

TRENDS IN SEARCHING FOR COMMERCE RELATED INFORMATION ON WEB SEARCH ENGINES

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ABSTRACT

According to the Pew Web Internet and American Life Project (Raine, 2005) search engine use is edging towards overtaking email usage as the primary Internet application for many users. Accessing commerce related information on the Web is becoming an everyday activity for many people in the digital age. The level of commerce related Web searching is a major subject of interest, particularly in the United States. Web queries are therefore an important element of commerce and the growth of e-commerce and purchasing products or services over the Web. Web queries are a primary means for translating people's product, service and information needs. This paper provides results from studies analyzing Web search logs to determine the level of commerce related searches on commercial Web search engines from 1997 to 2005. Within commerce, we include business, e-commerce, travel, employment or economic related Web queries. Results show that commerce related queries have increased as a proportion of all Web queries since 1997 and currently represented more than 30% of Web queries. Commerce related searching continues to be the major topic of search on commercial Web search engines. The commerce related terminology on Web is incredibly various and often difficult for the average user to predict with total accuracy. The implications of the findings and further research are discussed.

Keywords: e-commerce, web search engines

1. Introduction

E-commerce is a growing force in the world economy and the Web is becoming a major source of business products, Web services and information for many people worldwide (Chen, Chen and Shao, 2003; Nah and Davis, 2002; Zwass, 2000). Better Web search tools are important for the development of online business and e-commerce, as people use search engines to find commerce information on the Web. Many shopping and business Web sites provide search engines on their Web sites. Apart from entering commerce related URL, many users interact with a Web search engines, such as MSN, Yahoo! or Google.

Web searching is now a daily activity for many people. Web traffic has increased exponentially as people are using Web search engines as a major tool to dig their way through Web-based information. From the broad perspective, large-scale, quantitative or qualitative studies have explored how users' search the Web (Spink and Jansen, 2004). To support information behaviors, we are seeing the development of a new generation of Web tools, such as Web meta-search engines, to help users persist in electronic information behavior and help people resolve their information problems. Studies show that in general most Web queries are short, without much refinement or modification, and are simple in structure with few words (Spink and Jansen, 2004). Few queries incorporate advance search techniques, and when such techniques are used many mistakes result. Frequently, people retrieve a large number of Web sites, but view few result pages and tend not to browse beyond the first or second results pages (Spink and Jansen, 2004). Overall, a small number of terms are used with high frequency and many terms are used once. Web queries are very rich in subject diversity and some unique.

In addition, the Web has become a major source for all kinds of commerce related information, including business, e-commerce, travel, employment and economics. Since the inception of commerce related information on the Web, and easy and relatively less costly access to Web services, customers are using the Web has become a transaction medium for e-commerce purchases and commerce related information (Zwass, 2000). Web searching services are now everyday tools for providing commerce related information. Web search engine use is edging towards email usage as the primary Internet application (Raine, 2005).

In the midst of a growing Web, what proportion of Web queries are commerce or related? Has the increase in commerce related Website content led to an increase in commerce related queries on Web search engines? What are the trends in commerce related Web searching? In this paper we report results from major studies of Web searches on commercial Web search engines. In this paper we examine the level of Web queries that are commerce related to help address these questions. This is a significant area of research for Web companies, Web site developers and providers, e-commerce providers and people in general who search the Web.

The next section of the paper provides discusses related studies and then provides an overview of nine studies examining the trends in commerce related queries during Web retrieval.

2. Related Studies

E-commerce is a growing force in the world economy and the Web is becoming a major source of business products, services and information for many people worldwide (Chau et al. 2005; Koufaris et al., 2001/2002; Palvia, 1997; Wigand, 1997; Zwass, 2000). E-commerce is the use of electronic means and technology to conduct commerce, within-business, business-to-business and business-to-consumer (Chen, Chen and Shao, 2003; Choi, Stahl and Whinston, 1997). E-commerce involves sharing information, developing and sustaining business ties and monetary transactions across telecommunications networks (Hoffman and Novak, 1997). Estimate suggest that e-commerce was worth \$1.6 billion by 1998 (Guglielmo, 1998) and \$1 trillion by 2002 (E-Commerce Times, 2002). Major digital retail sites are continuing to develop and build brands, and creating market spaces for information, goods and services. Studies have show that by 1999 most Web content was business-related (Lawrence and Giles, 1999) with 83% of Web servers contain commercial content.

Many studies have identified the factors affecting Internet sales (Phau and Poon, 2000; Vijayasarathy and Jones, 2000), the role of technology on Internet sales (Aberg and Shahmehri, 2000), and the role of trust in e-commerce relationships (Hampton-Sosa and Koufaris, 2005; Ratnasingam, 2000; Rowley, 2000). Other studies have examined various aspects of business Web sites (Ng, Pan and Wilson, 1998) and the growth of online shopping (Koufaris et al., 2001/2002; Li et al., 2006; Spiteri, 2000). Ng, Pan and Wilson (1998) found an increasing sophistication and diversity in business Web sites. Both business-to-consumer and business-to-business transactions are increasing rapidly over the Web.

However, limited studies have investigated the level of and trends in commerce-related Web searching. We have little idea how people are locating commerce Web sites, although we know that people use Web search engines to locate information on the Web. There is certainly great value in understand how searchers express their commerce information needs.

2.1. Web Searching.

Large-scale, quantitative or qualitative studies have explored how people are using of Web search engines (Spink and Jansen, 2004). Most of these studies have focused on interactions with the non-sponsored Web search engine results. An increasingly important, popular, and uniquely contextual form of information interaction on the Web is sponsored search (Jansen, 2006). These results are not obtained via a crawl of the Web. With sponsored search, content providers pay Web search engines to display these sponsored links in response to user queries alongside the algorithmic links, also known as organic or non-sponsored links. This mechanism plays a critical role in financing the free search upon which so many users now rely.

Web studies on sponsored search are just appearing in research publications. Jansen and Resnick (2005) report results of an investigation into the effect of sponsored links on e-commerce information seeking. In their research, 56 participants each engaged in 6 e-commerce Web searching tasks using 60 organic and 30 sponsored Web links for each task. Jansen and Resnick (2005) then studied the perceptions of sponsored links and the factors that influence this bias. Findings showed that there is a strong preference for organic links, a bias against sponsored results, and that more than 56% of the time, the title of the sponsored link was the determining factor in searcher perceived relevance.

In related research, Jansen and Molina (2006) examined e-commerce Web searching effectiveness at the individual customer level by focusing on the success of everyday e-commerce searches. Searchers' found that the non-sponsored links were slightly more relevant than the sponsored links. Despite the growing research literature on business/e-commerce Websites, limited studies have analyzed levels and trends in commerce related Web searching.

The next section of the paper outlines the research questions explored in our study followed by the data analysis and discussion of the implications of the key findings.

3. Research Questions

The goal of our analysis is to illustrate the trends in commerce related Web searching on Web search engines. Specifically we examine the following research questions:

1. What proportion of Web searches are commerce related?
2. Are commerce search queries high frequency terms?

The next section of the paper provides an overview of the nine studies from 1997 to 2005 that examine the level of commerce related Web queries.

4. Commerce Related Web Searching Trends

4.1. Web Search Studies: 1997 to 2005

Table 1 shows the nine studies conducted from 1997 to 2005 that examined the level of commerce related Web queries with Web data from Excite, AlltheWeb, Alta Vista, Vivisimo, and Dogpile (Table 1) [26-32]. No published studies are available that have classified commerce related Web queries directly from Google, Microsoft (MSN), America Online or Yahoo! These nine studies are those large-scale studies that have been able to be conducted using large-scale Web logs directly from Web search engine companies. As Spink and Jansen (2004) state, access to large-scale Web logs for academic research analysis has been quite restricted for a number of reasons. Many Web search engine companies have been reluctant to provide large-scale Web logs for academic research. Spink and Jansen (2004) have been fortunate to obtain various large-scale Web logs and provide Web logs (where legally possible) to the Web research academic community.

4.2. Web Query Topics Categories

For each Web query data set analyzed over the studies from 1997 to 2005, a random sample of approximately 2,500 queries was qualitatively classified by the researchers into one of eleven categories shown in Table 2. Examples of queries in the commerce category include, product and company names such as “coca cola”, “Walmart” and “Rolex”. Travel related queries included, “railway trains in Canada”, “beach vacation Bahamas” and “cheap flights”. Employment related queries included, “jobs in Miami”, “how to join the army” and “child care positions”. Economic related queries may include finance queries, such as “financial planning”, “government bonds” and “stock market falls”.

Table 2 shows the distribution of Web queries across topic categories for the Web search engine studies. The classification scheme was developed over various studies of Web searching by Spink and Jansen (2004). The category related to commerce is listed in Table 2 as “Commerce, Travel, Employment or Economy”. Queries classified as commerce were identified and classified as related to business, economics, travel, employment, e-commerce or commerce.

Table 2 shows that people use Web search engines to find information on a broad range of information tasks. There has been a shift from 1997 to 2005 towards the use of the Web as a commerce information resource and tool. Commerce related queries increased as a proportion of Web queries from 13.3% in 1997 to now the most frequently occurring category (30.4%), followed by people, places and things, and unknown queries (indiscernible or non-English). The temporal findings across all data sets support the continued increase in commerce as a major topic for Web search engine users. From 1997 to 2005, Web queries related to commerce, computers and people increased as a proportion of all Web queries. Recently, Koshman et al., (2006) found that one in five queries submitted to Vivisimo related to commerce, travel, employment or the economy. This represents a sizable proportion of all queries. In addition, one in seven queries were related to people, places or things. These queries include personal names or the names of locations. The increase in the proportion of the commerce related Web searches could be related to many issues, including the increase in the availability of commerce related Websites.

4.3. Commerce Query Term Frequency

Overall, commerce related terms are not the high frequency terms appearing in the top ten terms. Table 3 shows that in 2005 terms such as “of” and some sexual terms such as “sex” and “nude” continue as high frequency query terms, but overall these terms are small in number compared to the large number of query terms entered into Web search engines.

Table 1: Basic Data for the Nine Studies Conducted from 1997 to 2005

Study No.	1	2	3	4	5	6	7	8	9
Web Search Engine	Excite (Jansen et al., 2000)	Excite (Wolfram et al., 2001)	AlltheWeb (Spink, Ozmutlu, Ozmutlu and Jansen, 2002)	Excite (Spink, Jansen, Wolfram and Saracevic, 2002)	AlltheWeb (Spink, Ozmutlu, Ozmutlu and Jansen, 2002)	Alta Vista (Jansen, et al., 2005)	Vivisimo (1) (Koshman et al., 2006)	Vivisimo (Koshman et al., 2006)	Dogpile (Jansen et al., 2007)
World Region	U.S.	U.S.	Europe	U.S.	Europe	U.S.	U.S.	U.S.	U.S.
Date Collected	Tues 16 Sep. 1997	Wed 1 Dec. 1999	Tues 6 Feb. 2001	Mon 30 Apr. 2001	Tues 28 May 2002	Sun 8 Sep. 2002	Mar. 28 – Apr. 4 2004	Apr. 25 – May 4 2004	May 6 2005
Sessions	211,063	325,711	153,297	262,025	345,093	369,350	279,766	275,456	534,507
Queries	1,025,908	1,025,910	451,551	1,025,910	957,303	1,073,388	1,082,431	927,303	1,523,793
Terms	1,277,763	1,500,500	1,350,619	1,538,120	2,225,141	1,073,388	3,394,989	2,905,592	4,250,656

Table 2: Distribution of Web Query Topic Categories for Each Web Search Engine Study

Categories/ Study	1 1997 Excite (2414 Queries) (Jansen et al., 2000)	2 1999 Excite (2539 Queries) (Wolfram et al., 2001)	3 2001 Excite (2453 Queries) (Spink, Jansen, Wolfram and Saracevic, 2002)	4 2001 AlltheWeb (2503 Queries) (Spink, Ozmutlu, Ozmutlu and Jansen, 2002)	5 2002 AltaVista (2603 Queries) (Jansen, et al., 2005)	6 2002 AlltheWeb (2535 Queries) (Spink, Ozmutlu, Ozmutlu and Jansen, 2002)	7 2004 (1) Vivisimo (3600 Queries) (Koshman et al., 2006)	8 2004 (2) Vivisimo (1368 Queries) (Koshman et al., 2006)	9 2005 Dogpile (2500 Queries) (Jansen et al., 2007)
People, Places or Things	6.7%	20.3%	19.7%	22.5%	49.3%	41.5%	15%	27.9%	16.0%
Commerce, Travel, Employment, or Economy	13.3%	24.5%	24.7%	12.3%	12.5%	12.7%	21%	14.6%	30.4%
Computers or Internet	12.5%	10.9%	9.7%	21.8%	12.4%	16.3%	13%	8.5%	5.7%
Health or Sciences	9.5%	7.8%	7.5%	7.8%	7.5%	4.5%	6%		8.9%
Education or Humanities	5.6%	5.3%	4.6%	2.9%	5.0%	2.3%	5%	11.6%	5.6%
Entertainment or Recreation	19.9%	7.5%	6.7%	9.1%	4.6%	9.5%	2%	11.4%	7.0%
Sex and Pornography	16.8%	7.5%	8.6%	10.8%	3.3%	4.5%	4%	3.6%	3.8%
Society, Culture, Ethnicity, or Religion	5.7%	4.2%	3.9%	4.8%	3.1%	4.5%	9%	9.7%	4.7%
Government or Legal	3.4%	1.6%	2.0%	2.7%	1.6%	2.6%	3%	0.5%	3.65
Performing or Fine Arts	5.4%	1.1%	1.2%	4.7%	0.7%	1.1%	3%	2.8%	0.5%
Non-English or Unknown	4.1%	9.3%	11.4%	0.6%	0.0%	2.5%	19%	-	13.2%
	102.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3: Most Frequent Web Query Terms

	Excite Study (1997)	Excite Study (1999)	Excite Study (2001)	AlltheWeb Study (2001)	Alta Vista Study (2002)	AlltheWeb Study (2002)	Vivisimo Study (2004)	Vivisimo Study (2004)	Dogpile Study (2005)
1	and	And	free	free	free	free	download	free	of
2	of	of	sex	download	sex	sex	new	download	the
3	sex	free	pictures	sex	pictures	download	software	new	in
4	free	the	new	pictures	new	software	windows	2004	and
5	the	sex	nude	uk	nude	uk	sex	pictures	free
6	nude	in	pics	nude	music	windows	school	how	for
7	pictures	christmas	school	hotel	school	new	history	software	a
8	in	nude	music	mp3	how	hotel	online	windows	to
9	university	for	download	new	lyrics	mp3	video	history	girls
10	pics	pictures	university	windows	home	video	what	sex	sex
11	chat	new	state	pics	pics	crack	music	school	on
12	for	pics	lyrics	software	download	nude	world	online	how
13	adult	to	home	lyrics	online	pictures	lyrics	music	nude
14	women	music	games	crack	american	web	hotel	video	lyrics
15	new	university	software	music	state	home	map	world	music
16	xxxx	a	american	video	country	world	system	hotel	new
17	girls	games	stories	map	university	online	home	map	pictures
18	music	porn	porn	university	car	Internet	mp3	uk	mp3
19	porn	or	college	school	texas	cd	linux	what	what
20	to	cards	county	girls	real	music	web	lyrics	is

In 1997, commerce-related terms constituted 8.3% of the 63 top terms and 13.3% of queries entered into the Excite search engine. By 2001, the data shows an increase to 24.7% for commerce-related queries commerce-related question queries where the second largest category of question queries behind people and places.

5. Discussion

In general, many Web search engines are currently attempting to cater to the broad market and some are catering to the specialized nature of human information needs. Niche and specialized Web search engines, such as Google Scholar [<http://www.google.com>] and Kosmix [<http://www.kosmix.com>] are appearing. Within the growth of the Web from 1997, the percent of commerce related queries has been cyclical. Currently, people are increasingly searching for commerce related information using Web search engines. The nature of their commerce related information needs are broad and relate to all aspects of commerce. Company (and industry) related queries account for some commerce related Web searches. Some people are searching for company Web sites. A need exists for new Web search tools that more easily facilitate company and product searches. Some people appeared to be searching for shopping sites via Web search engines as some commerce related queries are shopping-related. They are searching under brands names as well as generic types of products, such as "cars" or "golf clubs" (Spink and Jansen, 2004).

The great majority of Web commerce queries posed by the public are short, infrequently modified and simple in structure (Jansen, et al., 2007; Spink and Jansen, 2004). Few queries include advance search features or Boolean logic. Many queries contain spelling mistakes that lead to failed searches. Despite getting many Web sites in response to their queries, Web users for commerce information view few result pages and do not generally view beyond the first or second page of results (Spink and Jansen, 2004). Overall, a small number of terms are searched with high frequency, while most terms are used infrequently. Commerce related queries are not the most high frequency terms, that is, they generally do not appear in the top twenty terms. The language of commerce related Web queries is quite varied, with many unique company and product names appearing as queries. A few high frequency terms are more generic, such as "sex", "shopping" and "pizza".

Some users were seeking advice or product comparisons or they are just not sure what they want or how to find it on the Web. Many users may benefit from a conversation with an "expert" to guide them to expressing and solving their information problem. Web search engines and e-commerce sites should consider providing some forms of interaction for customers to help them sort through the plethora of Web sites, services, and products that confront the

average person searching for commerce related information. Some Web search engines are also providing comparison-shopping facilities, e.g., prciwatch.com, pricegrabber.com and mysimon.com.

Overall, commerce related queries are slightly longer than general queries (Spink and Jansen, 2004). People are also increasingly querying for commerce related information in question format. The development of Web services that focus on helping people with commerce related information needs in question and answer format is an emerging next step in improving the Web as an e-commerce tool. There is a need for niche Web services and search engines that facilitate more effective and targeted access to commerce sites.

As the Web continues to become a key centerpiece for commerce, new tools and new ways of searching for commerce related information on the Web are developing. Searching the Web today is still frustrating for many users. The Web also lacks a standardized approach to search engine functionality and terminology. The commerce related terminology on the Web is also incredibly various and difficult for the average user to predict with total accuracy.

6. Implications

The results of our research have implications for practice and theory. Commercial Web site developers need to be aware of how people search for commerce related information and trends in commercial Web searching. The growth of commerce related Web queries has implications for the practice of commerce via the Web. Particularly in the United States, people are increasingly seeking commerce related information and transaction via Web search engines. The Web search engine companies understand this is occurring and are developing their commerce related Web search capabilities. Sponsored links have emerged as major financial drivers for Web search engine companies (Jansen and Spink, 2007).

The result of our studies has implications for the development of human computer interaction and information behavior models that seek to represent users' interactions with Web search engines (Spink and Jansen, 2004). People's interaction with Web search engines is driven by many different human needs, including information behaviors and purchasing behaviors. We need a greater interaction across research within different fields, such as HCI, information science, computer science and business to develop an integrated model of users' interactions with Web search engines and Websites.

7. Conclusion and Further Research

Further ongoing research is needed to track the trends in commerce related Web searching. Major challenges exist in human computer interaction, human factors and Web usability (Miles, Howes and Davies, 2000; Nah and Davis, 2002) in the further development of commerce related Web search. In particular, more studies are needed that examine trends in commerce related searching on United States based Web search engines and the growing Chinese based Web search engines such as Baidu.com. The authors are conducting ongoing studies into many aspects of commerce related Web searching using data from Dogpile.com.

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