algorithm does not necessarily carry over to the enterprise environment, and the indices developed for enterprise search can take advantage of taxonomies that make sense within the organization (e.g., acronyms specific to the company and industry). There are additional issues tackled by enterprise search engines that are not as relevant for public search engines. Examples of such issues include single-point access to data stored in different formats in different divisions of the enterprise, access rights to information based on specific roles of users within the enterprise, and security to protect important enterprise data.

According to an Accenture study conducted in June 2006 (http://accenture.tekgroup.com/article_display.cfm?article_id=4484), 59% of the 1009 managers surveyed said they miss information almost every day that may be valuable to them, even though that information is already available within their company. Feldman and Sherman (2003) have estimated the cost to an enterprise when a knowledge worker is not able to find the information needed, which is available somewhere within the enterprise. This cost is about $2500 to $3500 per knowledge worker annually. If one takes into account opportunity costs, the corresponding amount is about $15,000 per knowledge worker. Recognizing this problem, several companies, such as FAST, have developed highly specialized software solutions for enterprise search. Even public search engines, such as Google, now have offerings in this area (e.g., Google Search Appliance). There is also growing interest in combining enterprise search capabilities with Internet search capabilities to provide employees with single point access to information from within and outside the enterprise. For example, Microsoft is enhancing Windows Live Search to provide a single user interface integrating previously separate search solutions such as Windows Desktop Search, Intranet search via SharePoint Server 2007, and Internet search. By deploying integrated search solutions, companies gain the tools to increase the productivity of their employees, and in the process, also increasing the adaptability of the organization.

Finally, consider the lower right box in Fig. 2. Here we articulate the potential value of enterprise search for the content provider, i.e., the company's management. The "business model" of enterprise search engines is organizational effectiveness, not advertising revenue. For effectively resolving many business problems, employees need timely information and insights. With the growing availability of information within organizations, search engines are becoming central to the knowledge management systems of modern organizations, and enterprise search engines are helping to meet this need. Today's business environment creates opportunities for companies to develop a competitive advantage if they can instantly transform their data, information, and intelligence into actions via informed decisions (Davenport and Harris, 2007). For example, search facilitates inventory visibility for a specific item throughout the supply chain so that certain decisions and actions, such as delivery commitment, can be made in real-time. This ability to make information instantly relevant and accessible could be the basis for developing competitive advantage through improved efficiency and effectiveness of activities and processes that are not necessarily observable, or replicable, by competitors. An enterprise search engine used at Morgan Stanley provides Intranet search access to more than 25,000 employees around the world, enabling them to search an index of 2.2 million documents from 200 different company Web services. The introduction of this service increased search traffic about eleven-fold and improved collaboration across the enterprise (Schofield, 2004).

Senior management views of search engines

In a knowledge economy, wealth is ultimately created in the minds of individuals who have the opportunity to deploy resources in new ways, such as entrepreneurs and senior executives, and not in the mines and oilfields under the earth. In this section, we explore how senior executives use search engines and what they see as the strategic implications of search engines. In 2004, Forbes.com and its partners carried out a survey of nearly 1500 senior executives in enterprise-level companies (with 1000+ employees) in 14 different industries to understand their online behaviors. The survey participants included over 1000 C-level executives. Over 50% of these executives considered the Internet to be the single most important source of information about business. About 85% use a search engine on a regular basis – 40% use Internet resources for industry and competitive information, and about a third use Internet resources for product information.

Some executives still view search engines at a tactical level in terms of keyword advertising to customers. Such a focus leads to inordinate levels of interest on keyword management

[9] Loss of privacy is another danger, but that applies more to individuals, rather than to businesses, our focus here.

and landing page optimization. Even here, some managers are beginning to explore strategic aspects of search advertising, such as, making long-term shifts of advertising spending from offline to online. Although the online medium still represents only 7.4% of the total media budget, it is growing rapidly (eMarketer, October 2007). Further, as alluded to at the beginning of this article, there are far more important strategic consequences of search, beyond media allocation. For example, search engines have the potential to reduce the impact of intermediaries by making it possible for more and more customers to find and build relationships directly with the manufacturers or service providers (e.g., airlines versus travel agents). Also, search is making markets much more transparent and is bringing enduring changes to customer behavior. We explore the business consequences of a searchable world. Our primary inputs for this purpose are the in-depth interviews we conducted in mid-2006 with senior executives (mostly C-level executives) of 7 large companies, and 10 medium companies. We do not claim that our insights are necessarily representative of the population of senior executives, but are, nevertheless, indicative of how the upper echelon of companies views search engines. Because several of our interviewees did not want us to reveal the identity of their companies, we are only indicating the industry affiliation of the interviewees when summarizing their views.

Senior executives use search engines for many different purposes (just like everyone else), but what we found to be most revealing is the amount of search they do to find information about people. Senior executives have to deal with a large and constantly changing cast of people and information, in the course of their business transactions. Search engines help them "connect the dots" and associate richer contexts with people and information.

> "My job is to grow our business. This means I am constantly trying to find new clients. Before meeting an important client or prospect, I have to know a lot about that person—Where did he grow up? Which schools did he attend? What languages does he speak? Which church(es) did he go to? Which companies has he worked for? Knowledge of this type helps me connect with that person." [Realty].

> "We get a lot of proposals from people who want us to invest in their companies. We use search engines to figure out whether the people who need our money are the ones we should be dealing with." [Bank].

> "We have made major investments based on research done on the Internet, with a lot of help from search engines. For example, we were able to identify that a small German company that wanted to establish a presence in the US was owned by the same family that owns BMW. Having that information helped us assess the long-term value of having that company as a client." [Insurance and real estate].

> "We make money by taking positions in companies where there is potential for huge movements in stock prices. We are constantly searching on the Internet to figure out what could go wrong with a merger deal that has not been priced in. If a deal is about a toothpaste company, we need to become experts on toothpaste quickly — here is where we use search engines. As the spreads shrink, every nugget of information is useful." [Capital management].

> "When we are looking for new partners or acquisition targets, we do a lot of due diligence work on financials in the traditional way. But it is equally important to find out whether there will be a cultural fit with the other company. Are these the type of people we would like to deal with after the acquisition? Search engines have helped us a lot with this type of information because we don't want to tip off anyone that a particular company is an acquisition target for us." [Investment banking].

In spite of their interest in learning more about other people, very few of our interviewees have taken any steps to provide more information about themselves on the Internet. Companies such as facebook.com, linkedin.com, and wink.com are creating the infrastructures to make people search easier in the future.

Below are some excerpts from our interviews regarding how executives view the changing competitive dynamics induced by search engines. It appears that the perceived competitive impact of search engines is stronger in some industries than others.

> "Google is a friend, and Google is a foe. Today, we are partners with Google — Google drives traffic to our site and we provide content. Google is the entrance gate, and we are the house inside the gate. We are not ready to open our house to everyone for free. In the future, Google may go into content, and that's where we need to be ready to compete with them." [Niche portal].

> "Google has the power to re-direct traffic from our site to those of our competitors. Recognizing that has been a wake up call for us to improve the content available at our site." [Niche portal].

> "Search engines are having great impact on the insurance industry. "Instant quotes" have the potential to knock out the broker, or at least knock out costs in finding the right insurance product for our customers." [Insurance].

> "Newspapers have to realize that they are less about news, and more about becoming destination sites — they need to weave themselves into the daily lives of their local citizens. Otherwise they have nothing that Google won't be able to give its users." [Publishing].

> "We want to come up in search results as the "good guys" of our industry. In the end, that will make us the leading player in our industry." [Outsourcing firm].

"Search engines have created a global marketplace for top talent — it is getting harder to find and retain top talent." [Consulting firm].

"Search engines have not yet had a major impact on retailers like convenience stores and gas stations. However, in the next few years, cell phones will be used for payment, and then people could start searching on the cell phone for the nearest stores, and stores with the lowest prices." [Large private retail chain].

"In the final analysis, search engines help us to build deeper connections to our customers by telling us more about what each customer is looking for." [Hotel and hospitality].

"Widely available information does not confer a competitive advantage to anyone, but not using such information will be a competitive disadvantage." [Publishing].

"Public search engines provide no competitive advantage. But internal search engines could improve our competitive capabilities by more fully utilizing our internal knowledge and skills." [Software].

A few of our interviewees indicated that search engines can help grow their businesses, although they did not perceive this to provide their companies with any edge over their competitors.

"For home builders, search engines are a big boost. People look for higher quality and more expensive options when they do research on the Internet. Marble tops, stainless steel appliances, and more recently, smart wiring, have taken off like a rocket because of search engines. When people search for those products, they can instantly find ten vendors." [Home building].

"Search engines have enabled us to build out our expertise into related areas. We can find re-usable code online that allows us to keep enhancing our features and broadening our product line. If a customer suggests a new enhancement, we can use search engines to quickly check existing market sentiments about that enhancement." [Knowledge management operations for a Utility].

"To grow our business, we need to put ourselves in the minds of our customers. For example, we try to find out the keywords that are used by senior citizens or government officials or customers in specific segments. And, then we create custom offerings." [Hotel and hospitality].

"Ideally, we would like customers to deal with us directly, and not go through agents. Therefore, we use search engines as channels for growth, not just for media buys." [Hotel and hospitality].

Finally, most of our interviewees indicated that search engines are valuable in helping them learn new knowledge and skills:

"My core competence is I know how to Google well for the type of information we need in our business." [Hedge fund].

"If you know what you need to know, search engines hasten the learning process." [Capital management].

"Search is all about control — how users learn to gain control over the vast amounts of information available out there." [Media and Publishing].

"Search engines make me into a passable expert quickly." [Insurance].

"Search engines provide me balanced, rounded information and opinions about companies and products, and the like. It is like talking to a number of people, but without bothering them." [Outsourcing firm].

"Anything online becomes fodder for fire — we need to be vigilant and keep track of what people are saying about us and our partners. Old stories can be dredged up because once something is online you cannot get rid of it. Search engines are our antennas." [Outsourcing firm].

"Search engines have increased the cost of being unprepared. If you now go to meet clients but you don't know the basic facts available at the client's Web site, or on search engines, you have already lost the sale." [Publishing].

In sum, our interpretation of over 20 hours of transcripts from the interviews is that senior executives have given considerable thought to the strategic effects of search engines in their own industries. Not surprisingly, those in the publishing and media businesses who are in direct competition with search engines see them as transforming the very nature of their industries. In most other industries, however, it appears that public search engines may not provide any enduring competitive advantages because they tend to help all the players equally. At the same time, there appears to be considerable disadvantage if firms do not leverage search engines and their capabilities to become smarter about how they conduct their businesses. One interesting opportunity is the deployment of internal search engines (i.e., enterprise search engines) to improve organizational capabilities, which could provide some enduring benefits.

Some action insights for practitioners and researchers

An important and broad research question is whether and how search engines make their users smarter, or more creative, than the users would be without the universal knowledge made accessible by search engines. Hoffman (2007) has proposed a number of research questions related to human "cognitive augmentation and discovery" that could occur as a result of

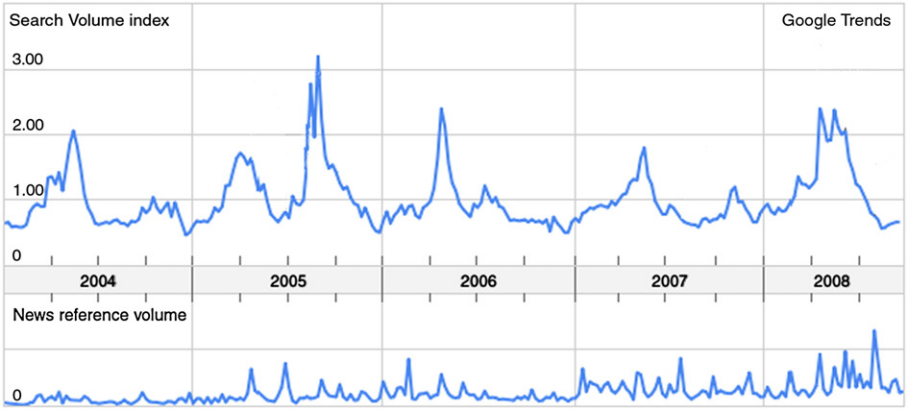

Fig. 3. Trends in the total volume of searches and news mentions of "hybrid cars" during the years 2004–2008. The search volume is indexed to 1.0 which represents the average volume of search for that keyword during the entire period.

people's reliance on Internet technologies, such as search engines. It would be insightful to do detailed analyses of the "sequence of searches" undertaken by customers in the course of resolving various decision problems (e.g., "find the best price," "find the best product." "find a gift for $50") and identify sequences that lead to favorable outcomes. Does "cognitive augmentation" lead to improved performance, or only to performance with greater variability — smart customers become smarter, and less smart customers get side-tracked and overwhelmed by all the information and obtain poorer outcomes? A search engine, when used by managers, could be viewed as a decision support system. An important question is whether and how search engines improve individual decisions makers as well as organizational effectiveness. Would organizational decision making improve with the help of "macros" (i.e., shortcuts for search tasks done repeatedly) and reporting tools that are customized to that organization? For example, sales managers could be routinely equipped with search-based summary of the latest events happening at a company that would be a good "cold calling" prospect.

The widespread adoption of search engines by consumers for doing product research has resulted in a widening split between consumers' "search process" and their "purchase process". For example, according to the J.D. Power 2006 autoshopper.com study, 67.5% of prospective car buyers use the Internet during their shopping process, but most of them buy the car offline in dealerships. In the past, the search and purchase processes often occurred together in the same physical location, perhaps over an extended period of time. The separation between search and purchase could trigger some fundamental changes to customer behavior, such as expanding or shrinking the number of products that customers consider before purchase, or shrinking the time to purchase a complex product, etc. Some theory-based experimental and empirical analyses of these questions should offer new and generalizable insights about customer behavior in a global, digital and networked environment; an environment that is new in human history (see, for example, Verhoef, Neslin, and Vroomen, 2007).

Marketers have long had access to data from companies such as Nielsen that have installed meters in a sample of households to track the TV programs (and ads) that people watch. Likewise, search engines are tracking what we search, and what we search leaves a trail that tells a lot about what we collectively think is important and what we think might happen in the future. The tracking system of search engines is, in some ways, several orders of magnitude more sophisticated than the Nielsen meters. An interesting research issue is whether the keyword database would be useful for forecasting purposes. Data on keywords used by searchers results in a "database of intentions" (Batelle, 2005) that contain within them the patterns that signal what is likely to happen in the near future, especially if the search data are combined with company-specific data on outcomes. The ability to forecast using patterns derived from the database of intentions could be of high potential value to marketers. Currently, those databases are closely guarded by the search engines, but indexed information about keyword searches (e.g., Google's Trend tool available at www.google.com/trends) is now publicly available. For example, the volume of searches for the key words "hybrid cars" has the pattern summarized in Fig. 3, which suggests that interest in hybrid cars and, perhaps, demand are likely to vary substantially due to news events (e.g., oil prices, situation in the Middle East).[10] On the other hand, the keyword HDTV shows an increasing trend with a seasonality pattern with peaks occurring during the November–December holiday season. And, the volume of search for "yellow pages" has declined by half since 2004, suggesting perhaps a change in how people find information about local businesses. An interesting research question is whether keyword trends (or trends associated with a set of keywords) when combined with company-specific data can be used as leading indicators for product and industry forecasts.

Some marketers are concerned that search engines may erode the value of a brand name by making it easier for consumers to obtain more attribute-specific information about products. The long-tail[11] phenomenon (Anderson 2006) could

[10] Google also includes flags on the chart to indicate news items that might be relevant for explaining the variations in volume.

[11] The long tail refers to a pattern in the frequency distribution of sales of different products in a category. If a large number of less popular products are sold, then the frequency distribution has a long-tail. Such a pattern is also seen in the frequency distribution of search terms.

be partly due to the ability of search engines to locate information about the attributes of less well-known brands just as easily as they can locate information about better-known brands. For example, the search phrase, "laptop computer" resulted in over 29 million listings from Yahoo! on September 25, 2008. When search results in such a large number of listings, there is the possibility that consumers may find and purchase a larger range of products in a category than if they did not use a search engine. At the same time, consumers can use search engines to narrow the focus to the most popular items (e.g., the search phrase "best rated laptop computer" gave only 370 listings at Yahoo!). Under this situation, it is possible that retailers will carry fewer items in a category (e.g., the narrow range of popular products sold by Best Buy), leading to a "winners take all" phenomenon. Further, it is likely that search engines will list the most popular products high on the organic listing, and those popular products are also likely to have larger media budgets to justify the higher costs of sponsored links. These factors contribute further to the "winners take all" phenomenon. As Elberse (2008) shows in the case of music and home video, there is, in fact, a concentration of sales at the head, rather than at the tail, of the distribution. Thus, an interesting research question is the role of search engines in the tug of war between the "long tail" and "winners take all." A testable hypothesis is that search engines increase the marginal value of well-known brand names, but decrease their absolute value.

Another research issue is the extent to which a strong brand can mute the adverse effects of search engines. Marketers are concerned that search engines direct traffic to sites that help the search engines realize the highest revenue, and not necessarily to sites that offer the best content or brands. If a brand is only able to generate traffic via paid search, it becomes a hostage to search engines. On the other hand, a brand that provides consistent customer experiences both online and offline should be able to use search-focused strategies to acquire new customers, and use integrated multi-channel strategies (see Neslin and Shankar this issue) to encourage repeat purchases from those customers. An interesting research topic, particularly for practice, is the identification of the appropriate communication strategies (see Winer accepted for publication) that will lead to mutually reinforcing outcomes, whereby search helps build the brand, and the brand communications help build search traffic.

There are also several research issues for the strategists. One interesting question is whether search engines make markets more competitive by improving their transparency, or make them less competitive by increasing opportunities for differentiation. Under what conditions (e.g., products, customer involvement) would transparency and/or differentiation occur? For example, a market consisting of highly-involved customers who search with intensity is likely to become more transparent as well as more differentiated. Such markets are likely to be characterized by intense "value competition" (rather than price competition) that sustains multiple players who are all excellent along one or more dimensions. Markets with less-involved customers who do limited searches (e.g., focusing only on price) are likely to become more transparent, but with fewer opportunities for differentiation, resulting in commoditization and price competition.

In conclusion, although concepts related to indexing and searching have been around for several decades, the first search engines for obtaining information from distributed sources started to appear only in the early 1990's (e.g., Archie search engine). Ten years ago, when the first issue of the *Journal of Interactive Marketing (JIM)* was published in Winter 1998, Google had just been incorporated in September 1998. As detailed in this article, in the past ten years, search engines have become essential components of the global, networked, digital infrastructure. For businesses of every imaginable kind, search engines represent something far more important than an information tool. We are just beginning to understand their strategic impact on businesses in general, and the marketing function, in particular. By the time we complete the second decade of *JIM* in 2018, we expect to see substantial new insights for theory and practice on the research issues explicated or implied by this article.

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