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CONCEPTUAL DISSEMINATION BETWEEN THE INTERNET AND THE MAINSTREAM

by

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ABSTRACT

CONCEPTUAL DISSEMINATION BETWEEN

THE INTERNET AND THE MAINSTREAM

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The University of Houston Clear Lake, 2000

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This study attempts to find patterns in the spread of ideas on both the Internet and in the mainstream media. It looks first at the history of diffusion research and theories of the spread of ideas from the media to grassroots and vice versa. Using a selection of terms it examines the frequency of their occurrence over time on both Usenet and in the newspapers indexed by Lexis-Nexis. The study asks if there are discernible patterns between each domain as the terms become more frequently used, and whether it is possible to predict usage in one domain by usage in the other.

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I. INTRODUCTION

Technology has long allowed ideas to spread further at increasing speeds. Simple technologies such as smoke signals and warning fires allowed the transmission of information faster than the previous speed limit of a man on horseback. The invention of writing systems made ideas more durable and cumulative, passing from one generation to the next. Printing dramatically increased who could have access to information and gave more people the ability to have their ideas heard. The telegraph allowed ideas to be transmitted instantly around the world, suddenly making the world smaller. Telephone, radio and television, along with the increasing availability and affordability of printed matter, have radically changed the world in which we live. New ideas spread quickly around the country and, increasingly, the world. Whether it's Harry Potter or *Who Wants to Be a Millionaire?*, new ideas are available to millions of people in different continents almost instantaneously.

The Internet has, again, pushed this process further. It is now easier for individuals to contact more people regardless of geographical distance. With the reproduction and transmission of material adding little or no cost, it is a supremely fertile environment for the propagation of ideas. Those who have received a chain letter or virus or a familiar URL in their email realise how such things can multiply and potentially last for years. Mini phenomena have emerged on the Internet such as Hampsterdance[1] and

[1] *www.hampsterdance.com*

Mahir Cagri[2]. Emails are passed on containing stories both real and fake that, once unleashed, are unstoppable.

In the early-90s, as the Internet was transforming from an obscure technical network to something ordinary people were using, these ideas were restricted to their native environment. At a time when newspapers still had to explain that the Internet was "the worldwide network of computers linked by telephone lines"[3] it was only the very biggest net news that made newspaper headlines. As the population of the Internet grew, it became increasingly common for stories to make the break into the mainstream media.

However, many such stories are not sudden events, like a timed virus outbreak bringing down networks around the world, but are things that have grown slowly online. They may have been part of the daily lives of a slowly growing number of people before reaching a level of popularity that brings them to the attention of the media. One recent example is Napster, the file-sharing software. This became big news in mid-2000 when court action by the recording industry made newspaper headlines. The program was available, however, for almost a year before that, and by the end of 1999 there were tens of thousands of users sharing music over Napster's servers at any one moment.

This pattern has become more and more familiar – increasing occurrences of an idea on websites or discussion groups until it becomes so widespread that it "breaks out" of these more personal arenas and into the conventional media. This proposal is designed to find out whether there is a measurable pattern here and, if so, whether it is possible to predict which ideas will "break out" and when they will do so. By tracking the occurrence of ideas online, is it possible to see when, or whether, they will become mainstream news?

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[2] *members.xoom.com/_XOOM/primall/mahir/index.html*
[3] Lloyd, 1994.

II. BACKGROUND

The diffusion of new ideas or products among a society usually follows an oft-repeated pattern. Initially, a small number of people will be using the product before anyone else is aware of it. These are usually described as Innovators, as described in Rogers's classic *The Diffusion of Innovation*.[4] The next group, the Early Adopters, notice the Innovators using the product and take it up. They are more respected and more a part of mainstream society, than the Innovators so their using the product encourages an even greater number of people to take it up. The Early Majority are swayed by the Early Adopters while the Late Majority are more sceptical, often finding themselves under pressure to take up the new product because so many of their peers are now using it. Finally, the Laggards, resistant to change, grudgingly accept the new product that has become almost ubiquitous (this does not imply the entire society will adopt the innovation, the Laggards simply being the last adopters before the market reaches saturation). This process of increasing rates of acceptance which then level off can be plotted on a chart, as shown in Figure 1 adapted from Rogers[5]. This shows the number of people taking up the new product at any point in time, with the rate starting slowly, then increasing rapidly until around half the population are using it, then dropping until the market is saturated. It should be noted that this does not mean the entire population of a society, but the potential market for the product under consideration and some Laggards may never take up the innovation.

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[4] Rogers, 1995, p. 263.
[5] Rogers, 1995, p. 262.

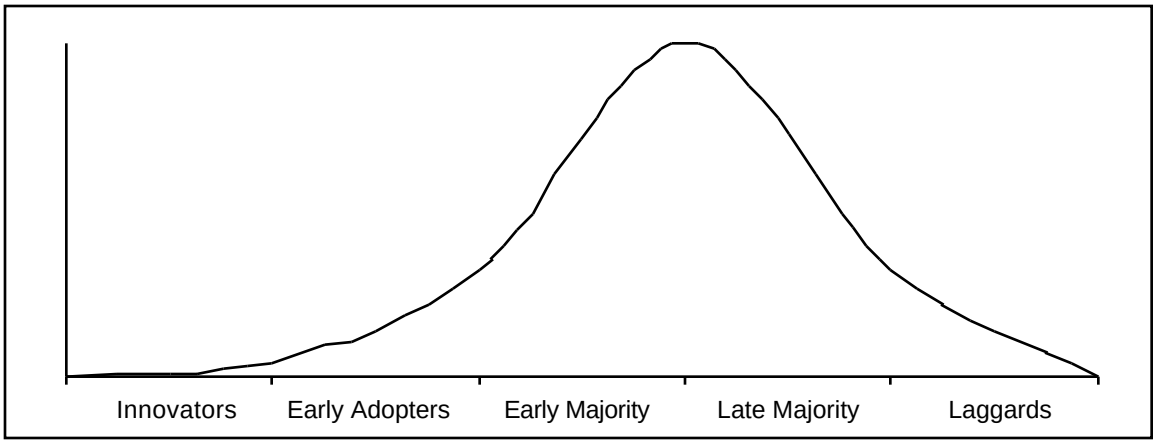

Figure 1. Adopter categorisation on the basis of innovativeness, from Rogers.

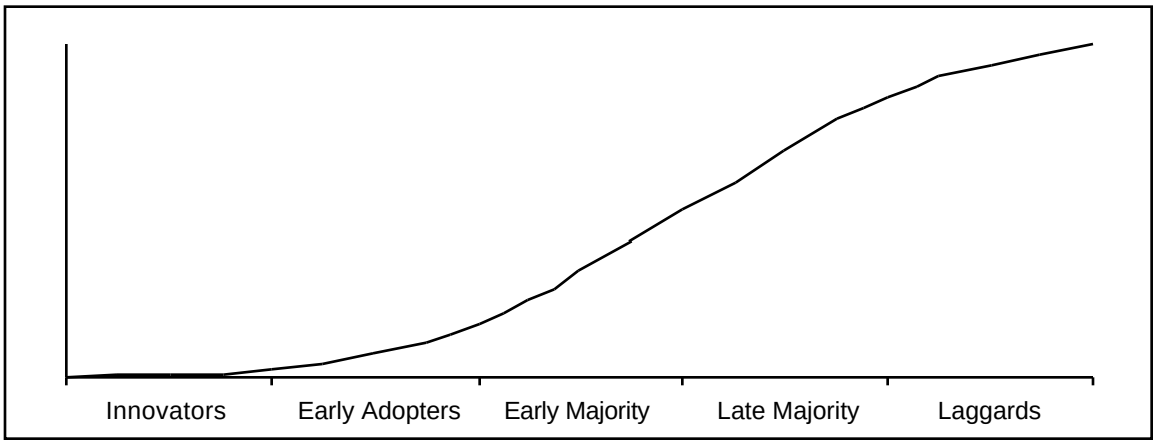

Figure 2. Cumulative adopter categorisation.

Figure 2 shows the same process, but this time the number of new adopters is cumulative over time. We can see that it describes an s-curve, with the number of new adopters slowing as we see the potential market filling. Theodore Modis uses such graphs to attempt to predict how large the market for a product might be, or when market saturation will be reached. He has successfully demonstrated his theories for many new products (both contemporary and historical) and in *Predictions* he suggests that the propagation of ideas may follow a similar pattern:

> One can immediately see how ideas or rumours may spread according to this law. Whether it is ideas, rumours, technologies, or diseases, the rate of new occurrences

> will always be proportional to how many people have it and to how many people don't have it yet.[6]

This spread of ideas has been described using two notable metaphors: the way genes spread through a gene pool over many generations and the way epidemics spread through a society.

Richard Dawkins was the first to compare the diffusion of ideas to that of biological evolution, in the final chapter of his 1976 book, *The Selfish Gene* (updated in 1989). He coined the word "meme" to describe a "unit of cultural transmission."

> Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches. Just as genes propagate themselves in the gene pool by leaping from body to body via sperm or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation.[7]

Many scientists thought this was going too far, insisting that there must be some biological advantage to the spread of a persistent meme, because genes, as Dawkins had spent the rest of the book explaining, are the ultimate cause of human behaviour. Dawkins suggested that perhaps genes are not the end of the story:

> We biologists have assimilated the idea of genetic evolution so deeply that we tend to forget that it is only one of many possible kinds of evolution.[8]

This idea was taken much further in 1999 by Susan Blackmore in *The Meme Machine.* She begins by summarising the current state of memetics, the field Dawkins' ideas have grown into. She reiterates what he has already said, particularly that in common with genes, successful memes share three essential attributes: longevity, fecundity and copying-fidelity. For a meme to succeed in spreading through a population,

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[6] Modis, 1992, p. 35.
[7] Dawkins, 1989, p. 192.
[8] Dawkins, 1989, p. 194.

it must last long enough to be copied, produce lots of copies and the copies must be accurate. Blackmore suggests that the development of language allows memes to be reproduced more accurately and more frequently than previously possible. She further suggests that language evolved primarily so that memes could replicate; memes drove the development of language. They also, she says, caused the evolution of larger, more powerful, brains among our species.

> Once imitation evolved, something like two and a half or three million years ago, a second replicator [in addition to the gene], the meme, was born. As people began to copy each other the highest-quality memes did the best – that is those with high fidelity, fecundity, and longevity. A spoken grammatical language resulted from the success of copyable sounds that were high in all three. The early speakers of this language not only copied the best speakers in their society but also mated with them, creating natural selection pressures on the genes to produce brains that were ever better and better at spreading the new memes. In this way, the memes and genes coevolved to produce just one species with the extraordinary properties of a large brain and language.[9]

(When Blackmore uses the term "imitation," she is using it broadly, to "include passing on information by using language, reading, and instruction, as well as other complex skills and behaviours."[10])

As well as this genetic model of ideas spreading, others have compared this behaviour to the spread of viruses. Malcolm Gladwell's *The Tipping Point* uses an epidemiological metaphor to focus on what is essentially a small part of Rogers' description of diffusion. While he also refers to it as a tipping point he prefers the term critical mass, defining it as

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[9] Blackmore, 1999, p. 107.
[10] Blackmore, 1999, p. 43.

> the point at which enough individuals have adopted an innovation so that the innovation's further rate of adoption becomes self-sustaining.[11]

At this point the rate of adoption suddenly rises, especially with what he calls "interactive innovations," items such as fax machines where the benefits of adoption increase dramatically as the number of other adoptees rises (a phenomenon often referred to as the "network effect"). Gladwell expands this to the realm of ideas and behaviours, not just products, and his book is more about what makes something break out from the Innovators and Early Adopters to the Early Majority. His less analytical but more expansive discussion centres on the environments and the kinds of people that cause or enable this tipping point. In discussing how a trend makes this move from the initial users to the mainstream he quotes from Geoffrey Moore's *Crossing the Chasm*:

> Moore's argument is that the attitude of the Early Adopters and the attitude of the Early Majority are fundamentally incompatible. Innovations don't just slide effortlessly from one group to the next. There is a chasm between. All kinds of high-tech products fail, never making it beyond the Early Adopters, because the companies that make them can't find a way to transform an idea that makes perfect sense to an Early Adopter into one that makes perfect sense to a member of the Early Majority.[12]

Part of the aim of this thesis is to look at which ideas become popular with groups of individuals before they become widespread in the media and those which work in the opposite direction – i.e., the media generating the discussion before any other group has adopted it. In an earlier article entitled *The Coolhunters*, upon which some of *The Tipping Point* is based, Gladwell suggests that idea epidemics are almost entirely word of mouth. After describing a nationwide craze for Hush Puppies that began in small clubs and stores in New York, he says

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[11] Rogers, 1995, p. 313.
[12] Gladwell, 2000, p. 198-9.

> You can't convince the late majority that Hush Puppies are cool, because the late majority makes its coolness decisions on the basis of what the early majority is doing, and you can't convince the early majority, because the early majority is looking at the early adopters, and you can't convince the early adopters, because they take their cues from the innovators. The innovators do get their cool ideas from people other than their peers, but the fact is that they are the last people who can be convinced by a marketing campaign that a pair of suède shoes is cool. These are, after all, the people who spent hours sifting through thrift-store bins. And why did they do that? Because their definition of cool is doing something that nobody else is doing. A company can intervene in the cool cycle. It can put its shoes on really cool celebrities and on fashion runways and on MTV. It can accelerate the transition from the innovator to the early adopter and on to the early majority.[13]

Rogers describes a slightly different pattern, emphasising the role of the media early on in the process. He describes the Bass model which

> assumes that potential adopters of an innovation are influenced by two types of communication channels: Mass media and interpersonal word-of-mouth channels. Individuals adopting a new product because of a mass media message occur continually throughout the diffusion process, but are concentrated in the relatively early time periods.[14]

These ideas suggest that once a trend or innovation has been successfully kick-started via media channels it can run wild in a society without the assistance of external forces such as more media coverage. While this idea of an epidemic run wild is exciting, it still places the media in a prime controlling position. However, there is more to the Innovator than mere stooge of the media. The above quote from Gladwell's article

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[13] Gladwell, 1997, pp. 83-4.
[14] Rogers, 1995, p. 81.

continues, “but [a company] can’t just manufacture cool out of thin air,” and this gets more at the spirit of his writings. There are true Innovators out there, in all fields, who are doing their own thing. If, as the Coolhunters attempt to do, you can spot what these people are doing you may just be able to create the next big thing. Some people, in any part of society, will be doing things differently from anyone else, and if you are able to spot which behaviours have the potential to reach a wider audience you can speed and encourage this process.

This idea is behind the lead user process developed by Eric von Hippel. The technique is designed to be used by a company looking for new product developments, and involves finding the Innovators in related areas. Through networking, the development team members work their way to the leading edge of product use, to find people who are creating their own solutions to problems in the target market and those related to it. For example, a team at 3M were looking to expand their line of surgical drapes, thin plastic films that are stuck to a patient’s skin at the point of incision prior to surgery. The incisions are made through the drapes which isolate the area being operated on from the external environment. They found alternative solutions being used in developing countries where infections are more common and budgets are tighter. Veterinarians also used alternative methods of controlling infection, and Hollywood makeup artists used different ways of applying easily-removable materials to human skin.[15]

Von Hippel also cites products such as the Apache web server as an example of just how many innovative users there are today. Apache is a piece of software developed by volunteers and is the most widely used web server.[16] Software like Apache, Linux and Napster are all “bottom-up” phenomena, developing from individual users rather than companies that have spotted an unexploited market.

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[15] Von Hippel, Thomke, and Sonnack, 1999.
[16] *www.netcraft.com/survey/*

Obviously, there does not appear to be a simple model of how an innovation or idea becomes widespread. In cases such as Napster, or the instant-messaging application ICQ, any existing user will continue to notice new waves of media interest and new users. More media coverage generates more users which in turn makes the product more newsworthy. Initially, new users of ICQ could only have found out about it from friends that were already using the software. As it became popular it became more noticeable and worth covering in the media. Now users can find out about the product from users or by reading about it.

Danny O'Brien, co-editor of the weekly Internet newsletter *Need to Know,*[17] identified four waves in this media diffusion process:

> The first wave was the discovery: when a small group of people do something for the hell of it.
>
> The second wave was the initial media discovery. A couple of journalists write about it, because they are intrigued by it, involved in it, or are paid by evil media organisations to track down promising new methods of maintaining the tawdry allure of the capitalist conspiracy.
>
> The third wave is journalists writing articles based on what they'd read in the second wave articles. These journalists have no experience of the phenomenon. They just read a lot.
>
> The fourth wave is journalists writing articles in the absolute conviction that they are first wave journalists because they have noticed that people are doing it on the streets. These people are doing it because they've read the third wave journalists.[18]

In our example of ICQ, the users are the first wave. The second wave might be people who began using the program after hearing about it from friends and decide to write about it for their online newsletters. After reading these articles journalists will

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[17] *www.ntk.net*

write about ICQ (and, by then, perhaps its imitators) for the feature sections of national newspapers. The final wave may then involve a jokey piece on the local TV news about this instant-messaging craze they've "discovered." This process illustrates that just when you think a topic has reached the point of total media saturation, another outlet will "discover" it anew, giving it more momentum and leading to further spread of the idea online. Illustrating this, I recently came across an article in the *San Francisco Chronicle* introducing the instant-messaging craze that I'd assumed had been exhaustively covered everywhere.[19]

Recently there has been an effort by many marketeers to avoid conventional media and utilise the alternative channel: word-of-mouth. Steve Jurvetson and Tim Draper coined the term "viral marketing" in a paper they wrote in 1998.[20] As directors of the venture capital firm Draper Fisher Jurvetson, they were early investors in Hotmail, the web-based email application. Much of the product's early marketing relied on tagging each email sent by users with a link back to the website. Consequently the Hotmail meme was spread to the friends and associates of every current user, implicitly showing the support of the email's sender. In this way the company acquired 12 million users in 18 months, spending only $500,000 on marketing, compared to Juno, a close competitor, that spent $20 million on acquiring "a fraction" of this number of users.

This strategy, however, was almost faking word-of-mouth. Adding a link to Hotmail to the end of all its outgoing emails was certainly successful, but it is less than spontaneous endorsement by the users. Other viral marketing techniques rely successfully on pure word-of-mouth. Virgin Net, an internet service provider in the UK, staged just such a promotion as this email to the UK Net Marketing list[21] demonstrates:

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[18] O'Brien, 1999.
[19] Kirby, 2000.
[20] Jurvetson and Draper, 1998.
[21] *www.chinwag.com/uk-netmarketing/*

Date: Tue, 22 Feb 2000 18:29:25 +0000
From: Jo Peat <jo@london.virgin.net>
Organization: Virgin Net
To: uk-netmarketing@chinwag.com
Subject: Re: UKNM: benign viruses

We ran a very sucessful viral marketing campaign with the Virgin Net cinema ticket giveaway.

We emailed just 25 opinion formers and all 20,000 tickets were snapped up in less than three hours. At its peak we received 450 emails a minute, demand outstipping reply by about 2 to 1. Requests even arrived 6 hours after the promotion ended.

III. EXPECTATIONS

Once I have obtained a useful amount of data on the frequency of use of a word in the two domains, grassroots Internet and mainstream media, I will be able to plot the frequency of each word over time in the two domains on the same graph in the form of cumulative frequency. While the absolute count of usage will be different in each domain, due to the amount of material in each of them, the relationship between the two lines of usage should be instructive. I would imagine that the lines will describe s-curves, although this depends on being able to track an idea from its initial use through to its peak. The curves may include only parts of s-curves if the time period is not long enough for a certain idea. In other words, we may begin tracking a word after it has already started to spread.

While Theodore Modis suggests this neat s-curve model could apply to "ideas or rumours" (as mentioned earlier), we should note a number of differences between what we are examining and most of what he has looked at. An s-curve assumes there is a finite "market place" for whatever is being tracked, that eventually a saturation point will be reached and the frequency will gradually slow, approaching zero. Is this a pattern we would expect from monitoring a word's frequency in the press? I would imagine that some fads would follow this pattern, but I'm not sure whether all new terms would. Despite Modis' belief I feel that usage of words will not always follow such a regular pattern over a long period of time, particularly in the media; a flurry of interest when new developments or crises occur, then slowing until the next newsworthy event. But maybe over the long term this averages out to form one of Modis' curves…

However, before beginning the study, I would imagine the s-curve (if it is an s-curve) describing usage on the Internet will be positioned earlier on the graph than that describing media usage. This would indicate that individual people are discussing these ideas for some time before they are picked up by the media. It is only when they have gained a certain momentum, when a certain number of people are talking about this idea, that the press will deem it worth reporting. If this is the case, can we find a certain common point at which the media began to take notice? Can we predict by extrapolation when a new idea will breakout from individual discussion into being a widely-reported concept?

Such a situation may indicate that individuals "make" some of what we read as news, that the media are merely reporting what is happening. This conclusion would, however, assume that all new ideas spring from individuals in the first place. This belief is behind viral marketing whose aim is to build awareness of a new product by word-of-mouth, rather than by a traditional media blitz (although the blitz may well follow an initial viral marketing phase). *The Blair Witch Project*, for example, was seen as having risen from an enthusiastic Internet fan base spreading word about the new low-budget movie. However, some reports suggested that this fan base was actually low-budget

marketing that gave the movie a credible edge. The creators of one site that claimed to be run by “very dedicated fans” turned out to have connections to the film.[22]

We may find, of course, that ideas do not reach a certain threshold of use online before appearing in the media. If we consistently find that appearances of these memes in the media precede growth in usage online, then perhaps the agenda is set purely by the conventional media.

Of course, the world is not so simple that a one-way flow in either direction is a realistic model. Within each domain there are many influences and interactions, and the process of diffusion of a new idea within just one would be complex enough even if it could be isolated from all external influences. I would not want to suggest that for a new idea to “break out” of the world of mailing lists and newsgroups onto TV and into newspapers is a simple case of discovery by one journalist which then opens the floodgates to instant blanket coverage with no further reference to its source. If the meme we are looking at is topical and important, then its speed and breadth of impact will be larger. A computer virus that spreads into many large corporations in a single day will, once reported in one major news outlet or feed, appear everywhere. Conversely, an emerging computer program such as ICQ will only appear in the media gradually, as discussed earlier.

Theodore Modis suggests that cumulative s-curves are so predictable we can use them to forecast when a frequency will slow to a trickle. Will we be able to do this with our tracked words, predicting when usage has reached its peak? Whether we can or not, will there be other patterns? Will we find a big jump in usage in the media sparks debate online, causing a similar jump there? Or will it be the reverse? So, in summary, the points I wish to address are:

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[22] DiLucchio, 1999.

1. Are there any common patterns of diffusion?
2. Do all memes become popular in one of the domains before crossing to the other or do some appear first in grassroots, some in the mainstream? Or is diffusion concurrent in each domain?
3. Can we predict when a meme will break out from one domain to another?

IV. METHOD

The aim is to reliably track the frequency of appearance of certain ideas in both grassroots Internet fora and in the mainstream media. By "grassroots" I mean areas where the content is generated by individuals rather than companies in the form of email lists, personal websites, discussion boards and Usenet. The definition of "mainstream media" has become increasingly difficult as the old guard has scrambled to catch up with the Net. For a while there was little on the Internet that could be regarded as mainstream, especially if it wasn't supported by part of old media. These days, however, the line is becoming more and more blurred. *Salon*[23], the online magazine, would have seemed like an alternative to the mainstream when it began in 1995. Now, however, it is positioning itself as a big player in the media world. Such matters become more complicated when Slashdot[24], a hugely popular technology news and discussion site, was bought by Andover.net, a network of open source-oriented web sites. While its output has changed little since the purchase, should it still be considered "grassroots" considering it is now a subsidiary of a large company? There are obviously no hard and fast rules here, but in most cases I will use mainstream to mean publishing that is funded by a company. There are exceptions to the rule, and I would still regard both Slashdot and Jim Romenesko's MediaNews[25] (bought by Poynter) as grassroots in both origin and the way in which they are currently regarded by many people.

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[23] *www.salon.com*
[24] *slashdot.org*
[25] *www.poynter.org/medianews/*

Given the vast scale of both domains, the grassroots Internet and the media, the tracking of ideas must somehow be automated. To achieve this, specific words and their frequency of use will be used as indicators of certain memes. The words to be searched for must be specific or highly correlated with the idea or meme. For instance, “Britney Spears” would give a relatively accurate count of the appearances of the teen sensation (aside from the slight possibility of anyone less famous sharing her name). Similarly, terms such as “MP3,” “Linux,” or “Blair Witch Project” are specific to the ideas they represent.

Other concepts unfortunately do not have unique terms and must be left from the search. For example, an increasing number of computer programs utilise “skins” to allow the creation of personalised front-ends – want your MP3 player to look like Britney Spears? Then download one of the Britney skins[26], created by adoring fans, and there she is, complete with graphic equaliser. However, searching for the word “skins” would not return results restricted to this concept of software personalisation. It would be possible to search for, say, articles that referred to both “skins,” “WinAmp” and/or “Mozilla” but this would be a subset of the entire concept. Therefore this research will track only those memes that are associated with a unique term or terms so that this term does not refer to other memes.

Searching large information sources for word patterns is not new, and a whole field called “bibliometrics” has developed. Watts and Porter applied it to looking for emerging technological trends and summarised the field thus:

> Bibliometrics uses counts of publications, patents, or citations to measure and interpret technological advances. Such analyses assume that counts of papers or patents provide useful indications of R&D activity and of innovation, depending on the sources examined. Another key tenet is that one can ascertain important links by analysing which topics occur together, which organisations produce what

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[26] *www.winamp-skins.com/dedicated_britney.html*

> papers and patents, and who cites what … Co-citation analysis identifies pairings of articles jointly cited by later articles. From these, cognitive structure may be inferred. Co-word analysis, dating mainly from the 1980s in Europe, looks for words appearing together … Bibliometric limitations need to be noted. Counts do not distinguish quality, and much technological development work is not reflected in publications or patents, at least not in a timely manner. Publishing and patenting practices vary considerably across fields and by institutions.[27]

Such analysis of patterns and co-occurrences would, I feel, be interesting if transferred from the domain of patents to more grassroots discussions. Unfortunately, such complex comparative procedures are beyond the scope of this project, requiring more resources than are available.

The next decision concerns which sources the project should track. Basically, there should be representative samples from both the user-oriented Internet domain and the mainstream media. There should also be some kind of balance between the two sides: tracking a small number of technology-oriented websites compared to the output of all America's newspapers, for example, would provide results that, while interesting in their own right, would not serve our purpose. First, I shall outline the options for each side, and then discuss the chosen ones.

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[27] Watts and Porter, 1997, p. 27.

The Internet

1. The immediately obvious sources, when it comes to searching the Internet, are conventional search engines. Enter a search term and it will tell you how many pages in its database match the term. While convenient, this is less than ideal. First, one is not searching the Internet, but the search engine's database; if the database isn't updated for several weeks then the results will not change. Second, even when the database is updated frequently it can take weeks for the engine's "spider" to index all of the millions (or billions) of pages. There is, therefore, a delay between what appears on the Internet and what is available to be searched. Third, finding data for specific time periods is impossible: we cannot search the Web as it was this time last year.
2. Usenet newsgroups provide, currently, around 28,000 discussion groups, each devoted to a specific topic. The system was started in 1979 by three students at Duke University and the University of North Carolina[28], and it continues to grow. It is possible to search newsgroups using Deja.com, a site that indexes all newsgroup postings dating back to 1995 (although only those from the past 12 months are, at the time of writing, available via its website). Newsgroups provide a huge array of conversations on any conceivable topic, and all searchable by time on Deja.com.
3. Email lists provide an alternative to Usenet for discussing specific (or not so specific) issues. They are popular not just for the convenience of having the posts arrive in one's email inbox, but also because they can be more private than newsgroups. The "signal to noise ratio" is therefore much higher. With the growth of sites such as eGroups.com, setting up mailing lists has become increasingly easy. However, it is impossible to search the content of a large number of mailing

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[28] Castells, 1996, p. 353.

lists; if it was possible to search all of eGroups' lists, this would be a useful alternative to newsgroups.

4. Weblogs are a fairly recent phenomenon. A weblog is a website, usually maintained by one person, that is usually updated on a daily basis listing news stories and websites the owner finds interesting. While people have been doing this for many years without a defining term, the idea has boomed in the past couple of years, thanks in part to the advent of tools that make the process easier (for more history and explanation of weblogs, see Appendix B). Tracking weblogs would allow us to see what was on the minds of those that maintain them on a daily basis. There is currently no way to search a large number of weblogs at once, however, although a custom program could track a pre-defined list of weblogs on a regular basis.

When it comes to grassroots Internet sources, Usenet stands out as the best example. Conventional search engines are not as suitable for the task, and it is impossible to search many mailing lists at once. With the aid of Deja.com it is also possible to search old Usenet postings, which, would allow us to look for patterns retroactively. It would then be possible to look retroactively for patterns in the propagation of memes that have now become widespread.

At the same time, weblogs are intriguing. The people who run weblogs frequently spend a large amount of time online and are always looking out for new and interesting things. They receive kudos for finding something first – i.e., before any other weblog or news source.[29] They are the "natural scanners" of the Internet. It would be useful therefore, in addition to tracking Usenet, to track a number of weblogs to see if there are any patterns to be found. On the other hand, it would be prohibitive to track hundreds or thousands of weblogs, but a manageable sample of at least a hundred of the most popular weblogs may be interesting as a comparison to see if they really are ahead of the game.

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[29] There is even a page dedicated to tracking which weblogs and news sources are first to link to other places on the web: *pine.cs.yale.edu/blogs/scoops.html*

Even a sample of this size may not provide useful data. Assuming the average daily weblog entry is a handful of paragraphs on a variety of topics, the chances of there being a representative number of "hits" for any chosen word seem slim at this stage, and a good reason for not using weblogs as a primary data source. If the larger weblog-building tools, such as Blogger,[30] allowed time-based searching of all the weblogs on their system, this would have been an extremely useful facility in terms of this project.

Mainstream media

Between TV, radio and printed material only the latter provides any way of searching for frequency of use, so at the risk of instantly ignoring two of the past century's biggest forms of media, this research will look at print as the indicator for mainstream media. There are a number of methods of searching the print-based media:

1. Lexis-Nexis is a traditional database of printed news and magazines from around the world. It currently lists 58 sources with historical archives. While searchable it is not possible to automate the searches. e.g., finding the number of times a word was used each week over the past year requires fifty-two searches of the database.
2. Online news aggregators like Excite's NewsTracker allow the user to search large numbers of online news sources (currently around 300 on NewsTracker). [31] These are mainly mainstream properties that have websites, with the addition a few purely online operations. It would be possible to automate searches of NewsTracker, saving much time, but there are two disadvantages: the archives only date back a few days and the source articles may not last long on their own sites which restricts the ability to examine the full text.
3. A custom-built program to search a set list of news websites. This program could visit each site in turn, look at every current story and search them for occurrences of the words to track. The benefit of this system is that the list of sources could

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[30] *www.blogger.com*
[31] *nt.excite.com*

be customised. However, like NewsTracker, it would be restricted to sources that are on the web and would require a large amount of maintenance. For example, every source that redesigned its website may cause the program to break, and merely making sure it was performing correctly could be a major overhead.

None of the mainstream media sources are ideal, but Lexis-Nexis is the most suitable. The disadvantage is the expense of accessing it outside the college environment since this study will continue after graduation. However, a custom tracking program would not be able to track a suitably large sample without a prohibitive amount of work and computing resources anyway. I am also wary of relying on a site such as NewsTracker that, given the Internet industry's volatility, may drastically change its list of sources or its process, or even cease to exist, with no notice.

Time interval

The next step is to decide on the time intervals. The ideal would be data each day to get a fine-grained view of the changes over time. Some terms will change quickly from day-to-day, and it would be interesting to track these changes. However, the inability to automate the Lexis-Nexis search process means some compromises will have to be made. While it is possible to return the number of times a word is used on any one day, it means 365 such manual searches will have to be made for every word to obtain just a year of data. With a long list of words this will take a prohibitive amount of time and a time interval of a week would be better. A week should be fine-grained enough to provide a reasonably useful look at change over time.

Adjusting for size of source material

Having decided on searching for a list of definite words, a statistical factor needs to be tackled: any increase in volume of the source will skew the results. e.g., if the amount of text posted to Usenet grows, direct comparisons of the frequency of meme appearance will not be useful; any growth may simply reflect the larger quantity of source material.

To combat this problem, the search will also include a set of “baseline” terms. These terms will be words that are unlikely to change in their frequency of use over the lifetime of this project. (Obviously, over long periods the use of language will change but there is little that can be done to account for this.) These baseline words will effectively be an indicator of the amount of content in the database, in the absence of a total word count. The results of searches for the monitored words can then be adjusted by any changes in the amount of baseline words to provide an adjusted total for each time period.

A number of factors need to be considered in selecting the baseline words. First, the words should not be part of a common brand or product name, or something else whose use is likely to change over a short period of time. Second, the words chosen should have fairly similar frequency of use. If one is consistently used fifty times more than any other, fluctuations in its use will disproportionately affect the baseline average. Third, each word should be used frequently enough that an average over time will be representative, but not so much that it appears more than a few hundred times per week in Lexis-Nexis. This is a purely practical restriction; any search on Lexis-Nexis returning more than 1,000 matches does not show the quantity.

I also imposed minimum-occurrence limits. If words are only used a couple of times per week there is too much potential for drastic fluctuations in use. I therefore set minimum limits of 100 uses per week in Lexis-Nexis and 1,000 on Usenet, the variance due to the vastly different volume of material in each source. I decided that a pool of ten words matching these requirements would provide a suitable baseline.

I used a systematic random sample of sixty words from the dictionary and found the frequency of use of each of these for a week from the past year picked at random (the week beginning 26th June 2000). I discarded the words that did not meet the minimum or maximum frequency requirements, leaving twenty. To choose the pool of ten I ranked these words by ratio of frequency on Usenet to Lexis-Nexis. This indicates words that probably have the same usage patterns in the two domains. Table 1 shows the twenty words, with the pool selected being the first ten.

Table 1. Frequency of use of words randomly chosen as baseline words.

	Word	Deja.com	Lexis-Nexis	Ratio
1	vice	6,214	706	9
2	aid	6,063	658	9
3	retail	6,969	603	12
4	ranch	1,180	102	12
5	schedule	7,798	429	18
6	skill	8,362	400	21
7	wire	6,728	276	24
8	animal	13,833	556	25
9	twist	4,049	127	32
10	jet	5,941	176	34
11	pearl	4,644	104	45
12	bus	11,091	248	45
13	previous	22,989	485	47
14	light	43,303	867	50
15	secure	8,757	173	51
16	signal	11,683	224	52
17	gun	19,329	364	53
18	direction	16,416	266	62
19	harm	7,086	114	62
20	tend	14,206	145	98

Having selected the ten words and gathered the full data for each one, it became apparent that some frequencies showed much greater variance over time than others. While the usage of most of these words tended to rise and fall approximately together, indicating greater and lesser amounts of source data, a few showed wildly different variations. As these words are intended to act purely as an indication of quantity of source material I measured the variance of each word over the full time period and rejected those whose variance was markedly greater than the rest of the sample. These were ‘animal’ on Deja.com and ‘vice’ on Lexis-Nexis.

Figures 3 and 4 show the frequencies of these ten words on Deja.com and Lexis-Nexis (without the words rejected for excessive variance).

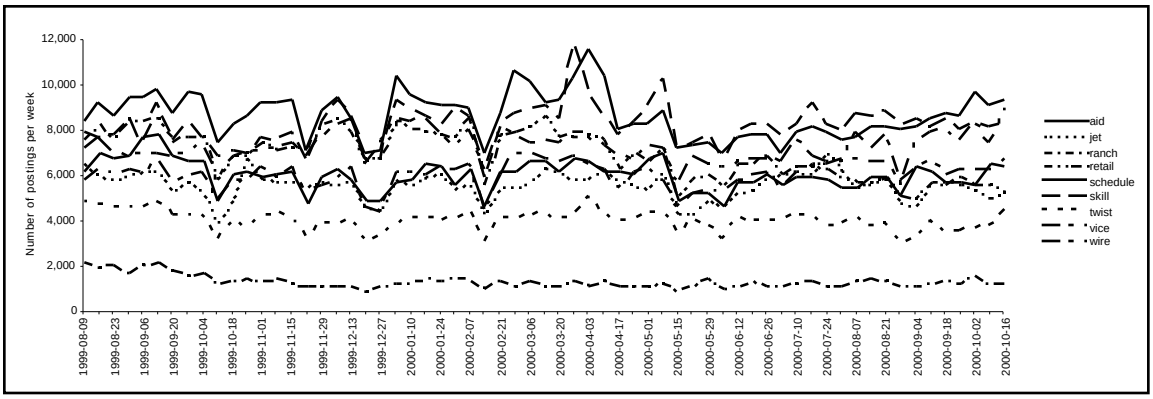

Figure 3. Frequency of baseline words on Deja.com

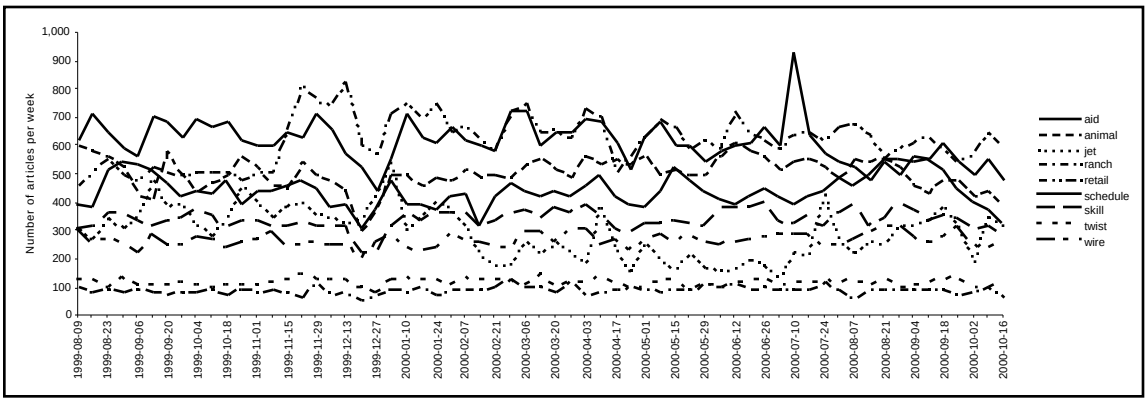

Figure 4. Frequency of baseline words on Lexis-Nexis

Below is a graph showing the percentage change from the average word count for both domains. The total frequency count for all ten words over the period of the project is found and then the average count per week. If, for example, the average word count per week was 1,000 and the week of September 20 1999 had a total baseline word count of 1,100, the percentage change for that week would be 10 percent, indicating a higher than average amount of material. Later, when looking at the tracked memes, every frequency count for that week will be adjusted down to reflect the fact we are looking at a larger amount of material. The formula will be:

adjusted frequency = frequency x (100 / (100 + %change))

where “%change” is the change in the baseline word frequency shown below. Adding 100 to this figure gives us the index of the baseline word frequency.

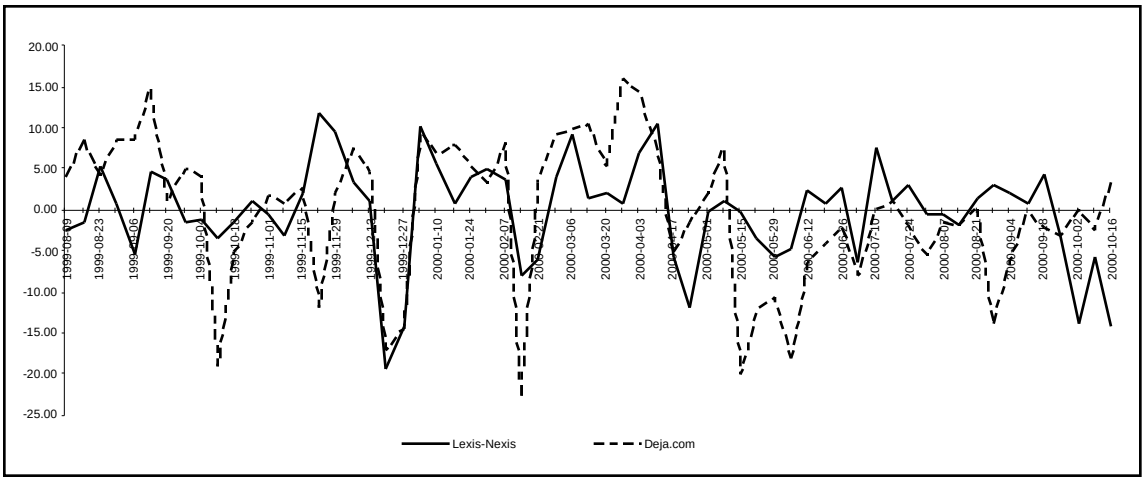

Figure 5. Percentage change from average baseline word count.

Weblogs process

When it comes to tracking terms on weblogs, it will be possible, given the smaller size of the sample, to obtain an accurate word count of the texts looked at, so there is no need for baseline words as an indicator of sample size.

In order to select a list of weblogs, I wanted to use some reasonably objective source, rather than simply pick some myself. Given that I am attempting to track the diffusion of memes, selecting weblogs that are popular will provide a better indicator of ideas that are spreading; if more people are reading them, the more these memes will spread. Ideally, we should perhaps take into account the number of readers of each weblog. We could then see approximately how many people have read the words we are tracking. Finding out how many readers all the weblogs have is not possible unfortunately, so it should be borne in mind that we are tracking the *publishing* of memes rather than the *reading* of them. To construct the list of weblogs to track I settled on combining two sources:

· Weblog Fan-Favourites (*jim.roepcke.com/fan-faves*). This page uses data from Weblogs.com, a directory of weblogs. Members can build lists of their favourite weblogs, and Fan-Favourites lists the top 100 weblogs by the number of times they appear on these lists.

· Metalog Ratings (*beebo.org/metalog/ratings/*). A list of 400 weblogs is scanned every day for links to other weblogs. Every weblog that is linked to gets a point. The top 50 most-linked-to weblogs are listed here.

I combined these two lists, eliminating duplicates, a handful of non-English-language weblogs, and a couple that are either conventional news sites (e.g., O'Reilly Network) or don't fit the common description of weblogs (e.g., Need to Know, a weekly newsletter). This process left a list of just over 100 weblogs. Over time these charts change, partly due to changing popularity, but also due to some ceasing publication, some changing their domain and/or name, and some starting up. To keep the list up to date I will frequently compare it to these two charts and add weblogs that are not currently on my list. As weblogs die, they will be removed from the list. If they change their domain they will also be removed (although their new form may appear on the charts, in which case they will be added in their new guise). The full list of tracked weblogs, and those found on the above sources that are not included, can be found in Appendix C.

I then wrote a program that visits each of these weblogs once per day and looks at the current day's entries. If the entry has changed since the previous day, i.e., it is today's entry, it is scanned for the number of times each of the tracked words is used (including in URLs) and this information is stored in a database. A few sites do not split entries up by day, so I estimated how many entries the site displays each day and this many are used for the day's entry (it is checked for new material before being examined for memes). The total number of words in the entry is also added to the day's total word count. This will be used to adjust the tracked-word data in a similar fashion to the frequency of baseline words in the Usenet/Lexis-Nexis tracking.

V. RESULTS

First, a note about problems I found with the Deja.com Usenet archive that have resulted in difficulties with some results. The most unfortunate problem, mentioned earlier in Method, is that the archive does not currently stretch back to 1995, when Deja began archiving Usenet posts. The site claims the currently available archive dates back to May 1999 but even this seems optimistic and I could find few posts before the second week of August 1999. This, then, is the first date this study looks at. The second problem is the difficulty of searching for terms that include more than one word (for example, “Macy Gray”). Deja.com does not provide accurate counts of search results when more than 100 results are returned. I worked around this by searching for such terms on a daily, rather than weekly, basis and totalling the results for each week. However, one term, “Blair Witch Project,” returned more than 100 results per day on many occasions and I thus had to leave it from the study due to lack of data. Finally, towards the end of the study Deja.com appeared to lose some of its data. While I had previously successfully obtained data for the duration of the study all of the posts between August 27 2000 and September 6 2000, and many either side of that period, appear to have disappeared from the archive. Thankfully most of my research was complete by the time this happened, but a couple of terms suffer from lack of data around this period.

The full data and graphs for each tracked word can be found in Appendix A. Here I shall group the results into common patterns using a few of the words as illustration. First, I shall look at the frequency of word usage over time, grouped into four distinct patterns. Second, I shall discuss the cumulative frequency graphs to see what further information these reveal. These are grouped into five kinds of pattern. All the graphs

shown in this section display the word counts adjusted according to the volume of material posted or published, as discussed in Method. Finally I will discuss the results from the monitoring of weblogs.

Frequency of word use

The four pattern groups are: A general correlation of frequency between domains over the length of the study; Correlation only on a few dates when frequency suddenly rose dramatically and momentarily; No apparent correlation between domains; Those terms whose first use falls within the duration of the study.

There are a few terms which barely registered a presence in the newspapers archived by Lexis-Nexis. I have not included these within this comparison between the two domains. These terms are: *blog, blogger, eazel, kathryn williams, mozilla, ogg vorbis, sdmi, weblog.*

1. General correlation

Of the 24 remaining search terms twelve showed a noticeable correlation between domains over the duration of the study (figures after the term indicate the statistical correlation between each domain, with 0 indicating no correlation and 1 being perfect positive correlation): *badly drawn boy* (0.725), *britney* (0.614), *genome* (0.644), *gnutella* (0.845), *i-mode* (0.375), *institutionalised/institutionalized racism* (0.296), *macy gray* (0.664), *napster* (0.946), *pokemon* (0.823), *reality tv* (0.709), *wap* (0.821), and *who wants to be a millionaire* (0.794). The increases and decreases in frequency on both Deja and Lexis-Nexis follow similar patterns over time and not solely on a few extreme occasions. Perhaps the best example of this is shown in Figure 6, *who wants to be a millionaire,* (the sudden drop in Deja frequency towards the end of the period is due to the disappearance of data mentioned above).

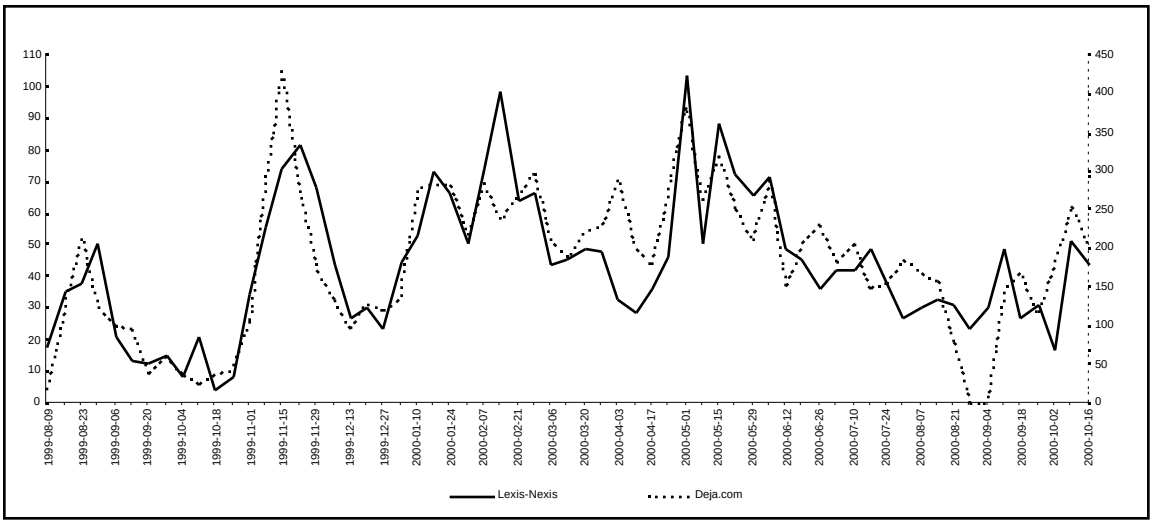

Figure 6. Frequency of *who wants to be a millionaire*.

_ This graph shows an interesting phenomenon rarely seen elsewhere. The first two large peaks (August 1999 and mid-November 1999) show discussion on Usenet peaking the week before media interest reaches its high point for the period. This behaviour does not extend to the rest of the data for this term. If Usenet was, say, one week ahead of the press then lagging the Deja.com data by one week should show the correlation rising. However, for the period from 16 August 1999 to 28 August 2000 (immediately prior to the Deja.com data loss) the correlation drops from 0.820 to 0.726. So, while we can see interest on Usenet occasionally peaks ahead of the newspapers this is not a consistent occurrence. Such pre-empting of activity on Lexis-Nexis by Usenet is rarely found in any other graphs with a substantial level of Lexis-Nexis frequency. The only exceptions being one peak for *britney* and two for *i-mode*. Where there is some similarities between peaks they are usually simultaneous in each domain.

The graphs of other terms are just as closely matched, e.g., *britney* (Figure 7) and *napster* (Figure 8). Others are not but demonstrate a noticeable similarity between the two domains over time. The graph for *pokemon*, for example, shows a large increase in frequency in both domains over a period of around ten weeks, accompanied by a slight drop in frequency towards the end of the study.

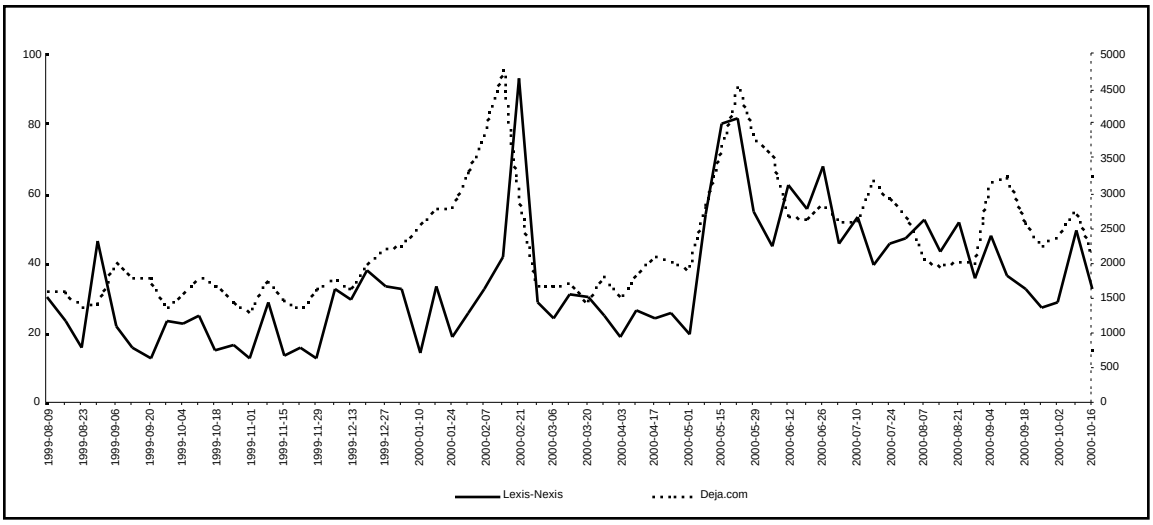

Figure 7. Frequency of *britney.*

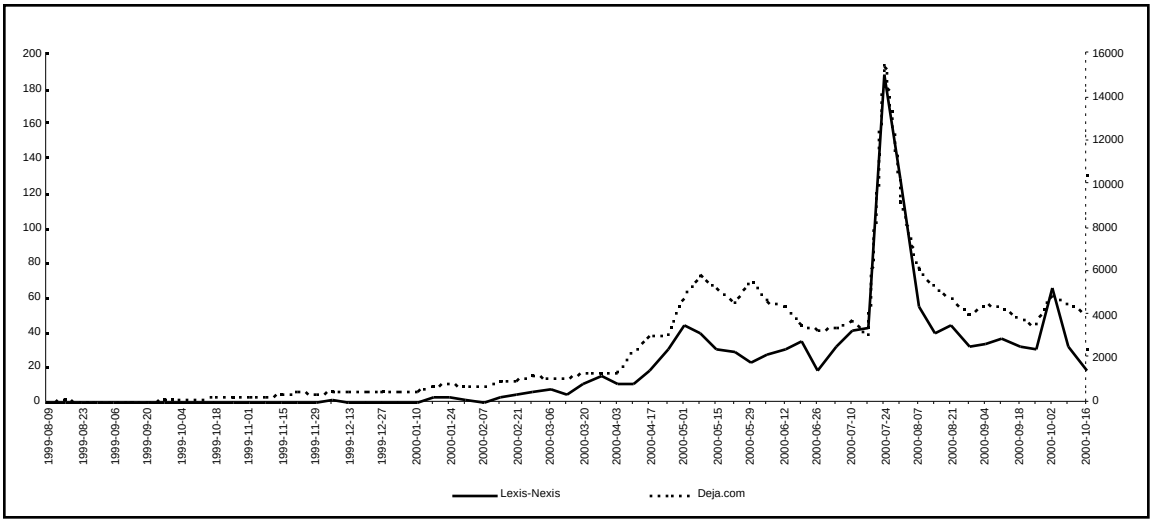

Figure 8. Frequency of *napster*.

One peculiarity with this list of terms is that of the six commercial, non-computer-oriented terms in this study (either TV shows or pop stars), all but one are included in this category. The only other such term in the entire survey (counting the 24 terms which had significant results on Lexis-Nexis) is *david gray*, the results of which are rather skewed by the existence of more than one David Gray. If we include the three computer-oriented brand names (*daikatana*, *i-mode* and *napster*), this list contains seven of the nine such terms. This is a less easy to define distinction, however. These nine terms do not include *linux* or *sms*, but do include *i-mode*.

2. Correlation on a few peaks only

It is impossible to definitively measure this category particularly with terms whose usage fluctuates wildly; do those few matching peaks mean a correlation or, given the total number of peaks, is it purely chance? However, I would definitely include in this category the following terms: *cybersquatting*, *denial of service*, *dna computing/er*, *docusoap* and *weblog.*

Denial of service, shown in Figure 9, demonstrates affinity between the two domains on one occasion when many high-profile websites were affected by such attacks. But there are no other similarities between the results from Usenet and the press.

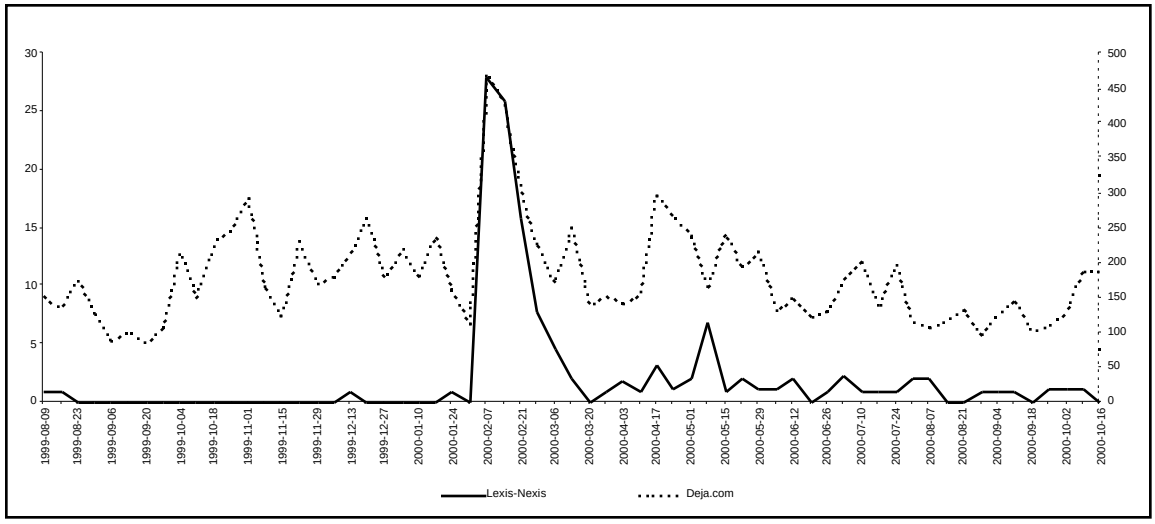

Figure 9. Frequency of *denial of service.*

3. No correlation

There are eight terms for whom it is impossible to recognise any correlation between frequencies in the two domains: *aimster*, *daikatana*, *david gray*, *digital rights management*, *freenet*, *linux*, *mp3* and *sms*. Figure 10 shows the frequency of *daikatana*. The peak in April on Deja.com is discussion of the demo version of the game being released and that in May is the release of the final game. Reviews in the press only appear in June and July, however.

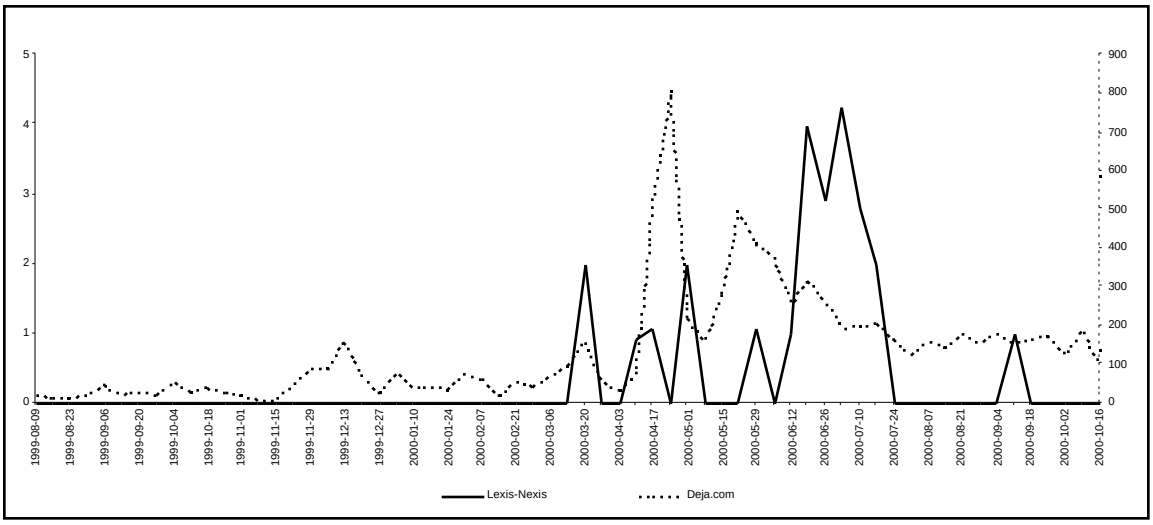

Figure 10. Frequency of *daikatana*.

4. First usage is visible

There are three terms that are included in the above three categories but are also distinct because they first appeared during the research period: *eazel, gnutella* and *napster*. Between these three there is little in the way of common patterns. *Napster*, as shown below, is already present on Usenet at the start of the study, with just under 30 posts per week. Apart from a single mention in December 1999 it doesn't make a regular appearance in newspapers until mid-January 2000. *Gnutella,* Napster's file-sharing cousin, on the other hand, appears almost simultaneously in both domains in March 2000 and follows a similar pattern on and offline thereafter. *Eazel* is somewhere between these two. There are very occasional mentions on Usenet beginning in September 1999 but it is only a couple of weeks before it hits the press in February 2000 that discussion becomes more regular.

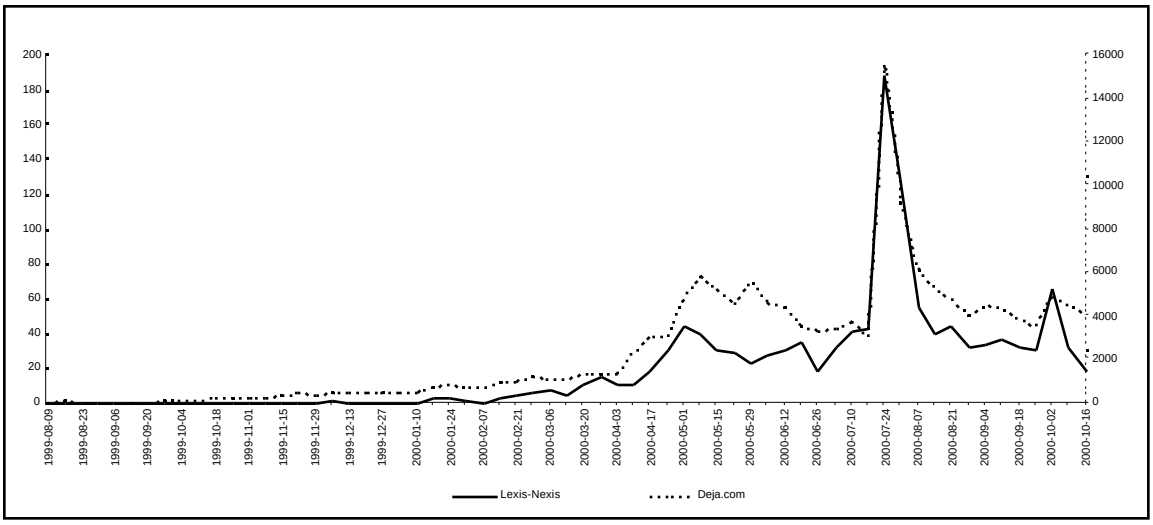

Figure 11. Frequency of *napster*.

Cumulative frequency of word use

Looking at the cumulative count of word usage gives us some idea of whether something is being talked about more or less often over time. The spikes invariably found on the plain frequency graphs are smoothed out and we instead look at the slope of the cumulative line. If it shows a linear increase then usage has remained at a steady rate, with a similar total of word usage being added to the cumulative total every week. If the graph shows the line becoming steeper then use of the word is becoming increasingly common. Conversely, if the slope levels off then usage is less frequent than it once was.

I have divided these graphs into five groups: Graphs that show increasing usage over time, those that show a steady rate of use, those that level off, those that show an s-curve, and three that do not fit into the previous four groups. The divisions between these groups are far from hard and fast. In some cases it is hard to distinguish between a line showing a steady rate of use and one that might display a gradual increase in frequency towards its end.

1. Increasing usage over time

Of the 32 terms, 11 show an increase in frequency of use over the duration of the study: *aimster*, *badly drawn boy*, *blogger*, *digital rights management*, *i-mode*, *napster*, *ogg*

vorbis, *reality tv, wap* and *weblog.* The graph for *wap*, shown below, shows a noticeable increase in frequency of use that is shown as a gradual curve on the Deja line and a sudden change of direction for Lexis-Nexis around the end of January 2000. Thereafter the frequency remains more or less steady for the remainder of the study.

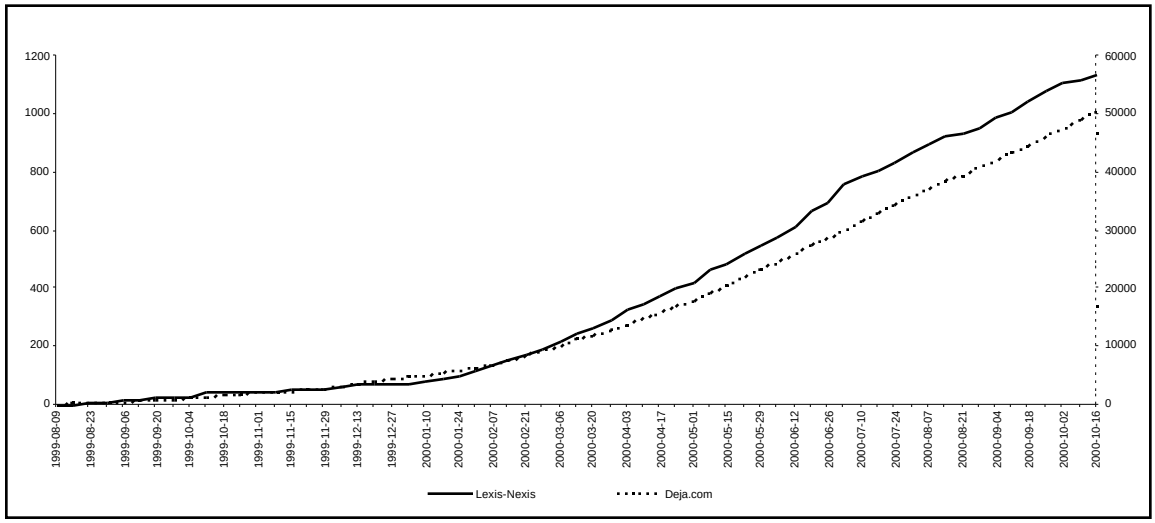

Figure 12. Cumulative count of *wap*.

2. Steady rate of use

Eleven of the 32 terms fall within this category of cumulative graphs: *britney, cybersquatting*, *dna computing/er, docusoap*, *freenet*, *genome*, *institutionalised/institutionalized racism*, *linux, mp3*, *sdmi* and *sms*. There are variations within this however, and some could almost be interpreted as very slightly rising or falling. An interesting example is the cumulative graph for *genome*, shown below. We can ignore the first small jump in the Deja.com line as this is due to thousands of identical messages sent to a single newsgroup. So, other than the jump in both lines around June 2000 we could see this graph showing a steady rate of use over time. Alternatively, the Lexis-Nexis line could be interpreted differently, leaving aside the sudden jump: the early part of the line actually shows a slight increase in frequency over time, with the line trending upwards, while the latter part appears to show the rate dropping slightly. This could almost be interpreted as a subtle s-curve!

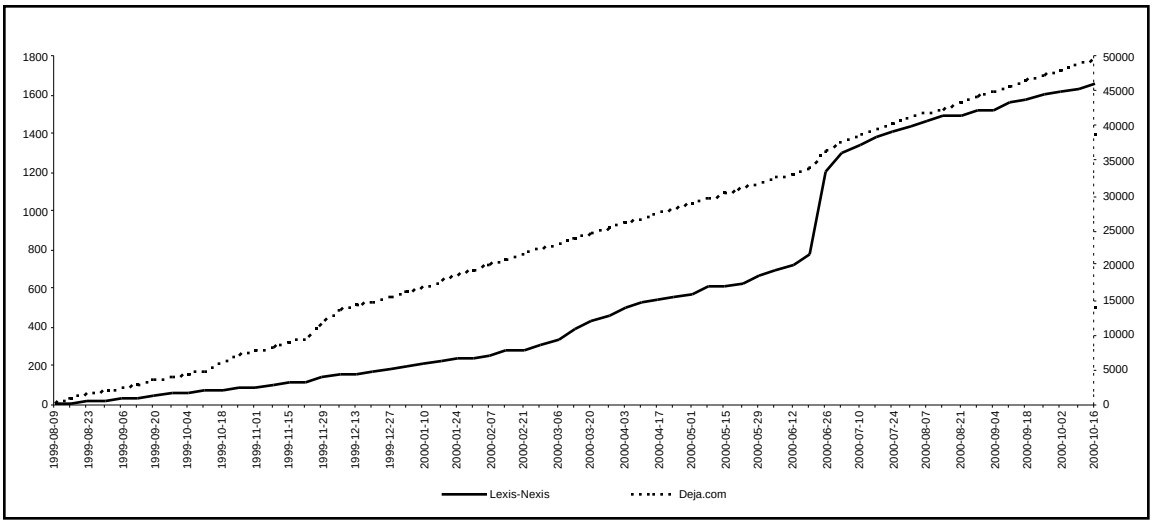

Figure 13. Cumulative count of *genome*.

3. Decreasing usage over time

There are only two terms that clearly fall into this category: *mozilla* and *pokemon*. The former has too few uses on Lexis-Nexis to generate a useful graph, but shows a sudden drop in usage on Usenet around June 2000. The graph for *pokemon*, shown below, shows a gradual decline in use on Usenet and a different pattern in the press resulting, after a period of increased use, in a similar gradual decline. The Lexis-Nexis pattern is more of an s-curve than a simple decline in use.

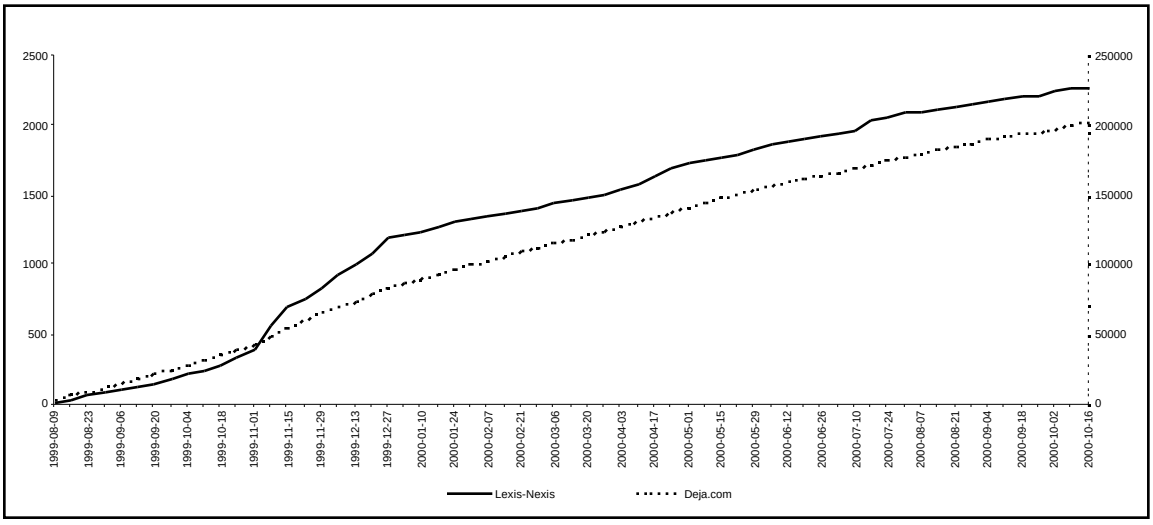

Figure 14. Cumulative count of *pokemon*.

4. Complete s-curves

Five terms have graphs that look like s-curves, although some are very close to straight lines: *daikatana*, *david gray*, *gnutella*, *macy gray*, and *who wants to be a millionaire*. The graph for *macy gray*, shown below, is the most distinct example of an s-curve with usage in both domains following a similar pattern of increasing use followed by a decline towards the end of the study.

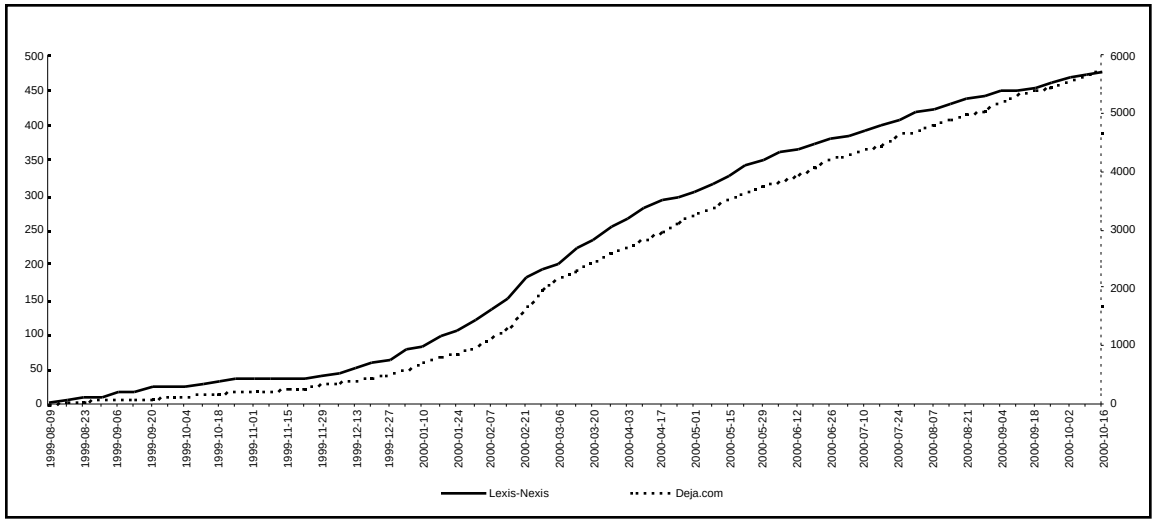

Figure 15. Cumulative count of *macy gray.*

5. Other patterns

Three terms do not fit easily into the previous four categories, displaying more erratic patterns: *denial of service*, *eazel* and *kathryn williams.* The graph for *eazel,* shown below, is a good example. The line for Deja.com shows a sudden large jump in February 2000 and although it settles down after this the rate of use is still far greater than it was prior to the jump. Six months later another similar jump occurs, with usage then returning to the intermediate level again. Given that there are only a total of six uses on Lexis-Nexis for the entire duration of the study, I would normally be tempted to ignore the results. However, it is interesting that even this small sample matches the pattern of use on Deja.com.

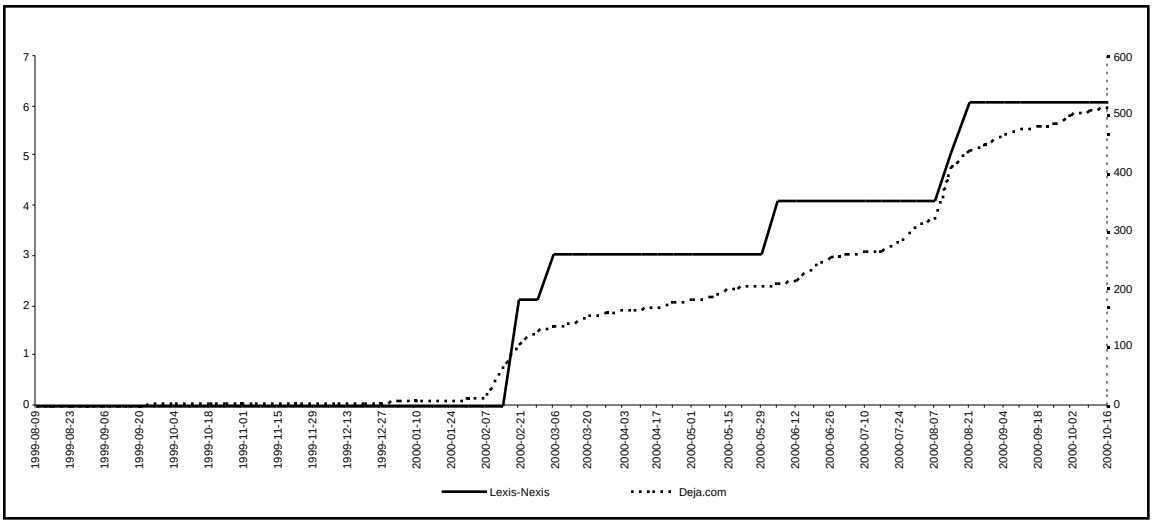

Figure 16. Cumulative count of *eazel.*

Weblog results

Unfortunately, given that there is no way of retroactively searching posts to weblogs, we have a limited amount of weblog-related data, only ten weeks. Given this short window of time it is not possible to compare usage directly between weblogs, Usenet and the press. However, by comparing graphs in Appendix A we can immediately see how some terms are used far more frequently on weblogs than others. Many were never used during these ten weeks, or only a small number of times. Others occurred as much as once per day per weblog on average. *Linux,* for example, was used 1,282 times in ten weeks on just over 100 weblogs! I will return to this matter in the Conclusion.

VI. CONCLUSION

Before discussing the questions posed in Expectations, I would first like to cover some of the problems found with the method.

While Deja.com's Usenet archive is an invaluable research tool, I encountered more problems with it than I expected. First, the current inability to search archived posts prior to August 1999 restricted the historical data. I feel that any patterns in the data would have been more apparent over a longer period of time. Second, Usenet is a far from 'clean' source. Data were skewed on a few occasions by single messages being posted thousands of times over the course of one or more days. Another example is the number of 'cancel' posts from Mozilla which skewed much of that term's data before the posts suddenly disappeared part-way through the study. Third, it is hugely time-consuming to obtain accurate counts of search matches for recent weeks and impossible to obtain accurate data for multi-word strings that appear in more than 100 posts per day.

There are other, less serious, peculiarities inherent to Usenet itself. These become more apparent for terms that are of fairly low frequency. While a large jump in frequency on Lexis-Nexis can be translated as almost simultaneous interest in a topic by a number of alternative sources, the same does not hold for Usenet. If one person posts a message on a topic this might result in a large number of follow-up posts that would not otherwise have occurred. This is not a problem per se, but if the overall frequency is low it generates the appearance of many people being independently interested in something which isn't quite true. The situation could be more serious, however, if the thread of discussion moves wildly off the topic we are tracking but the posts still contain the word we're searching for, quoted in the original message.

The other Usenet-specific problem is that of signatures. The data for *weblog,* for example, show a large spike in July 2000 that is solely the result of a couple of people mentioning their own weblog in their email signatures. They were extremely frequent posters for a short period of time, resulting in this discrepancy. This is not to say the results are flawed; we are, after all, looking at the spread of memes and, as we saw earlier, Hotmail found messages at the end of emails to be a hugely successful means of getting the word out. We should bear in mind that, in this case, while we see a jump in the visibility of the weblog meme (see Figure 17) it is not a result of people discussing weblogs.

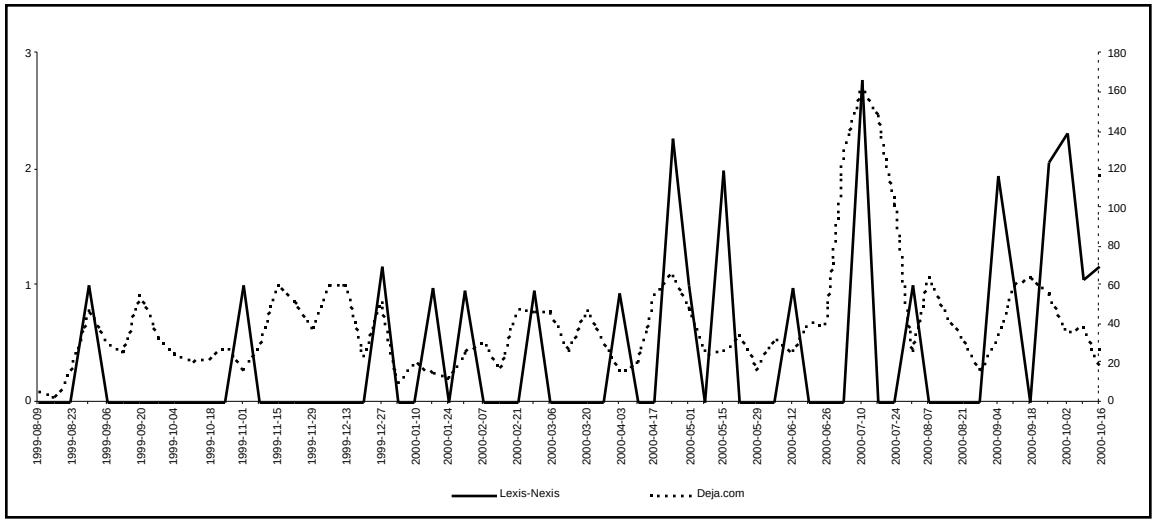

Figure 17. Frequency of *weblog*.

Moving on from Usenet, there were a few problems with the search terms themselves, namely the usage of the term to refer to entities other than those which I intended to track. One example is the number of sportsmen called David Gray, skewing the tracking of the singer of the same name. Another is the common usage of *freenet* long before the particular Freenet I intended to track even existed. There is no way to avoid such difficulties other than to avoid such terms altogether and concentrate on those that are as unique as possible. Even so we may run into problems; the search for *aimster* turned up someone on Usenet who used this as his nickname long before the file-sharing program was thought of!

I was disappointed by the results of the weblog tracking although, as mentioned in Method (page 22), I did have my doubts about the usefulness of the data that would be obtained. Aside from not tracking them for long enough to obtain enough data for comparison with the other domains, there are two factors at work here. As mentioned in Results, the weblogs tracked seem focused on a very narrow field. The frequency of words such as *linux* and *blog* vastly outnumbered less technical terms, many of which never occurred once. This is, perhaps, similar to conducting the Usenet part of the study ten or more years ago, when the proportion of tech-related discussion probably outweighed other topics more than it does today. The only way around this, if the project were to be repeated, would be to scan a much larger number of weblogs in the hope of including those that mention a wider variety of subjects. Even this may not be enough at this stage of their evolution. If they proliferate so that more "non-geeks" have weblogs, they may be a more useful general resource. At the present it is akin to talk radio stations discussing radio more than any other topic.

In Expectations I asked three questions that bear repeating here:

1. Are there any common patterns of diffusion?
2. Do all memes become popular in one of the domains before crossing to the other or do some appear first in grassroots, some in the mainstream? Or is diffusion concurrent in each domain?
3. Can we predict when a meme will break out from one domain to another?

There are a few interesting patterns in the data. As noted in Results, a large proportion of the graphs where both domains display similar patterns over time are those of non-computer-oriented commercial entities. Looking at those for *britney*, *macy gray* and *who wants to be a millionaire* for example, it is striking how closely the two lines follow similar patterns. It would be interesting to have data since these phenomena emerged to see how closely they match over their lifecycle. It could be argued that media coverage is echoing what people are talking about or vice versa. Alternatively it could be that both

domains are only responding to a third stimulus. For example, when Britney Spears is about to release a new record resulting in increased use on Usenet and in the media one of three things could be happening: a) People are discussing what they've read about in the media, b) the media are reporting on what is a popular topic of discussion, or c) the discussion and reporting are both simultaneously fuelled by record company publicity. As indicated in Background, such patterns are not mutually exclusive and each affects the other. I am skeptical, however, that discussion or reporting of commercial products could be purely spontaneous.

Non-commercial terms generally seem to appear on Usenet before making the newspapers but I feel much of this phenomenon could be explained purely by the differences in amount of material. While it is possible to have an extremely low level of discussion on Usenet, newspapers have a threshold of "newsworthiness" that holds them back, resulting in a sporadic pattern of coverage, jumping up and down, for topics that are "bubbling under." It could well be that journalists' knowledge of memes mirrors that of posters to Usenet but this is not apparent from reading their newspapers, where memes only appear once deemed of interest to a wider audience.

Predicting when a meme will, for example, break out from Usenet to the press does not seem possible from these results. The differences between the form of each domain confuse matters. So determining at what point a meme has broken out into the mainstream, let alone predicting it, is not clear: is it when the first story appears, or when *x* stories appear per week for *y* weeks continuously? A much larger study involving a more extensive list of terms over a longer period may reveal more patterns leading to more concrete conclusions on this point.

It would be interesting to test Modis' s-curve theories but, again, the study's duration has not been long enough to obtain anything but the slight suggestion of s-curves in the data. I must admit to being sceptical that the idea can be applied to the domains of discussion or news, as opposed to the finite realms of the number of a composer's compositions or the amount of railroad track laid. This is not to say s-curves would not

be apparent, but I find it unlikely the frequency of many phenomena in the news, say, could be described as single s-curves. The cumulative frequency graph for *macy gray* shows a slight s-curve and I can imagine the cycles of album releases and publicity creating a series of such curves over the lifetime of a performer.

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APPENDIX A – TRACKED WORDS

The following pages show the graphs of results for each of the terms that was tracked. There are three graphs for each term:

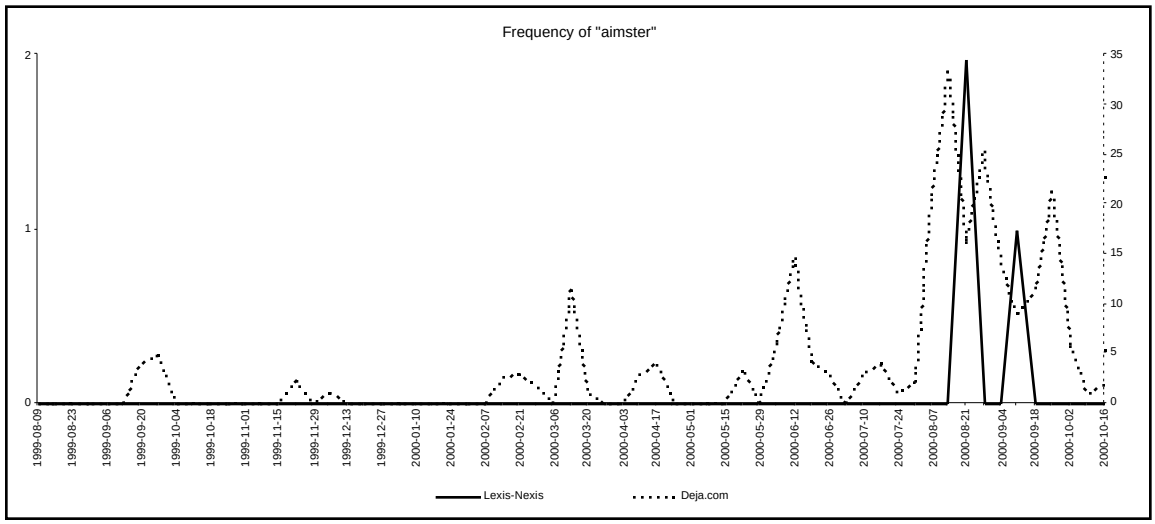
Frequency showing the number of times the Usenet posts or newspaper articles that appeared each week containing the term. The graphs are based on figures adjusted for the number of baseline words appearing per week (see page 26).

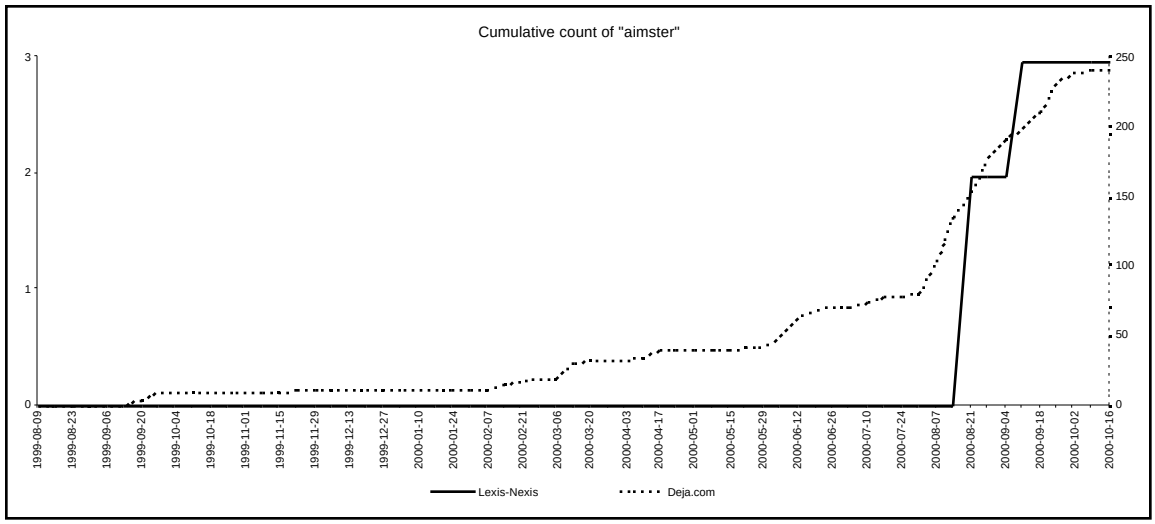
Cumulative count of the above frequency per week for both Deja.com and Lexis-Nexis.

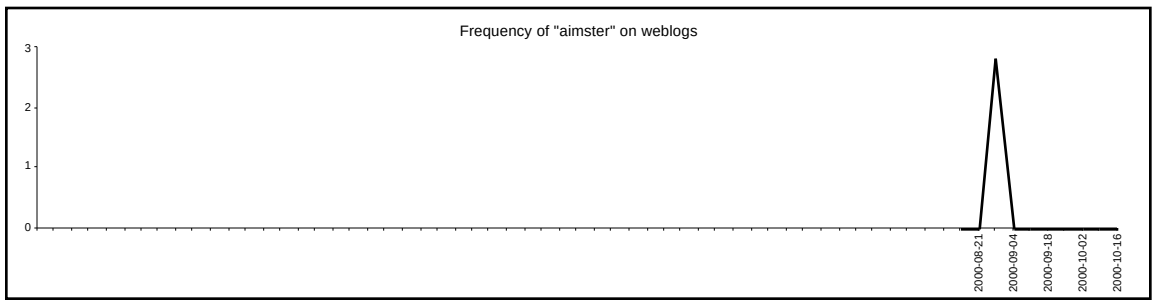
Weblog frequency showing the number of times the term was used on the monitored weblogs each week (data is only available for a few weeks).

Aimster

A file-sharing application based on Gnutella technology, using AOL Internet Messenger. The large August 2000 peak is just after the 9th August launch; earlier occurrences appear to be coincidences, e.g. people using Aimster as a nickname on Usenet.

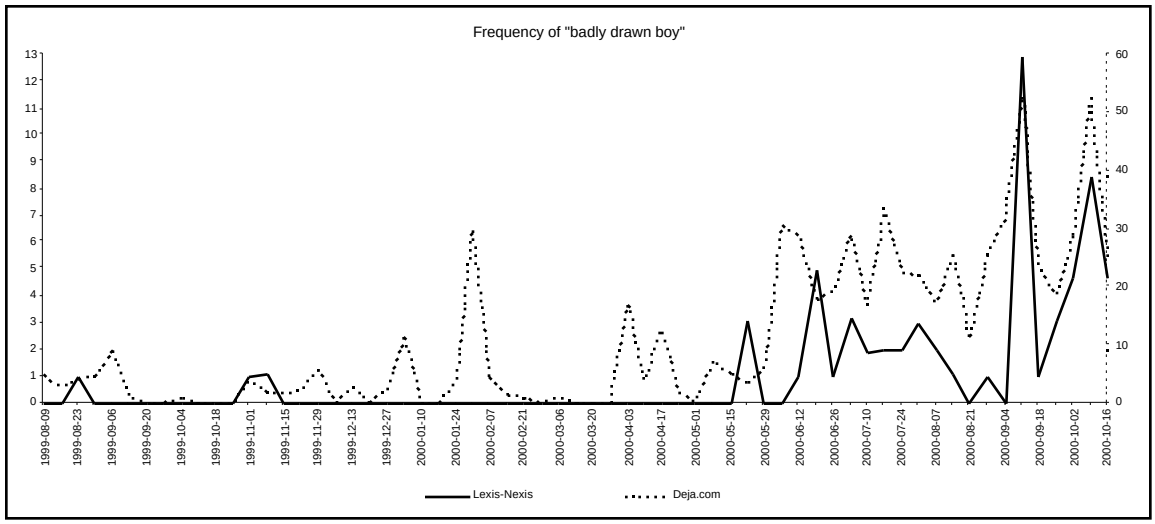


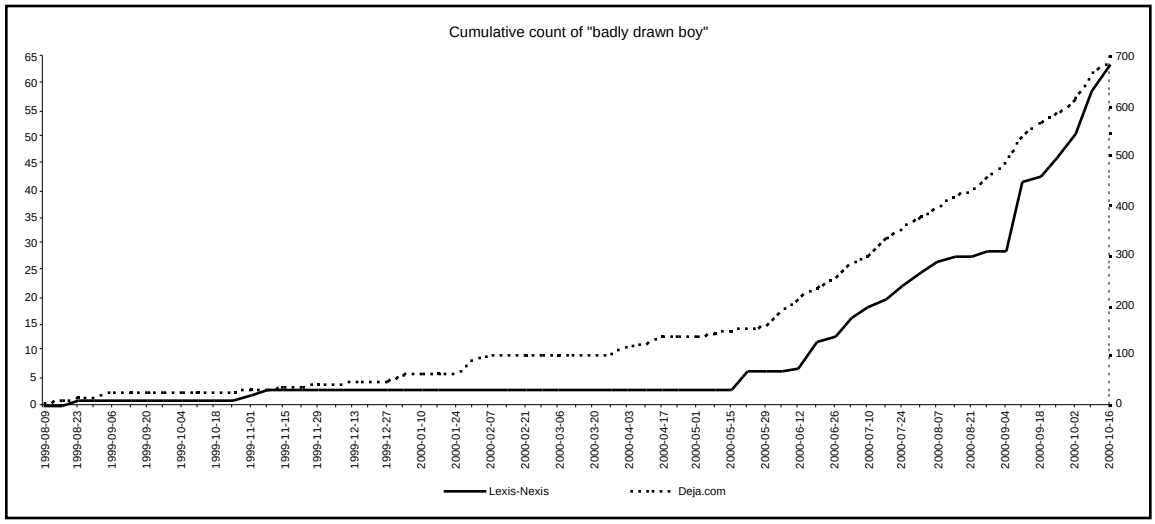


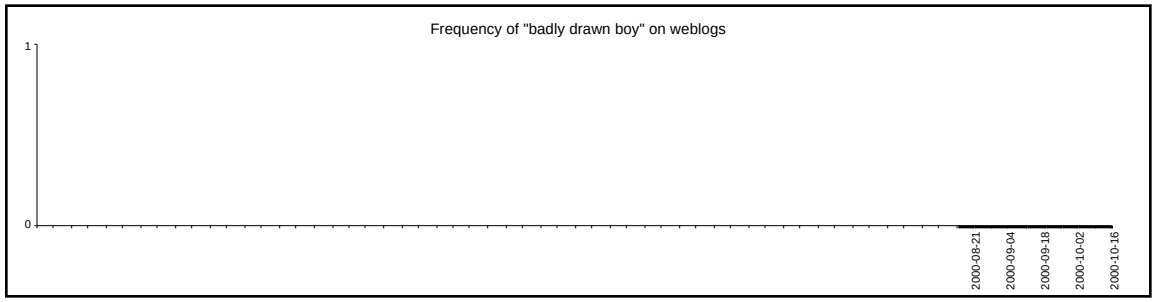


Badly Drawn Boy

A British musician who won the country's Mercury Music Prize in September 2000, coinciding with the largest peak on the graph.

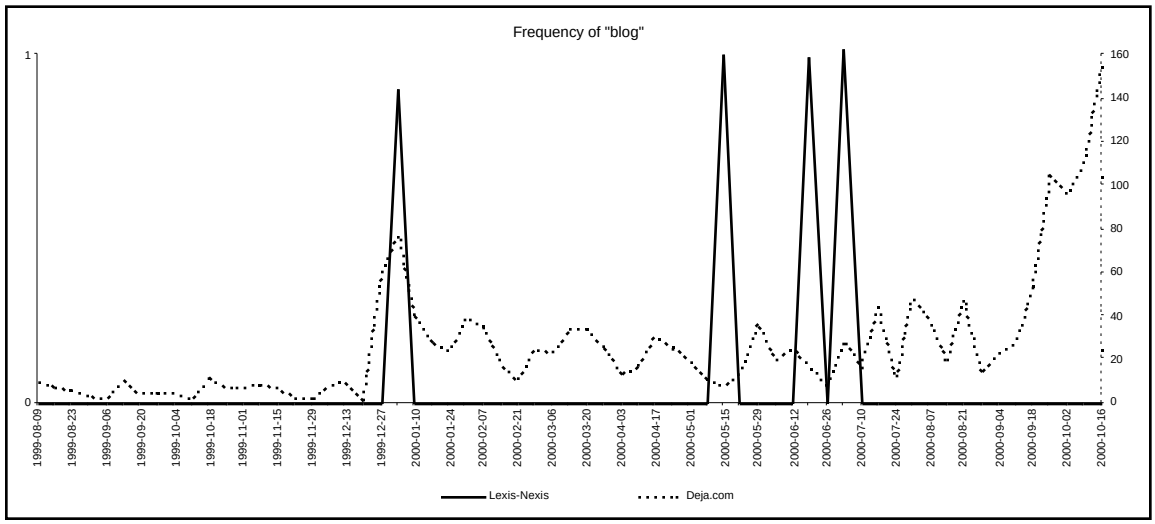


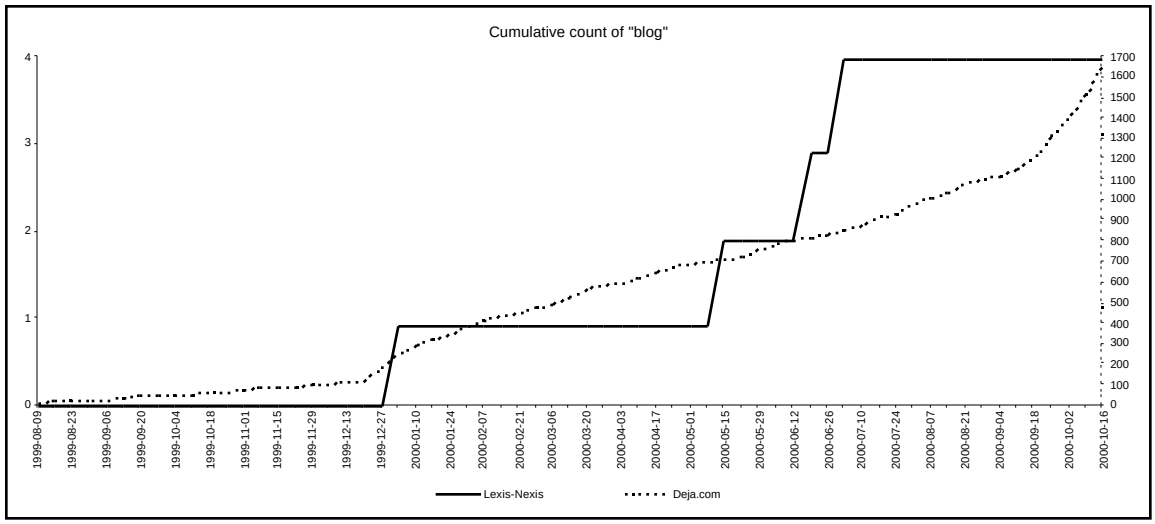


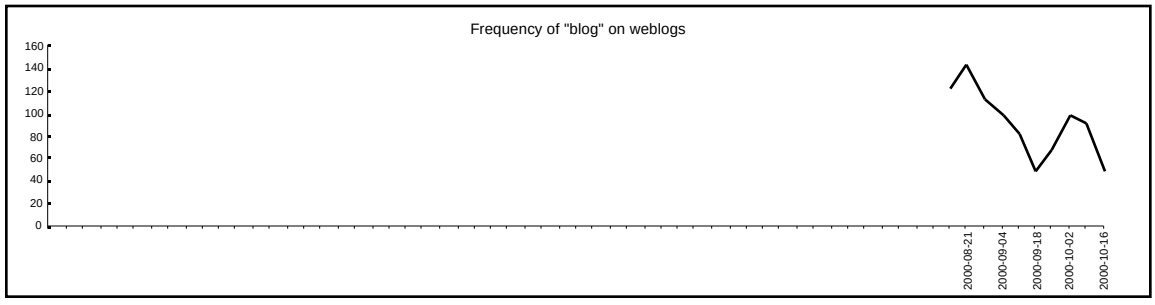


Blog

An abbreviation of “weblog.” Many of the recent Usenet occurrences are a result of posters mentioning their own blog in their email signature. It’s not discussion, but it’s certainly another method of spreading a meme.

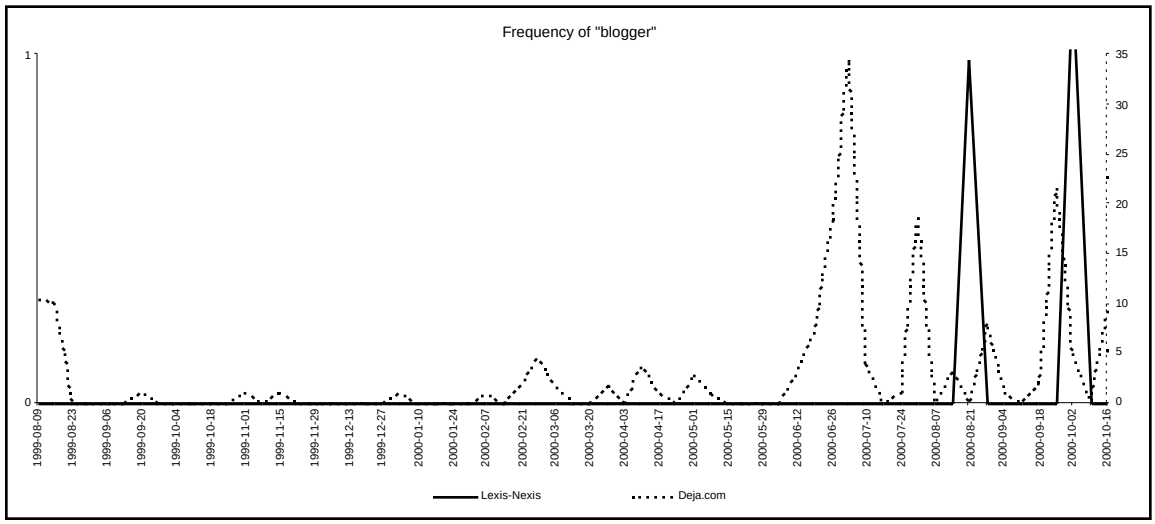


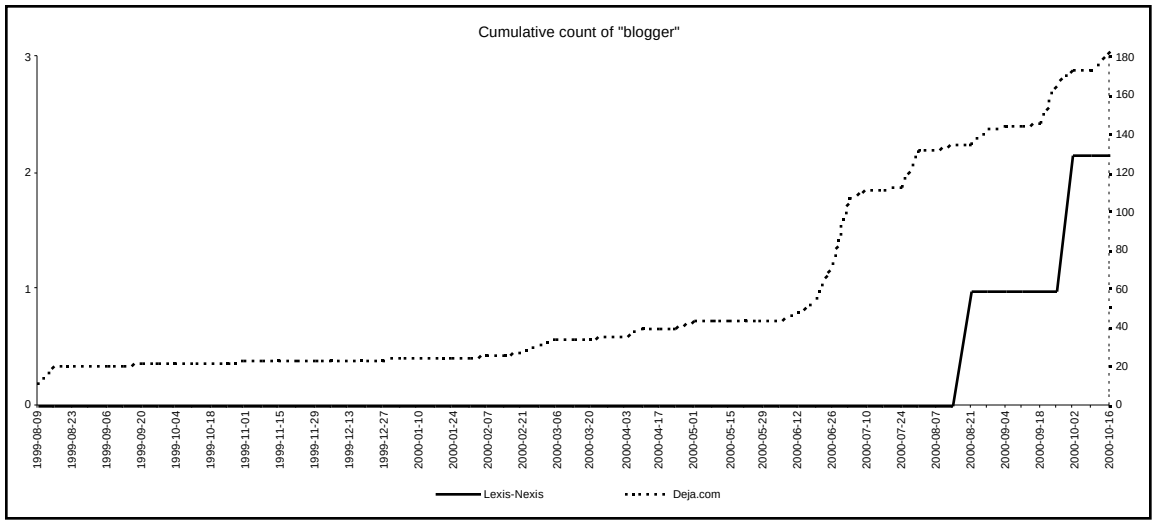


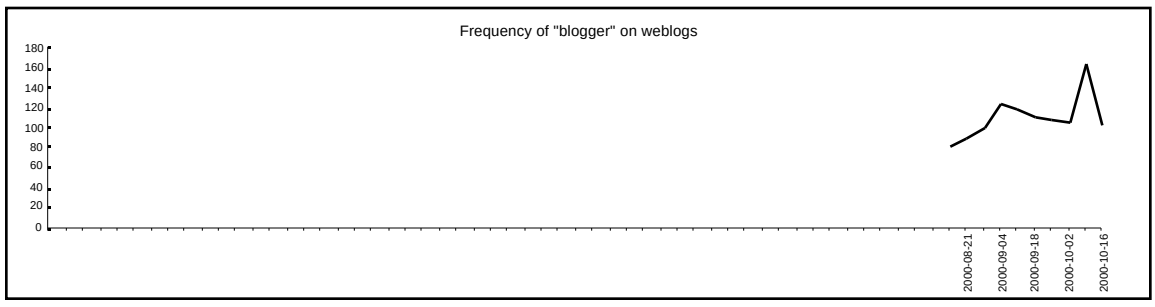


Blogger

The most popular weblog-building tool, and also used to refer to the owner of a (we)blog. However, the Deja.com peaks of July 2000 are solely due to the postings of one person who describes himself as a blogger in his signature.

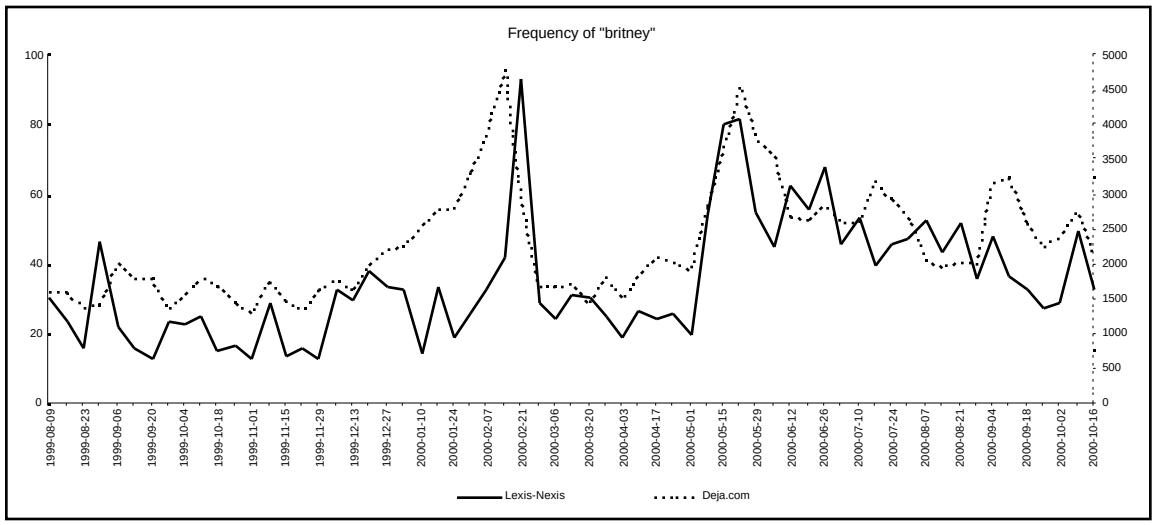


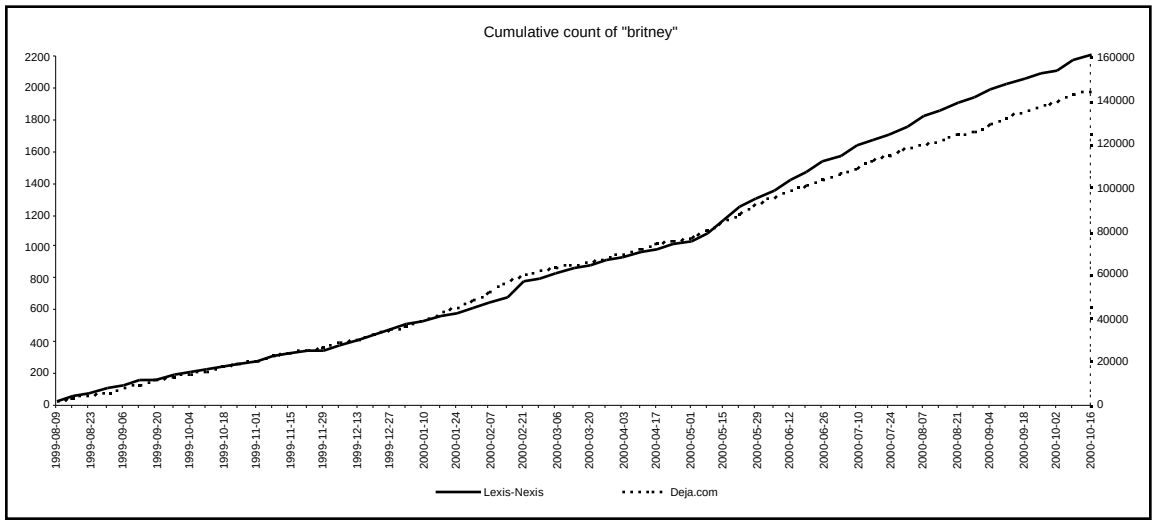


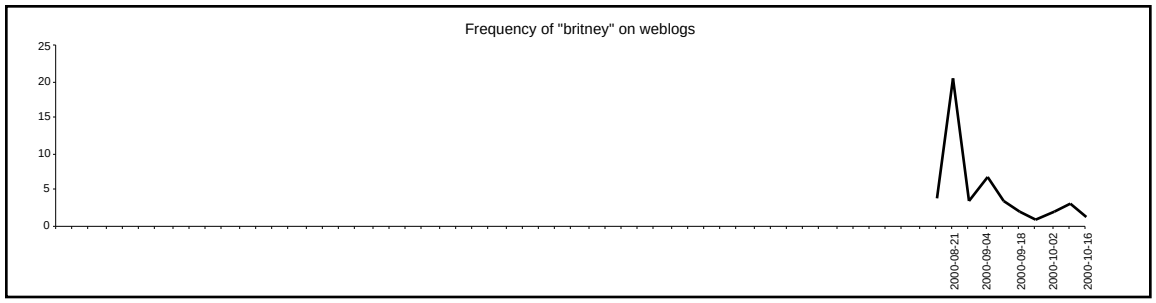


Britney

This may match occurrences of other people also called Britney, but we need to match just Spears' first name, as fans are more likely to use that alone. The peaks in February coincide with her nomination (but not win) at the Grammys and the announcement of tour dates. In May her new album was the second fastest selling ever in the US.

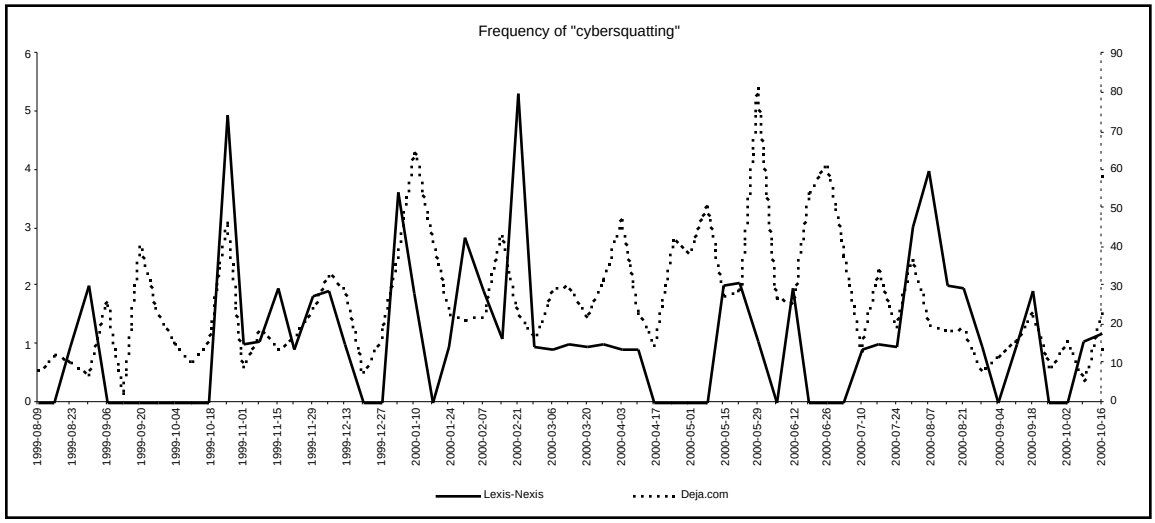


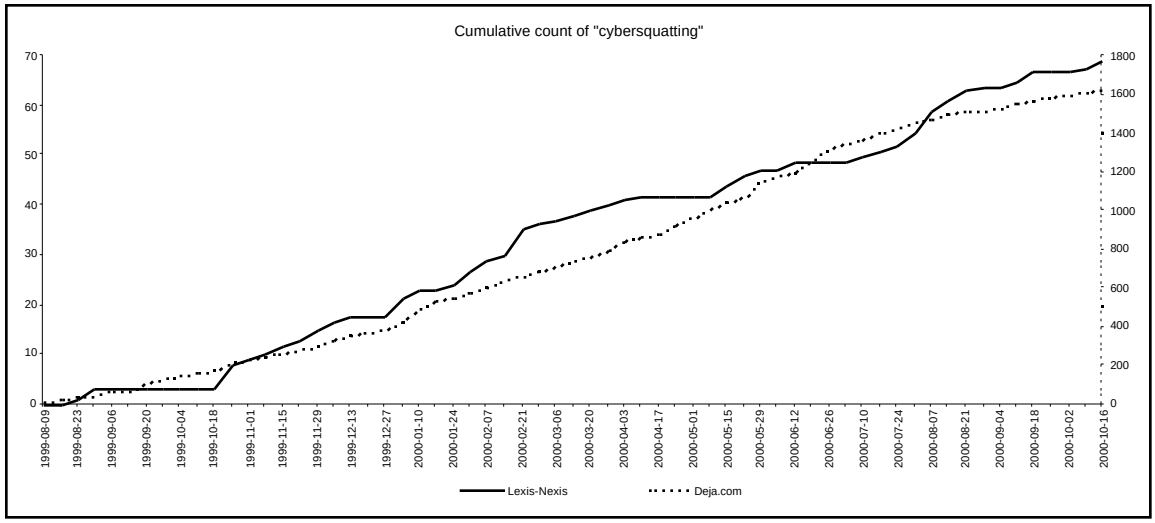


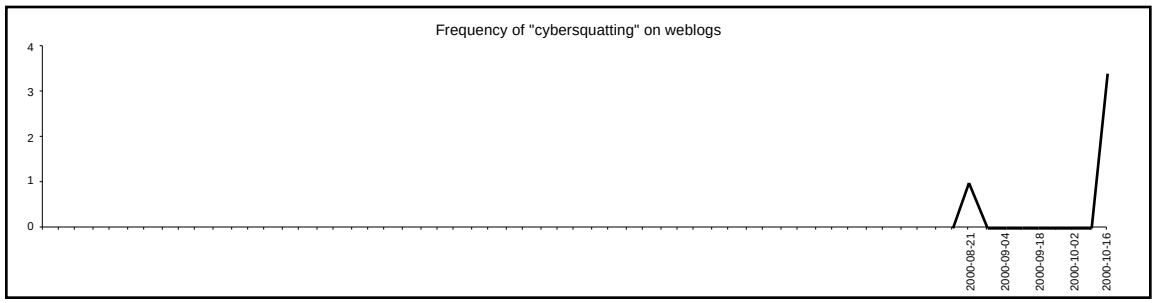


Cybersquatting

The practice of buying a recognisable and available domain name in the hope of selling it for a large profit. The October 1999 peak coincides with a House of Representatives bill attempting to crack down on the practice.

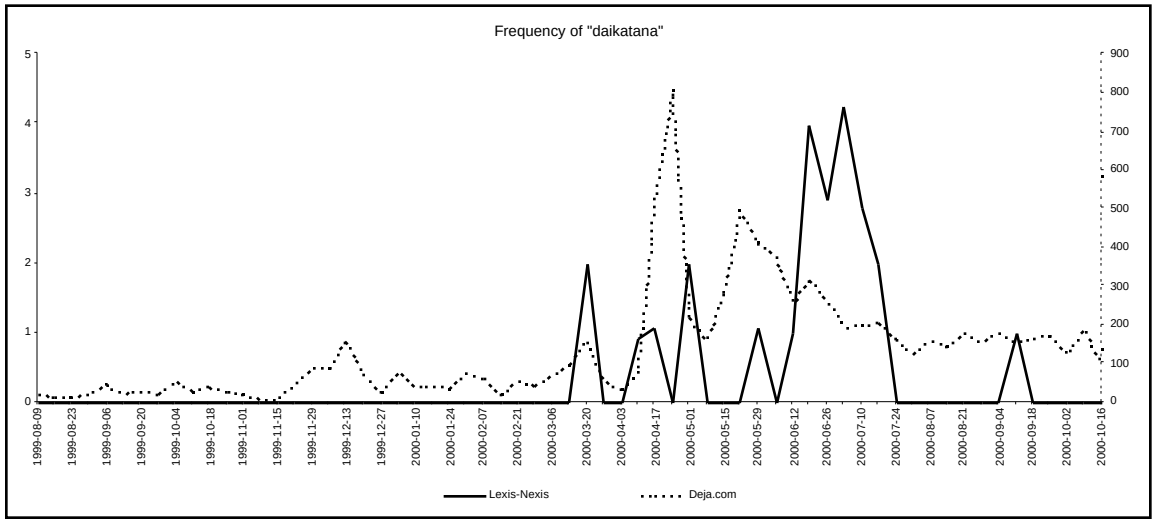


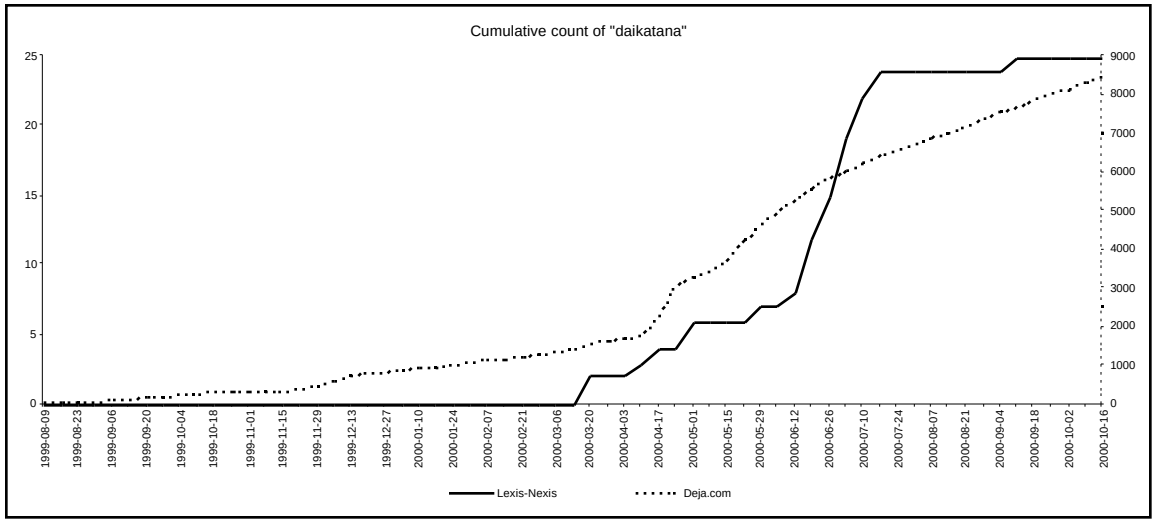


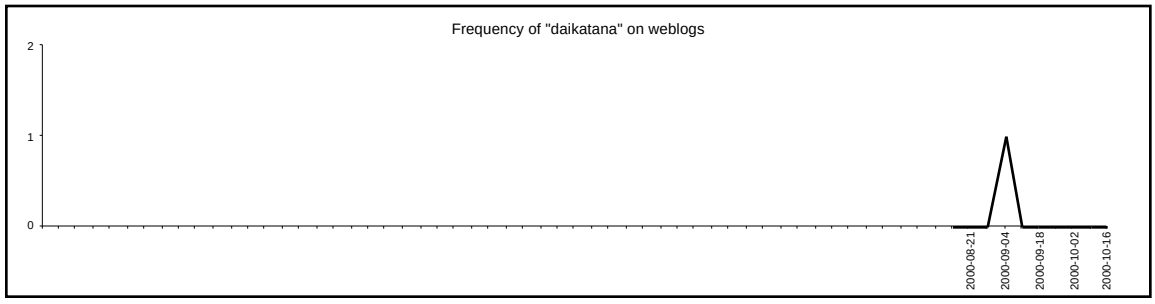


Daikatana

A long-delayed computer game from John Romero, designer of *Doom* and *Quake*. The April Deja.com peak is discussion of the demo version and the May peak with the release of the final game. Reviews in the press only appear in June and July however.

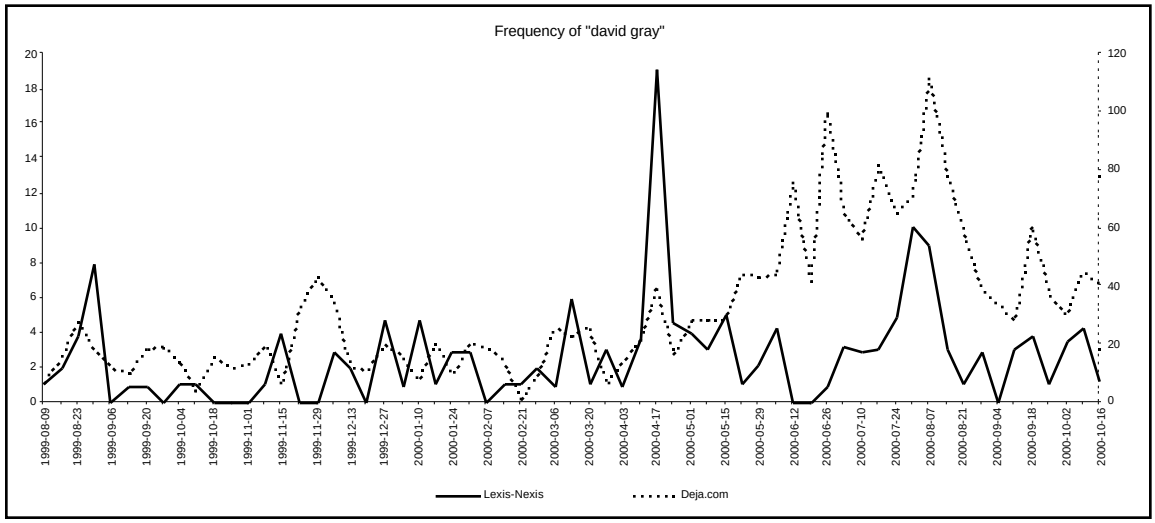


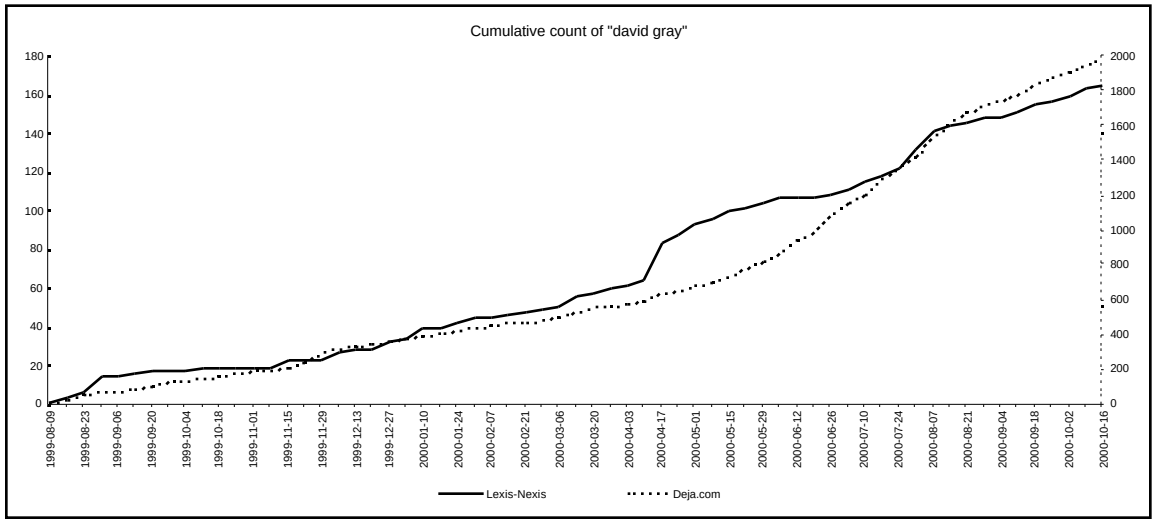


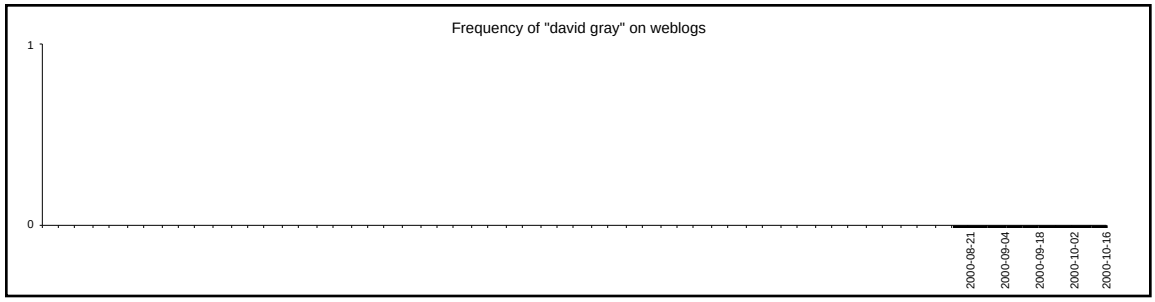


David Gray

A singer. The April Lexis-Nexis spike coincides with the re-issue of his album *White Ladder*. Unfortunately the presence of other David Grays (there is at least a snooker player and a jockey) skews the other results.

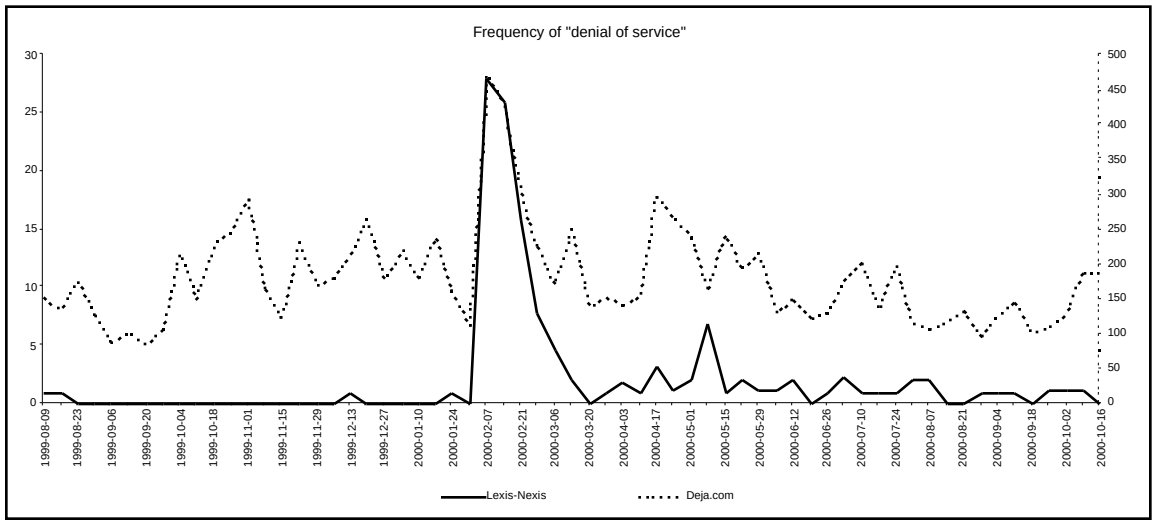


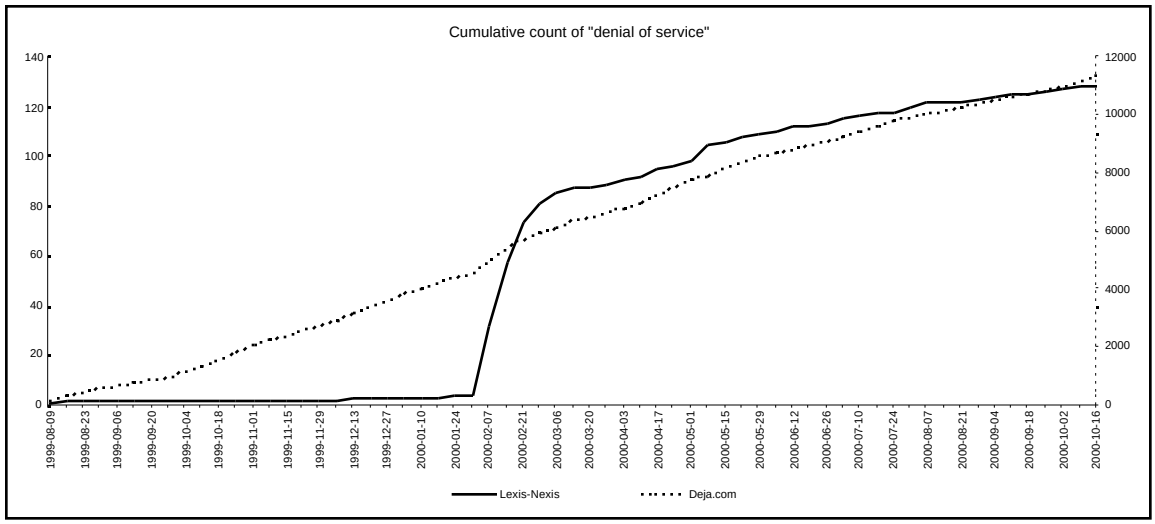


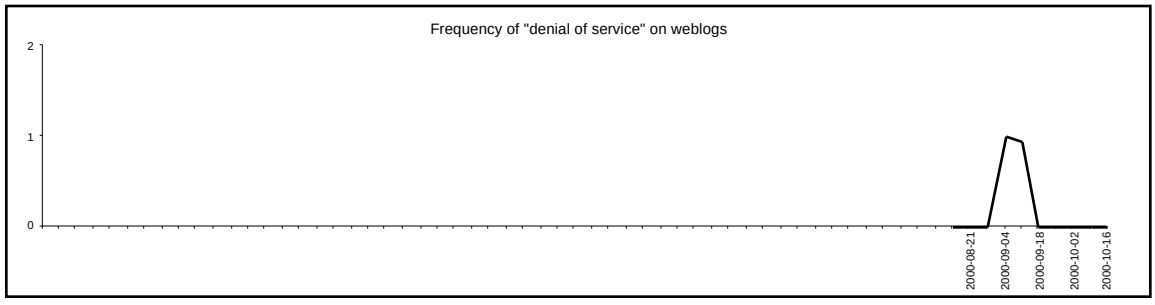


Denial of Service

A method of bombarding a website with requests so that it is unable to function properly for legitimate users. The simultaneous peak in February 2000 is caused by attacks on many high profile websites and the discussion in the weeks following.

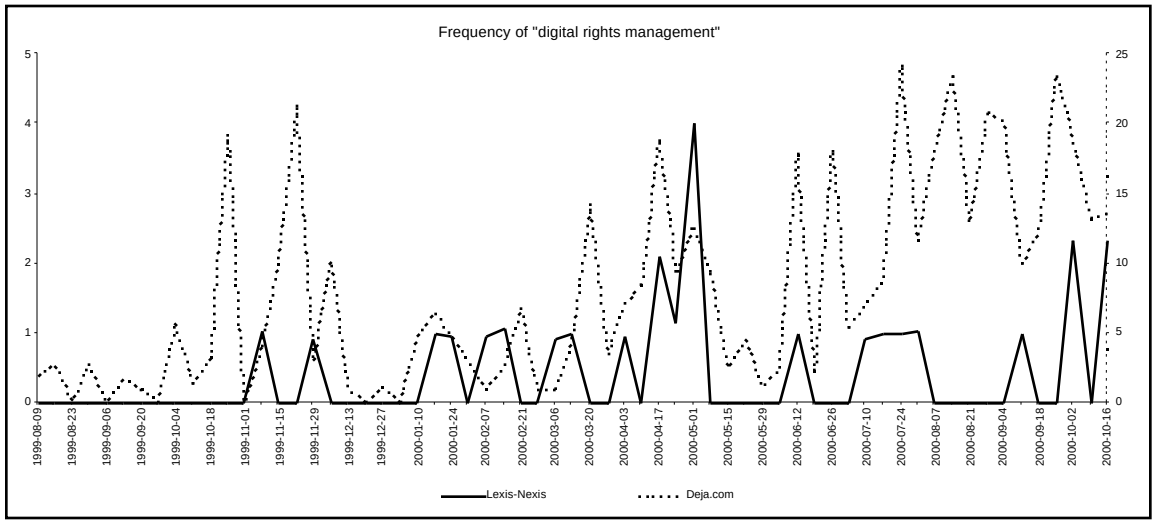


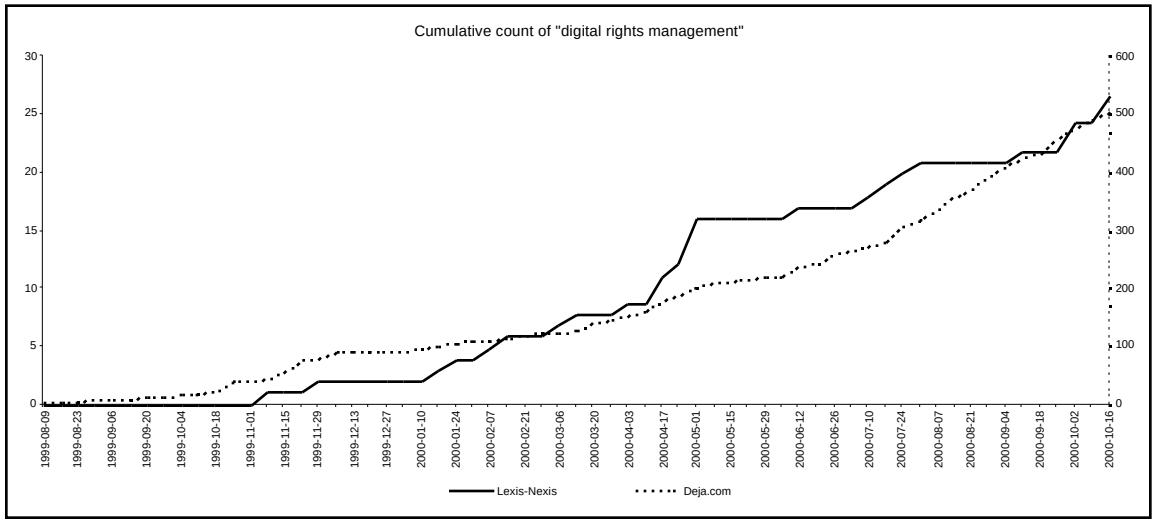


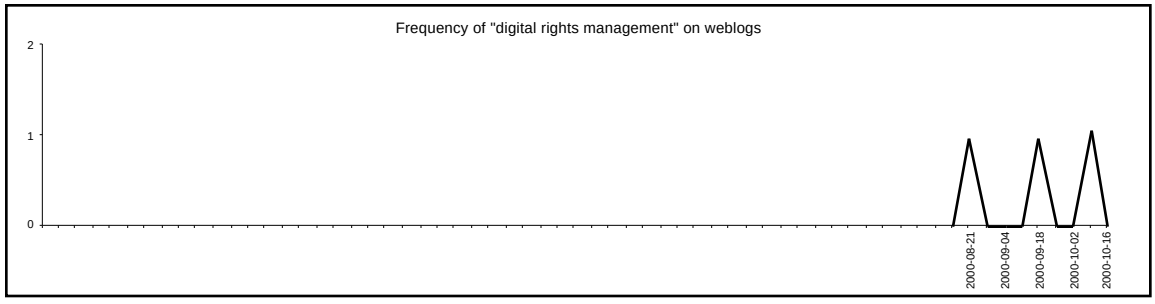


Digital Rights Management

A term used to describe methods of protecting copyrightable products such as music.

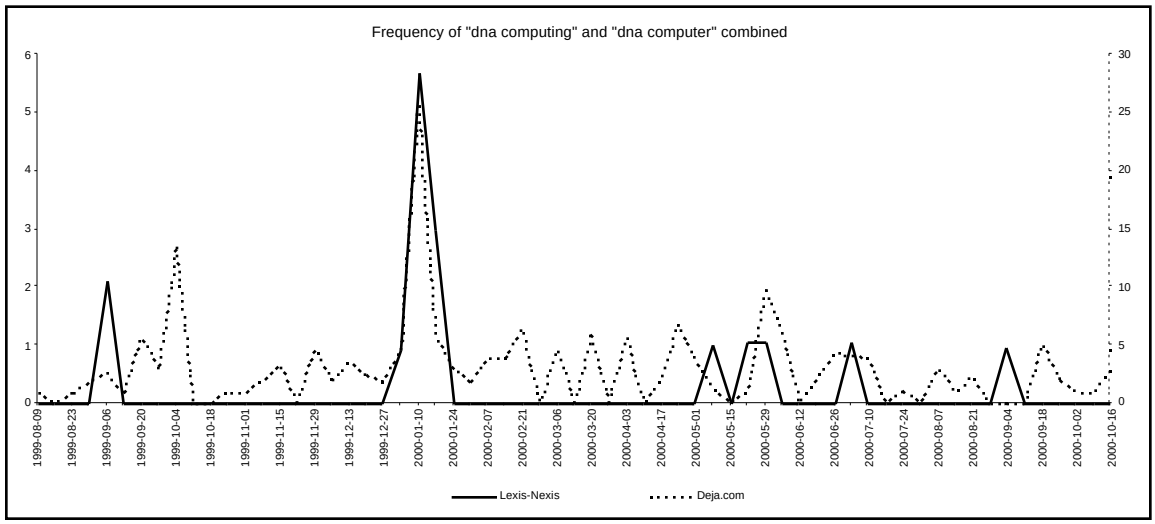


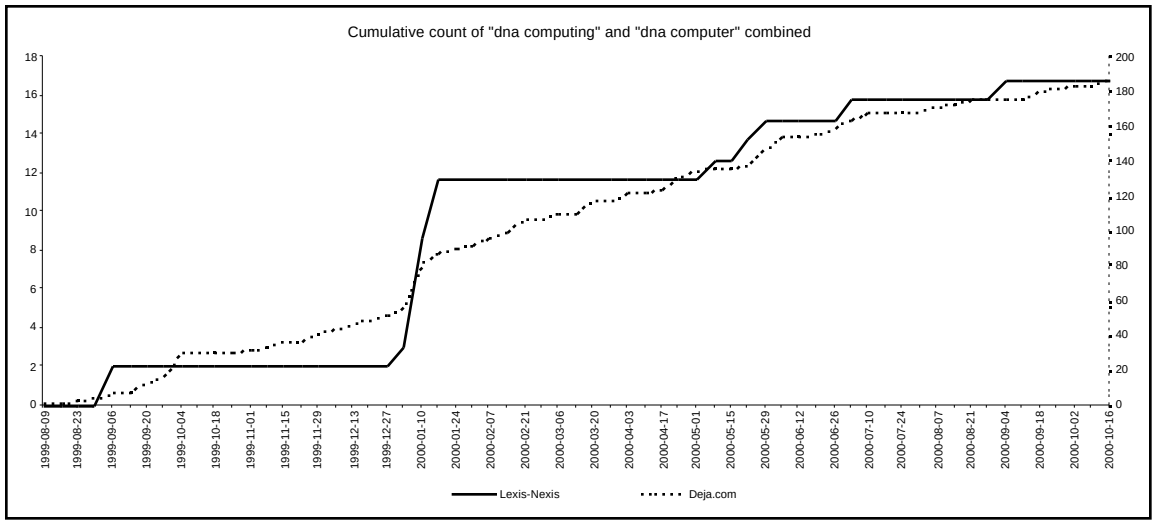


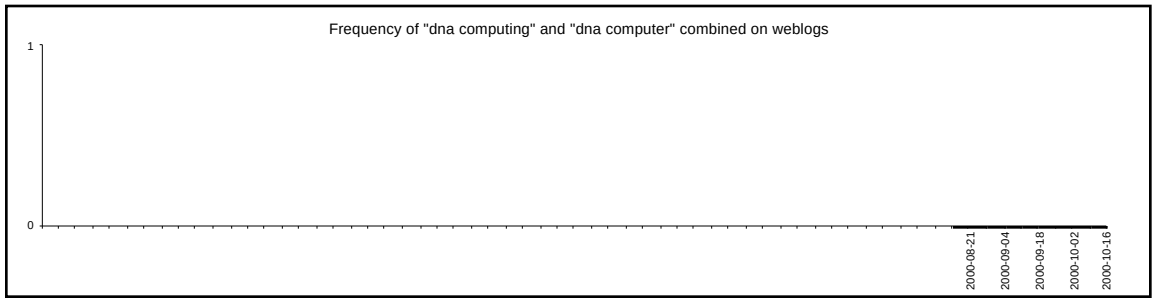


DNA Computing/Computer

Using strands of DNA as components of a computer. The large spike in January follows a report in *Nature* about scientists creating the first DNA computer on a solid surface rather than in a test tube.

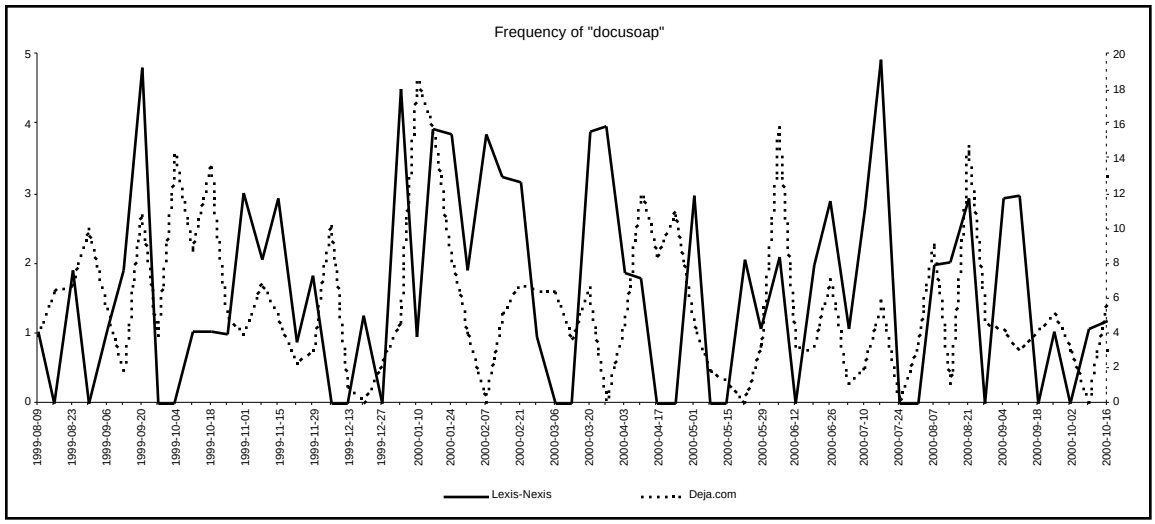


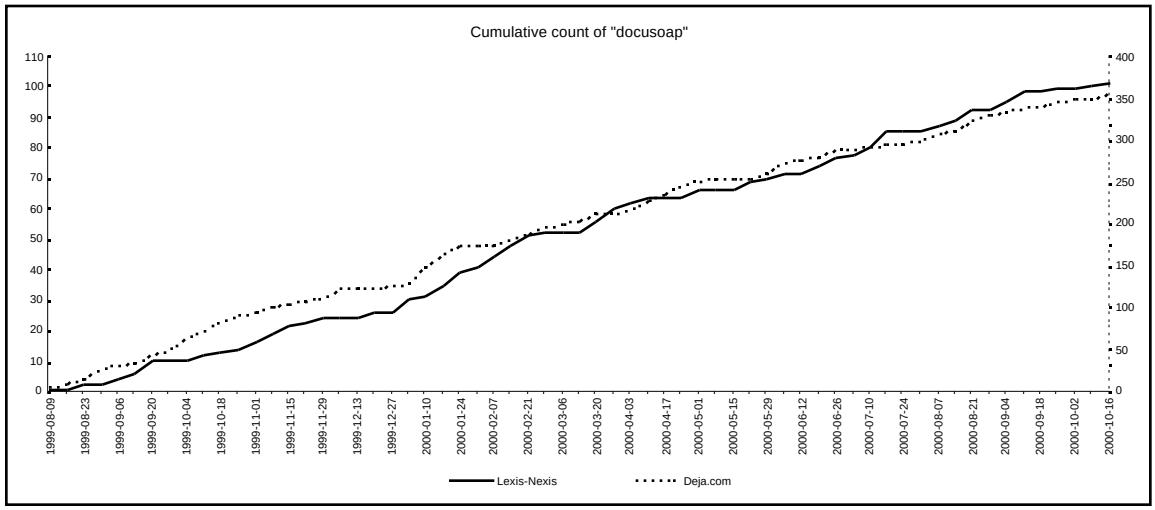


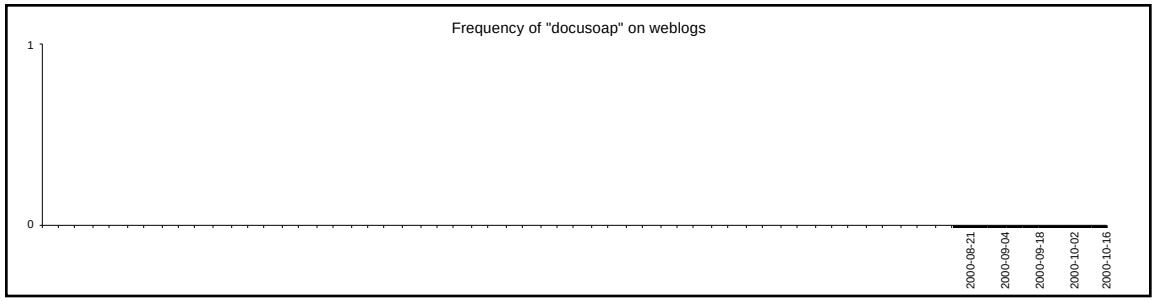


Docusoap

A mainly British term describing a TV documentary, usually in series form, often focusing on the personalities in a workplace or other location.

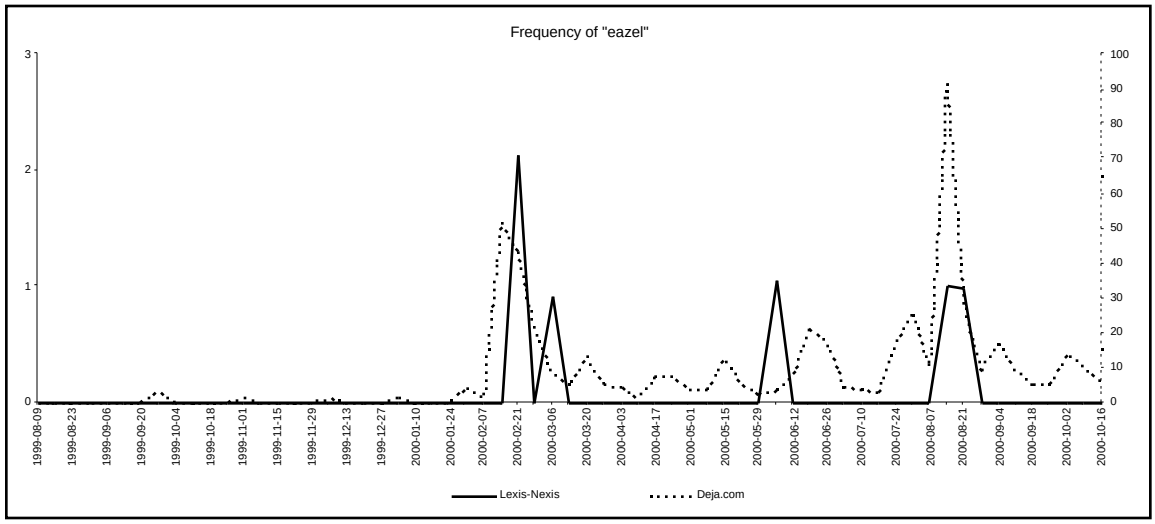


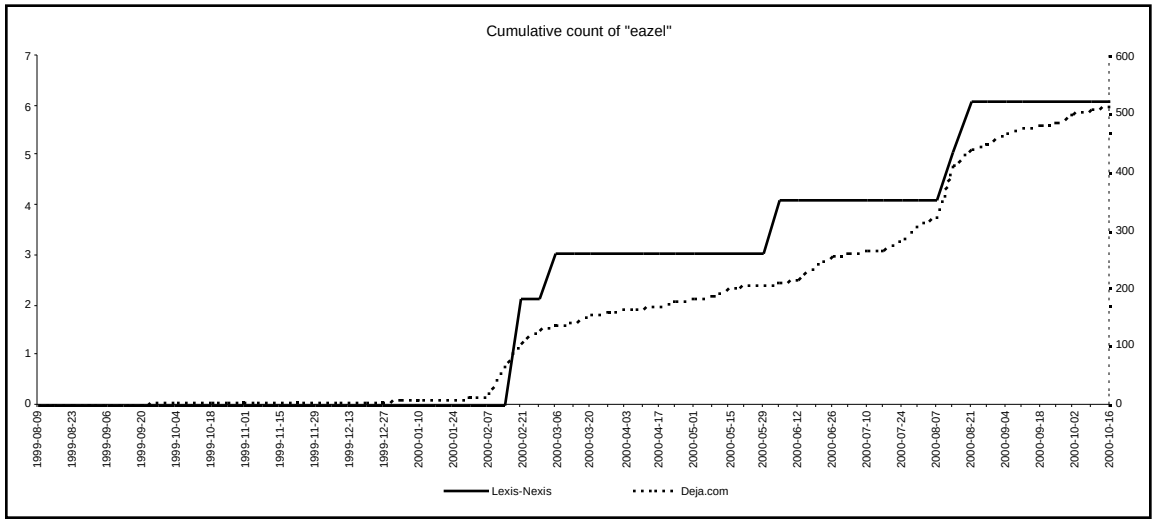


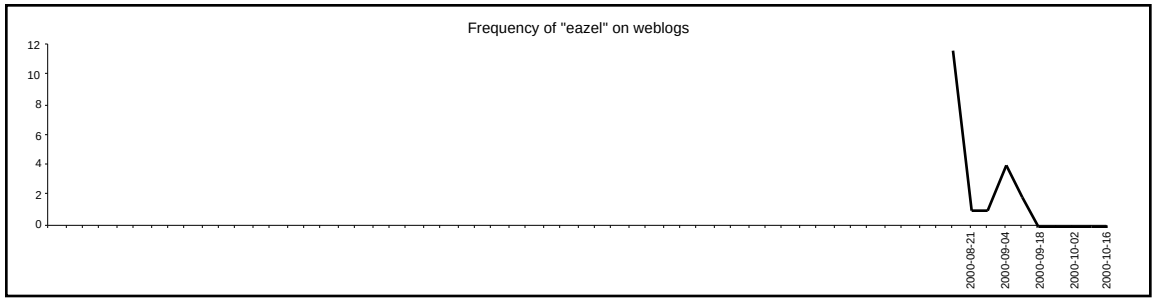


Eazel

A company producing a user-friendly front-end to the Linux operating system.

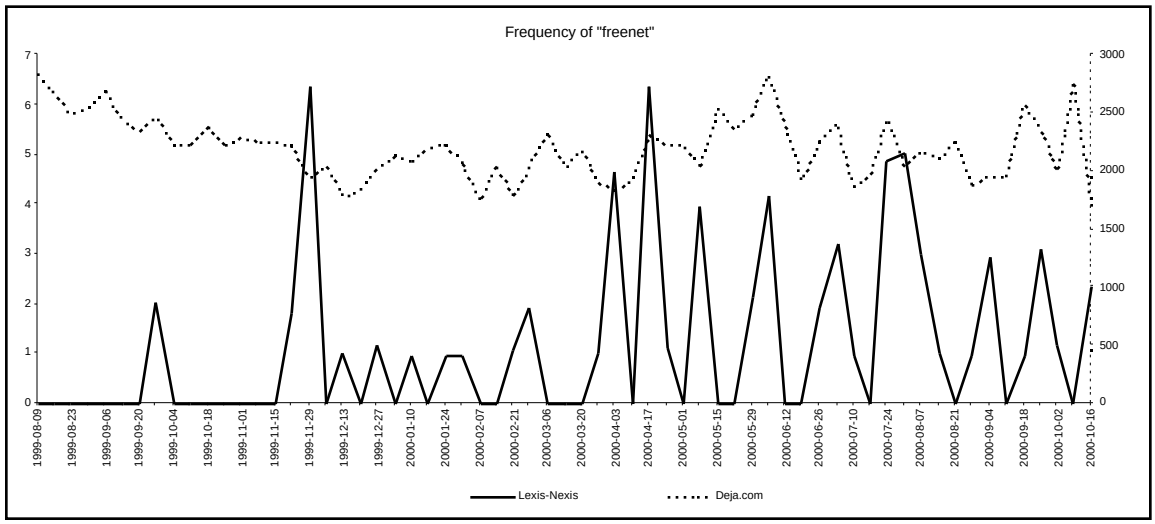


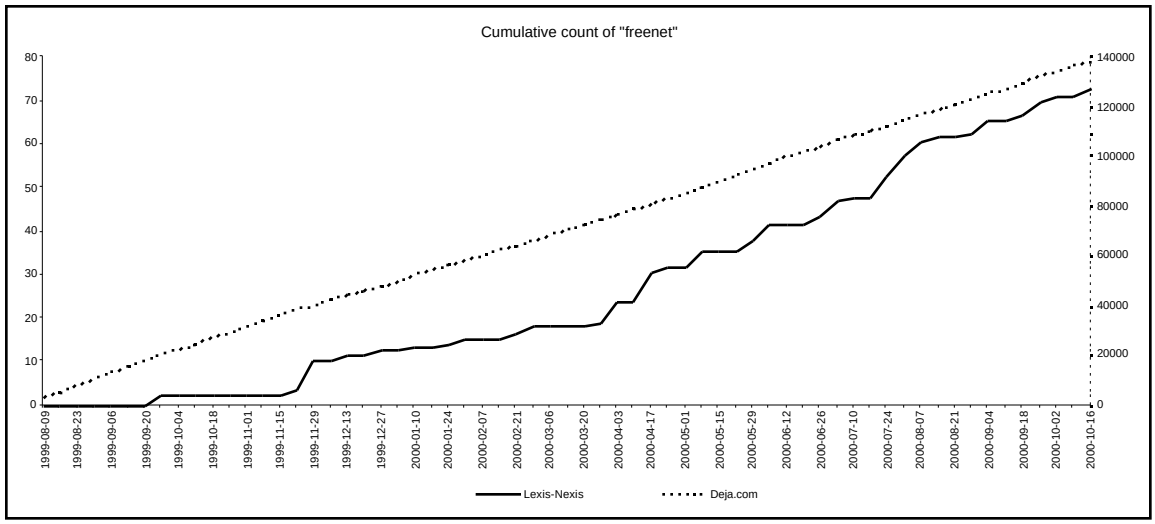


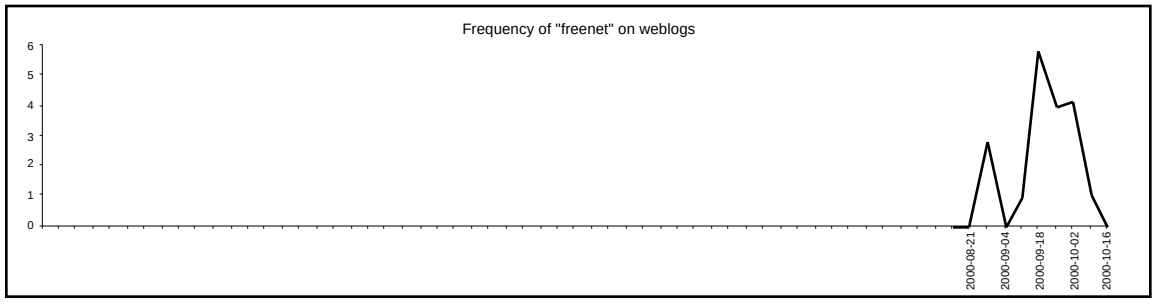


Freenet

A network for the distribution of files across the Internet. It is, however, a name that's been used for many things online so it is impossible to pick out details relating to *this* Freenet from the background noise.

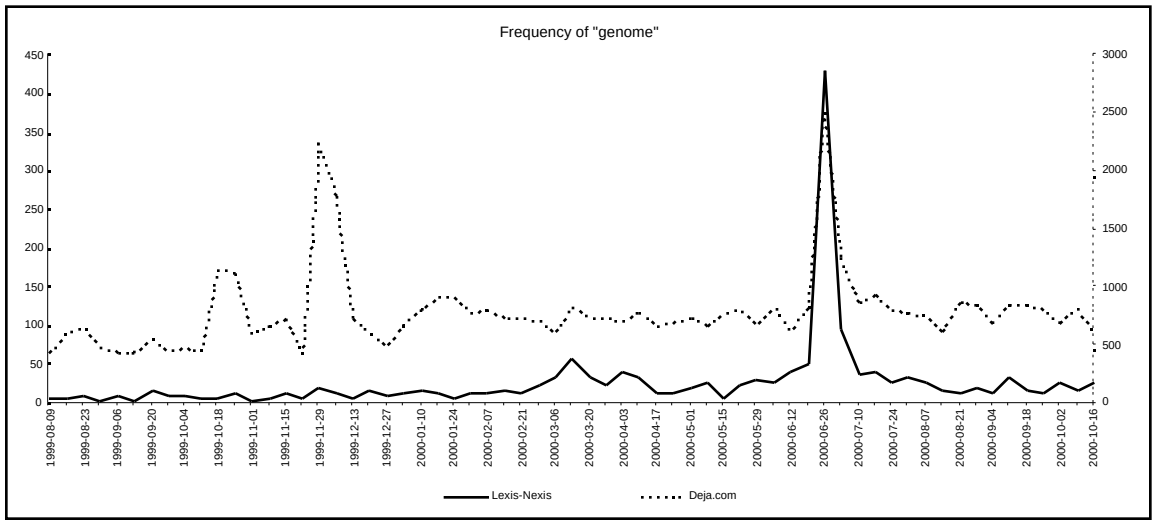


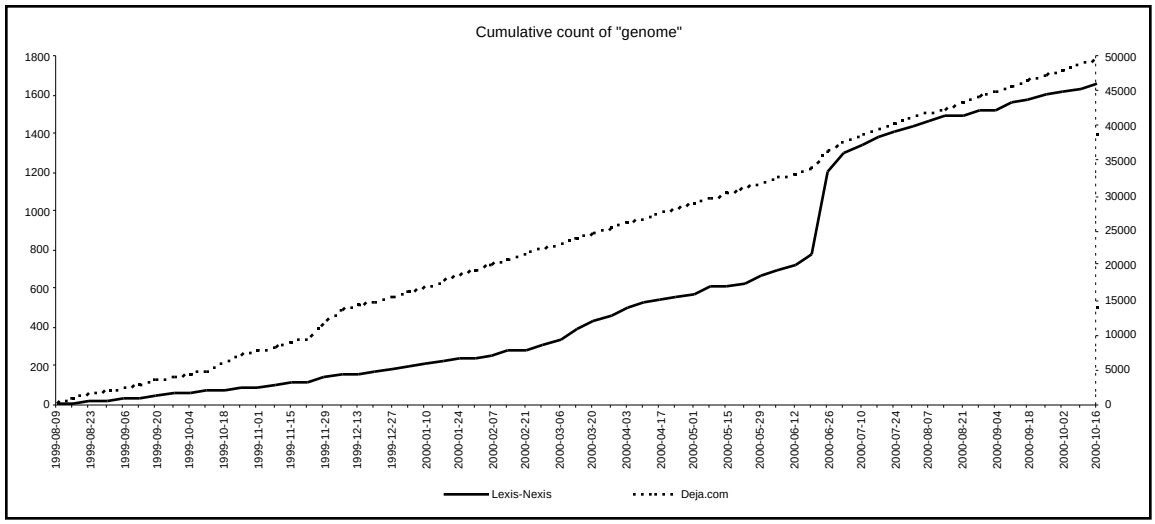


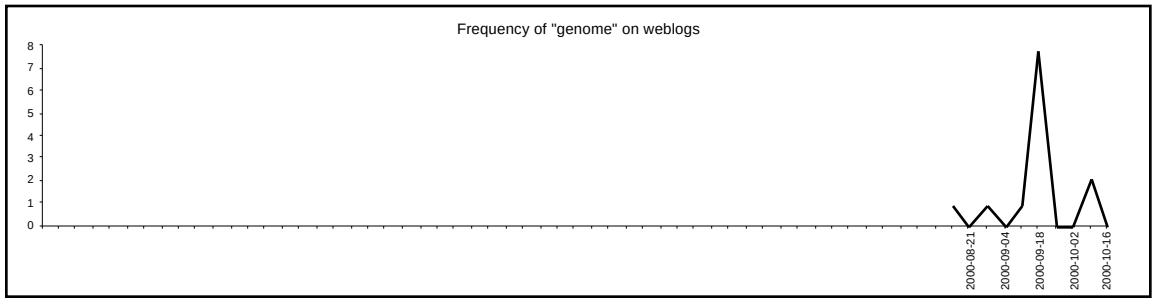


Genome

The spike at the end of June 2000 is a result of Celera announcing their complete map of the human genome. The peak on Usenet in November 1999 is due to a single message posted hundreds of times to one newsgroup.

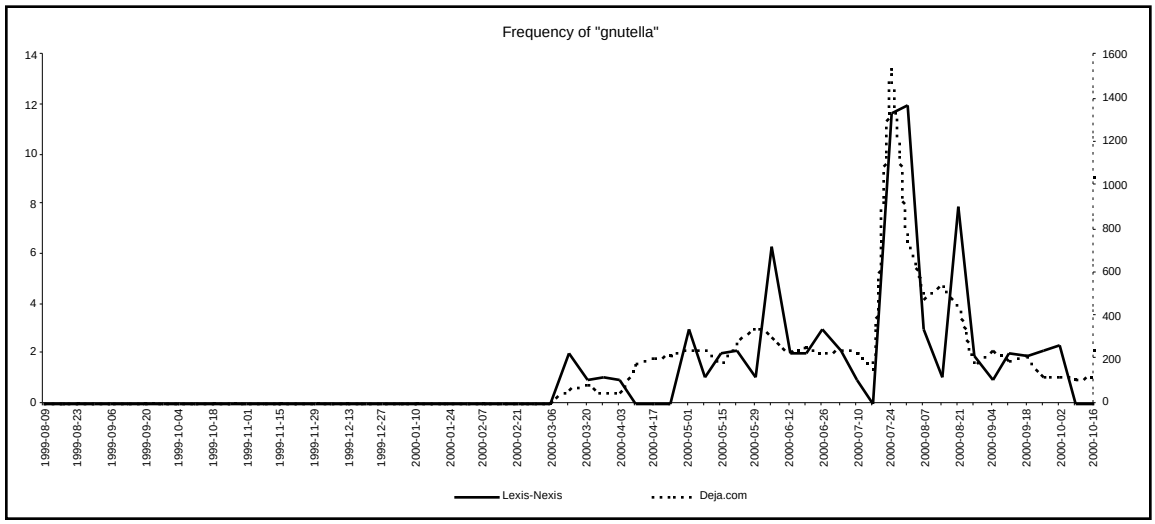


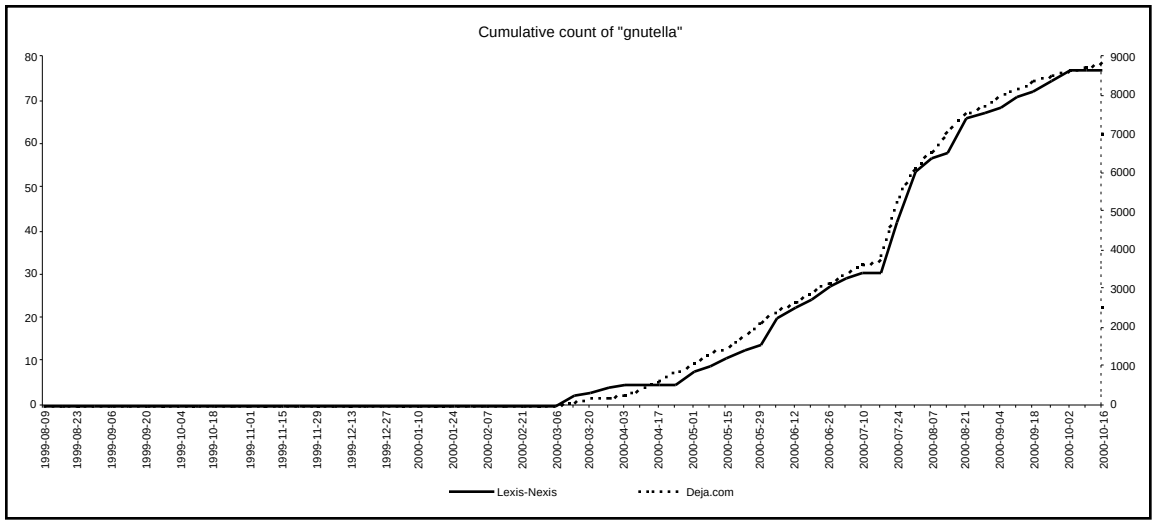


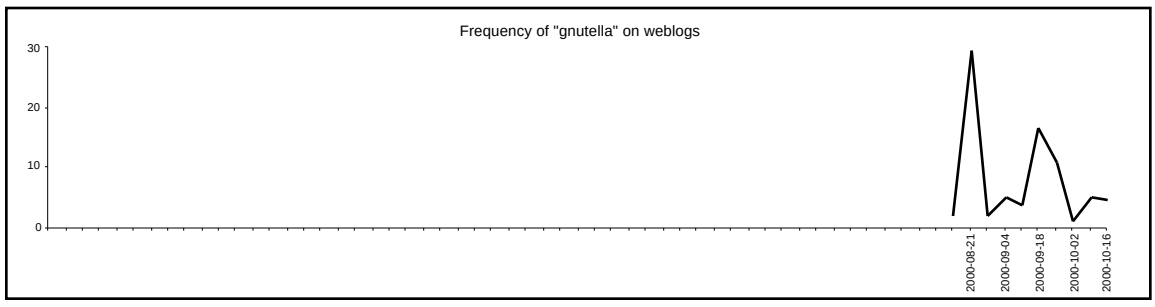


Gnutella

A distributed method of sharing computer files (such as MP3 music files) among a large number of users. The peak in July 2000 is prompted by a judge granting an injunction against Napster, a similar piece of software.

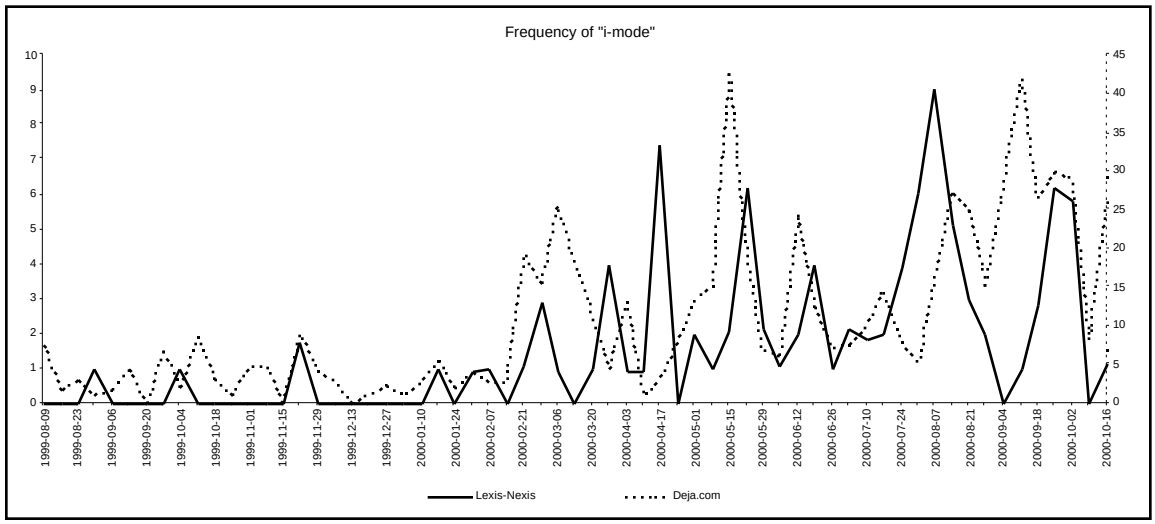


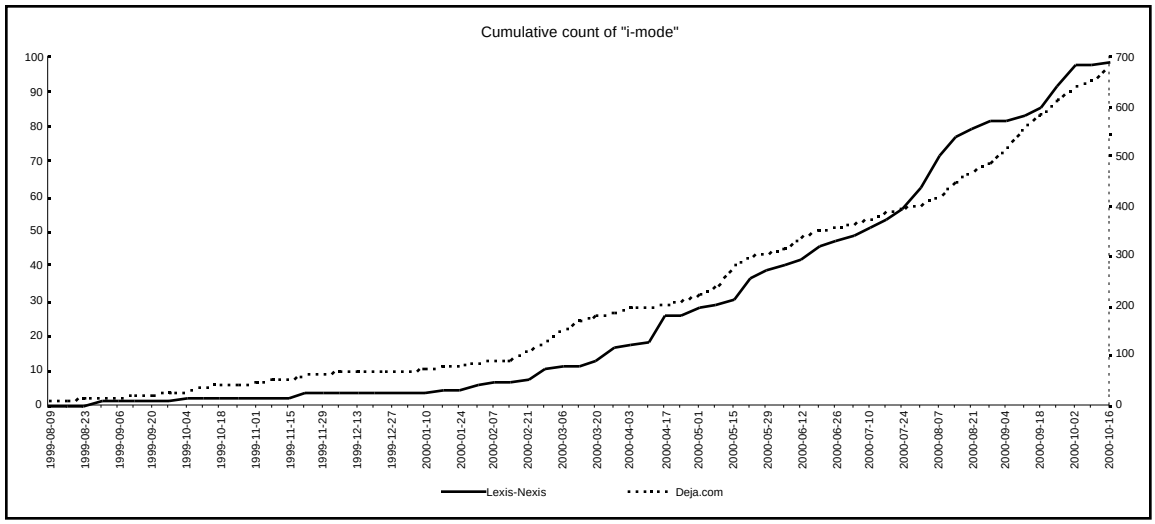


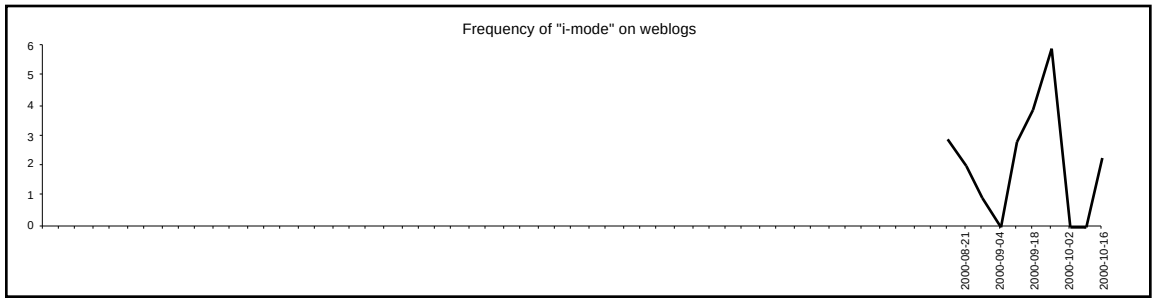


I-mode

A means of using the Internet with cellular phones in Japan, developed by the company DoCoMo. The large Lexis-Nexis peak in August 2000 is caused by reports of the i-mode system breaking down for five hours.

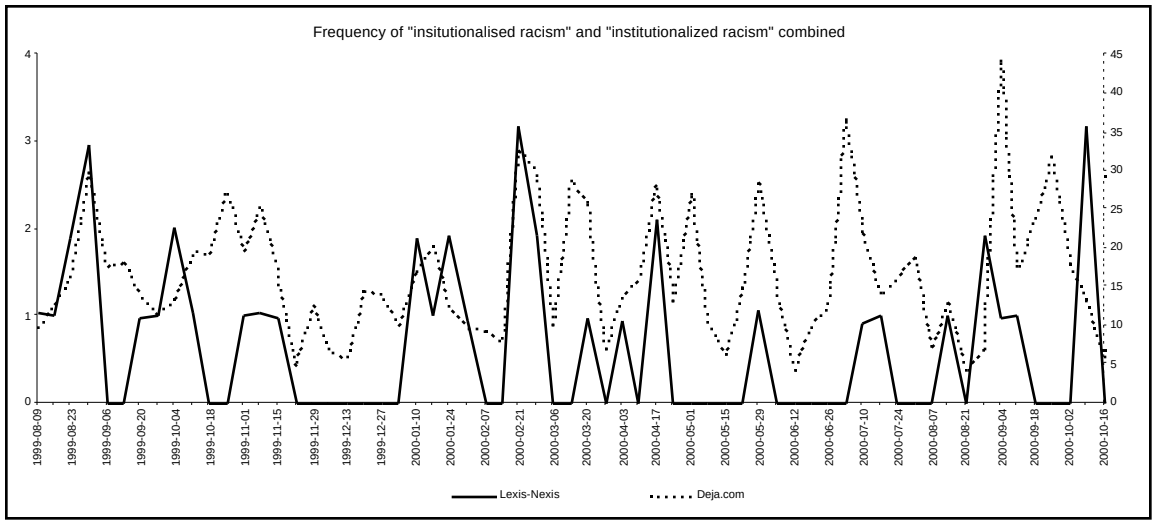


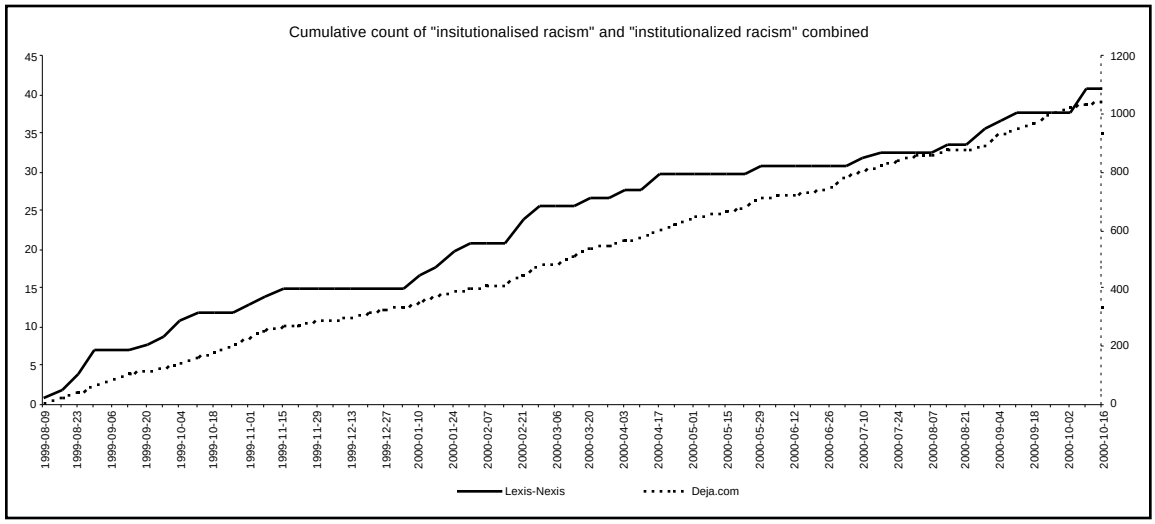


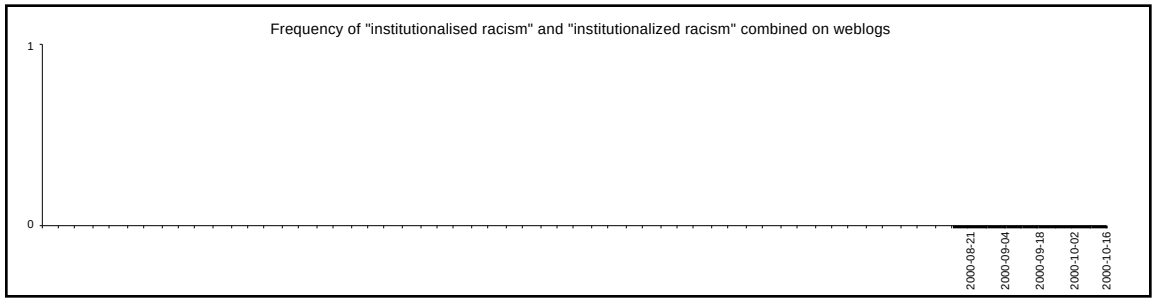


Institutionalised/Institutionalized Racism

A term seemingly becoming more common to describe racism embedded in an organisation.

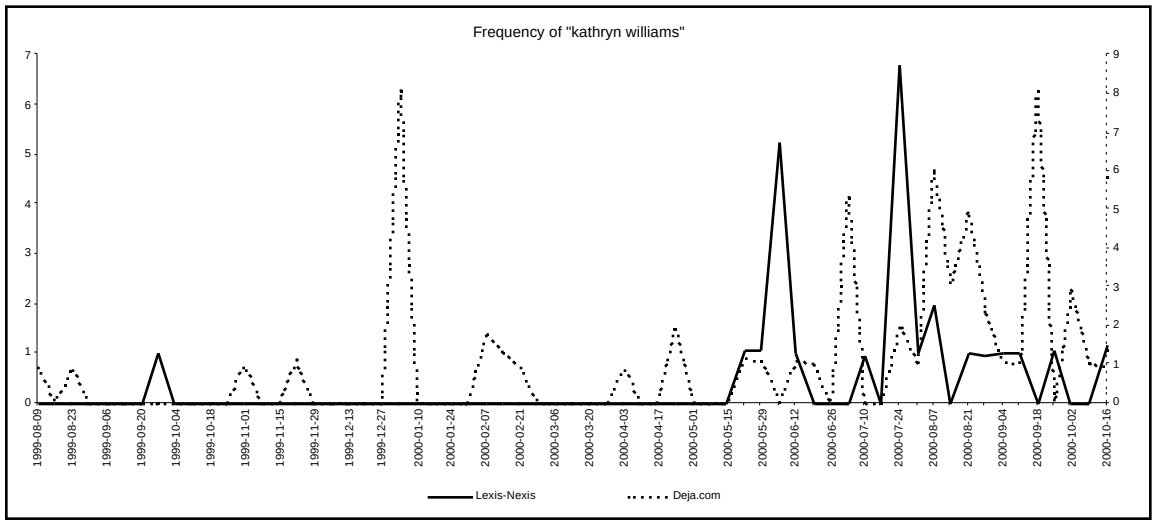


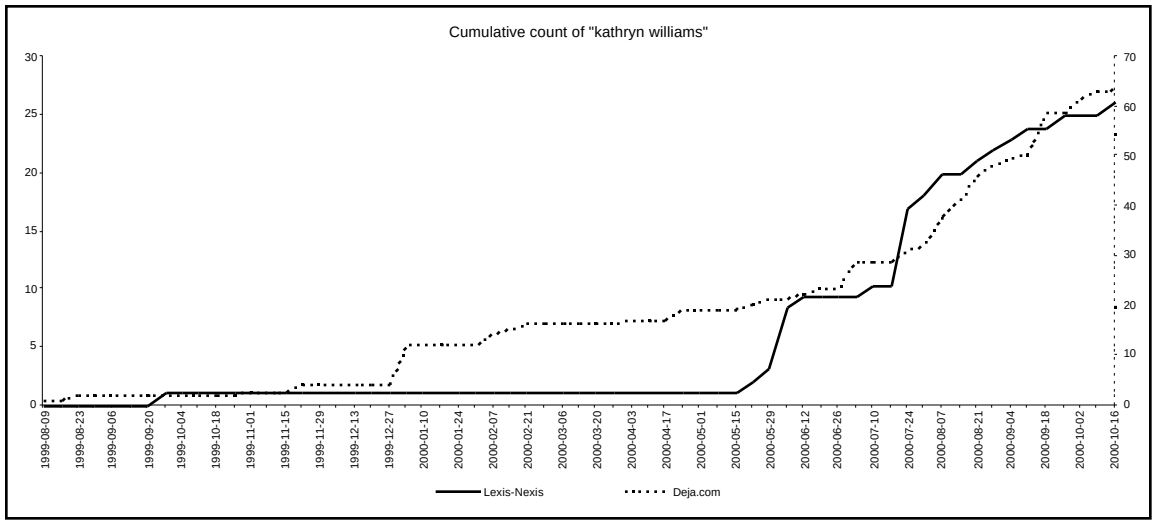


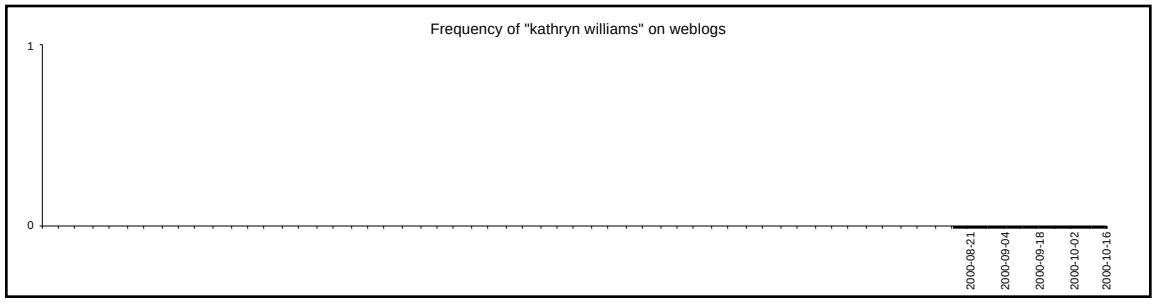


Kathryn Williams

A singer, although other Kathryn Williams occurred occasionally in the news. In June she released her *Little Black Numbers* album and in July she was announced as one of the Mercury Music Prize nominees

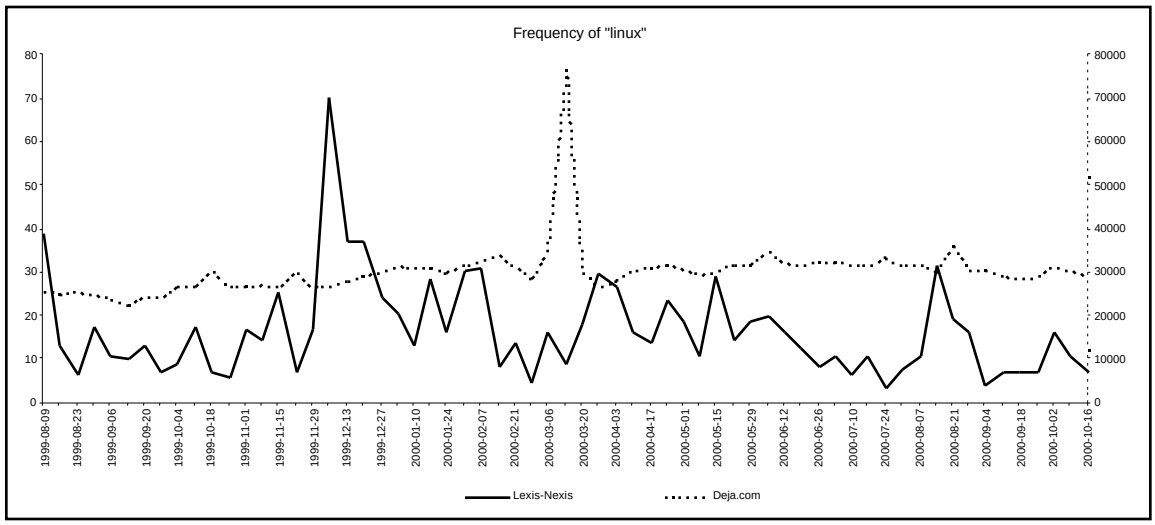


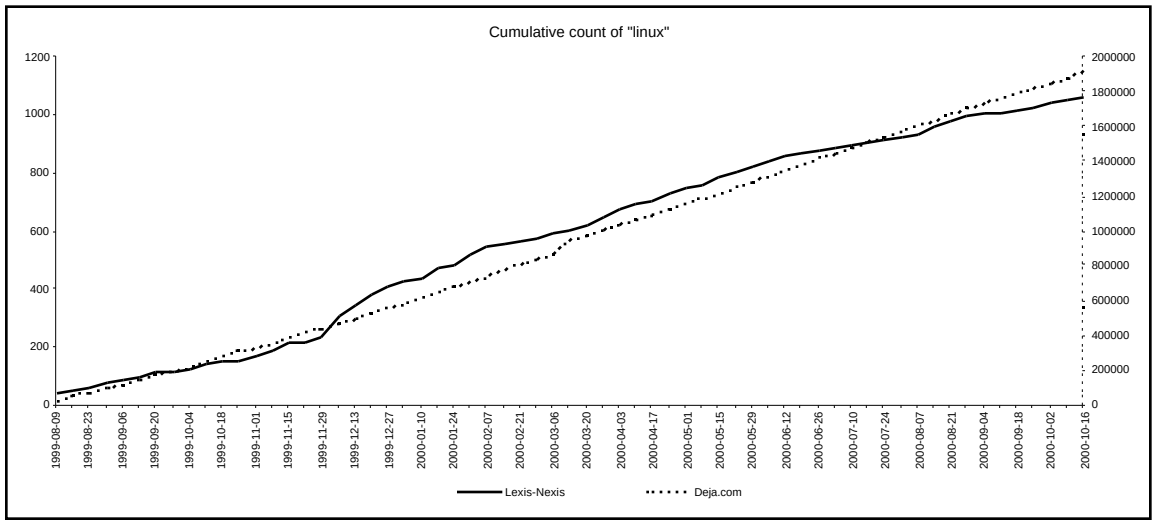


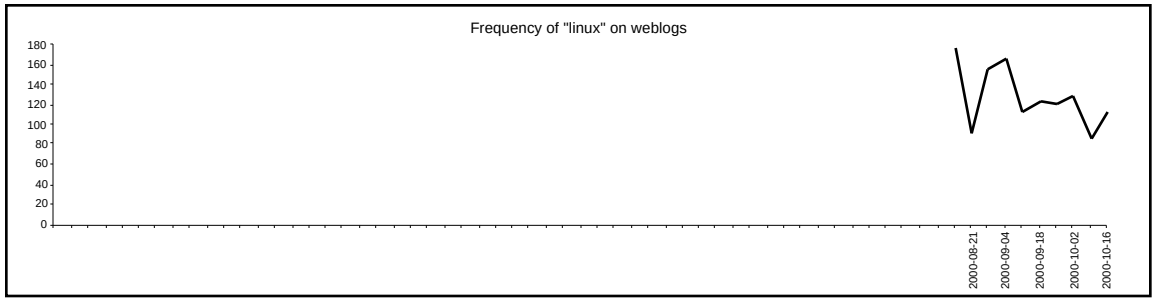


Linux

The open-source computer operating system. The Lexis-Nexis spike in December is due to a variety of business news such as the shares of VA Linux peaking at more than ten times the offering price on launch day. The March Deja.com spike is due to a series of messages posted thousands of times to one newsgroup by a single person.

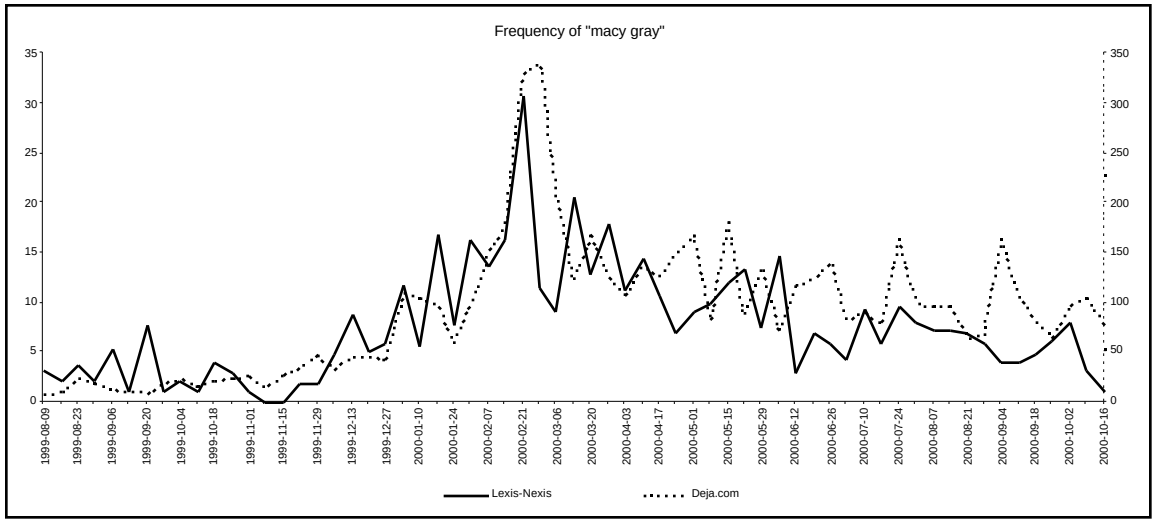


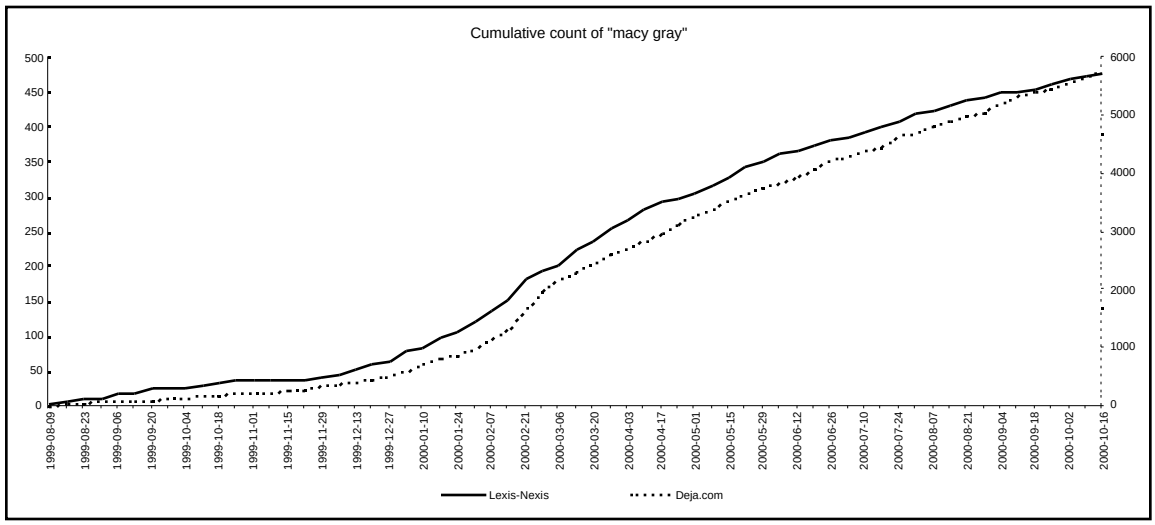


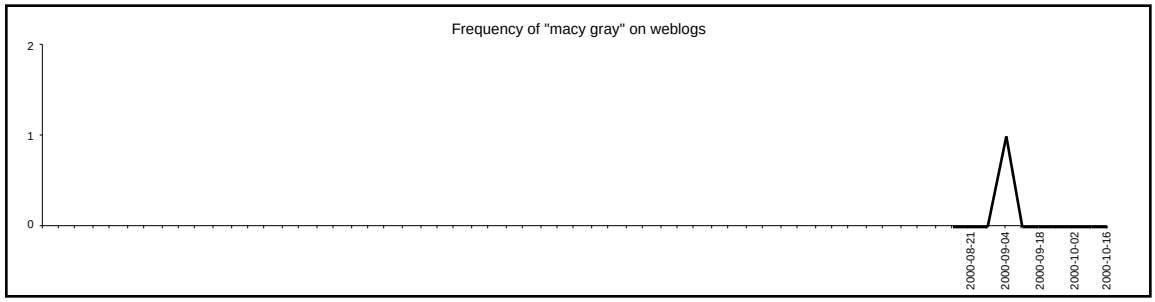


Macy Gray

The singer. The large peak in February seems largely due to her nomination for a Grammy, although she didn't win anything.

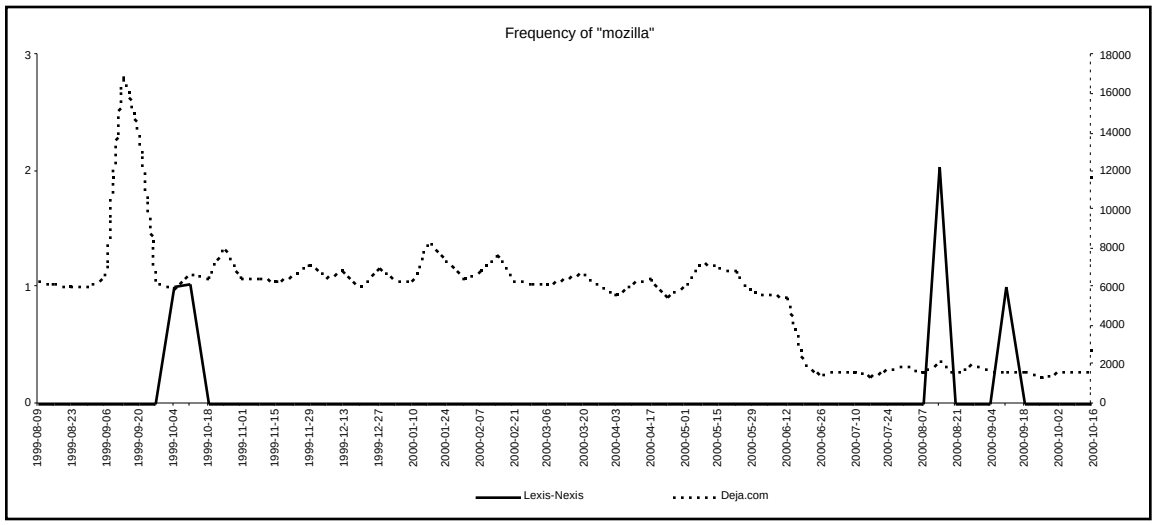


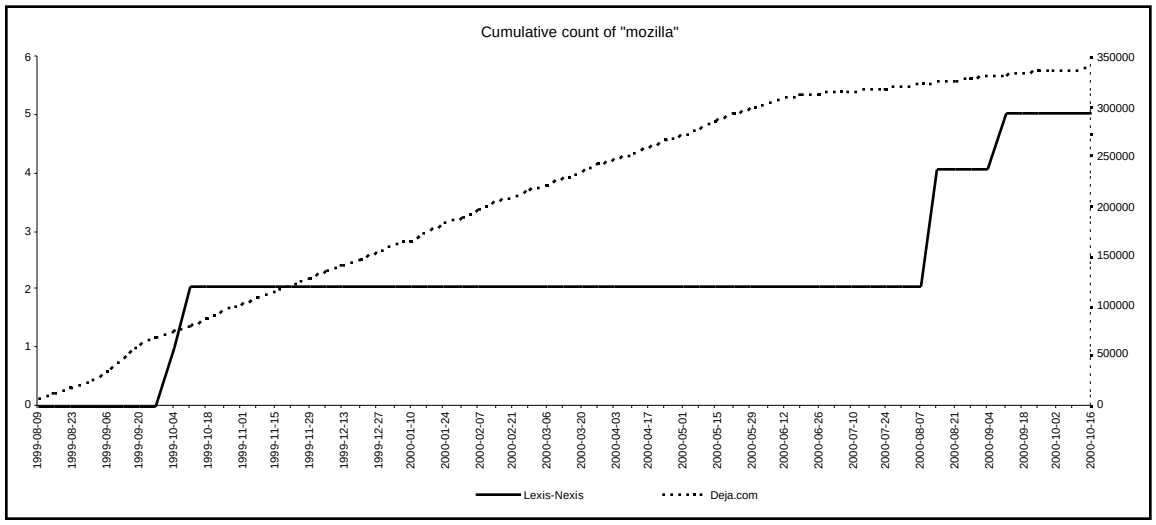


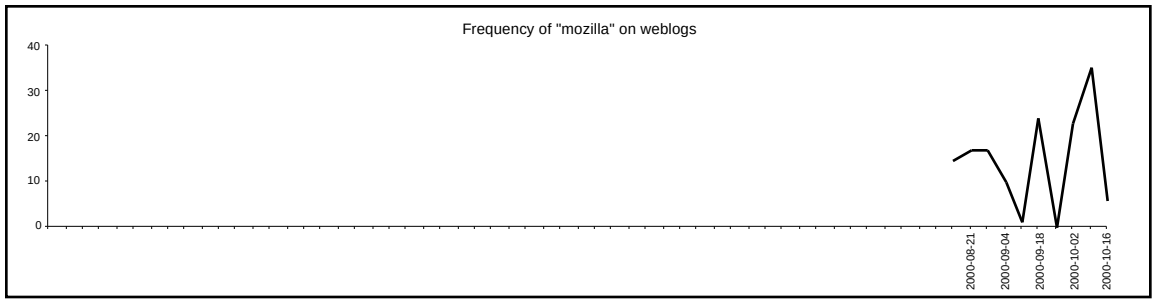


Mozilla

The name for the next, open source, version of Netscape's web browser. The spike in September 1999 is due to thousands of cancel messages sent to Usenet from within Mozilla browsers. There are a lesser number of these (but still a few thousand) appearing every week until June 2000 when they stop appearing.

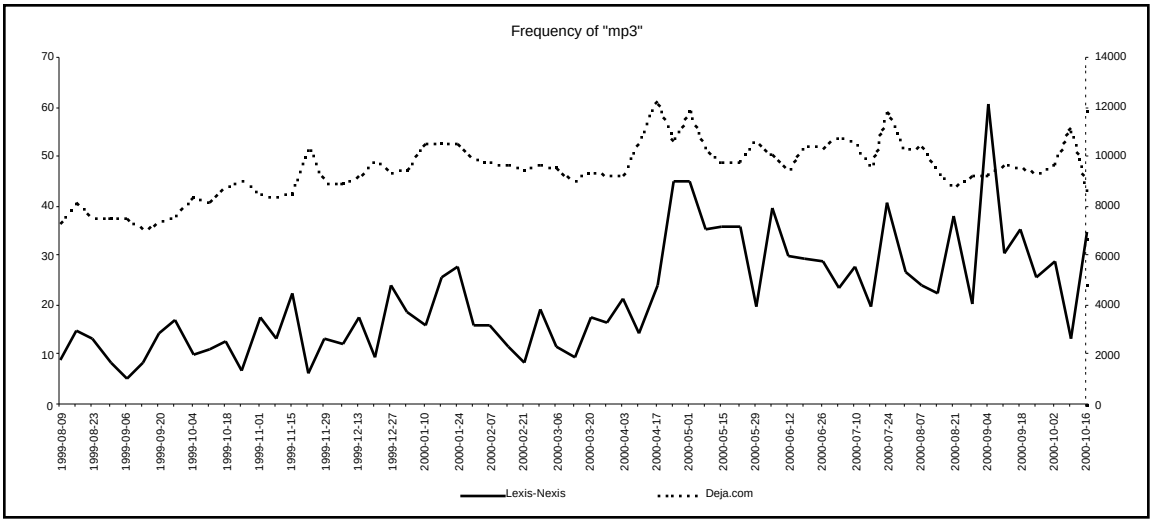


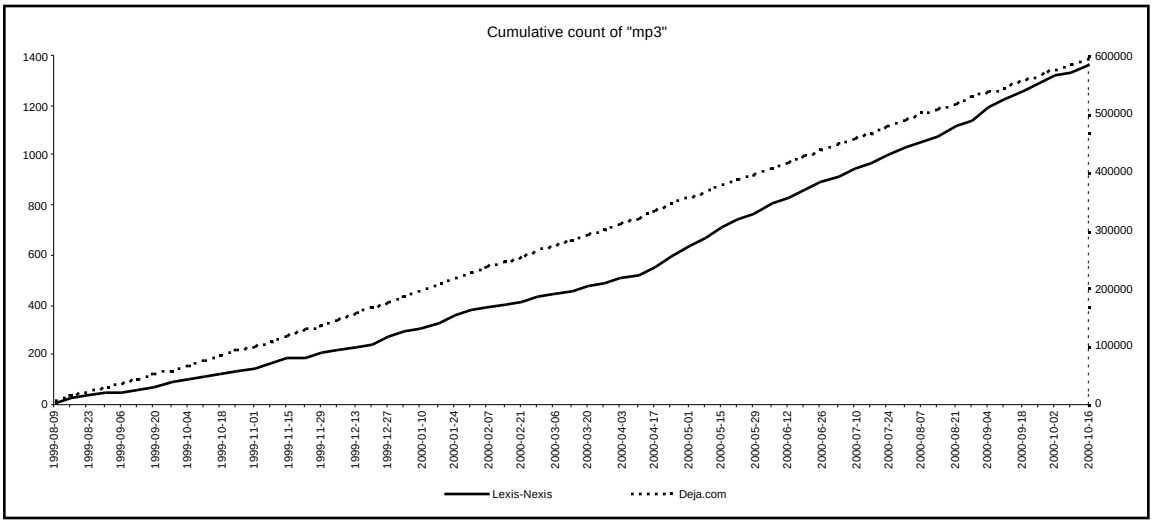


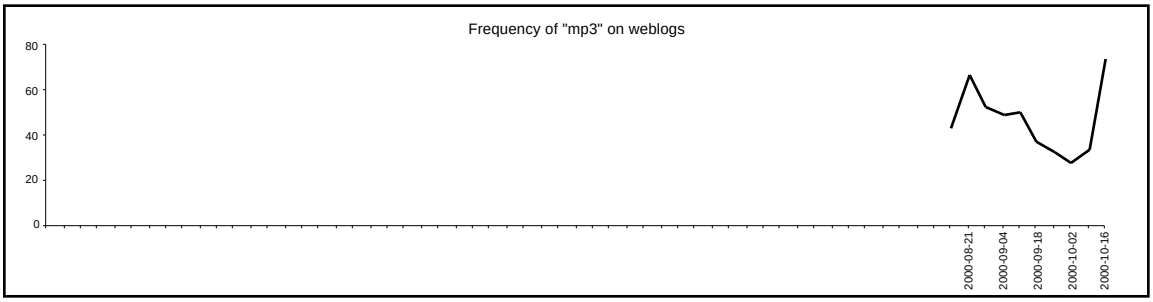


MP3

A digital music format. The Lexis-Nexis peak in September 2000 is prompted by a judge fining MP3.com for copyright infringement.

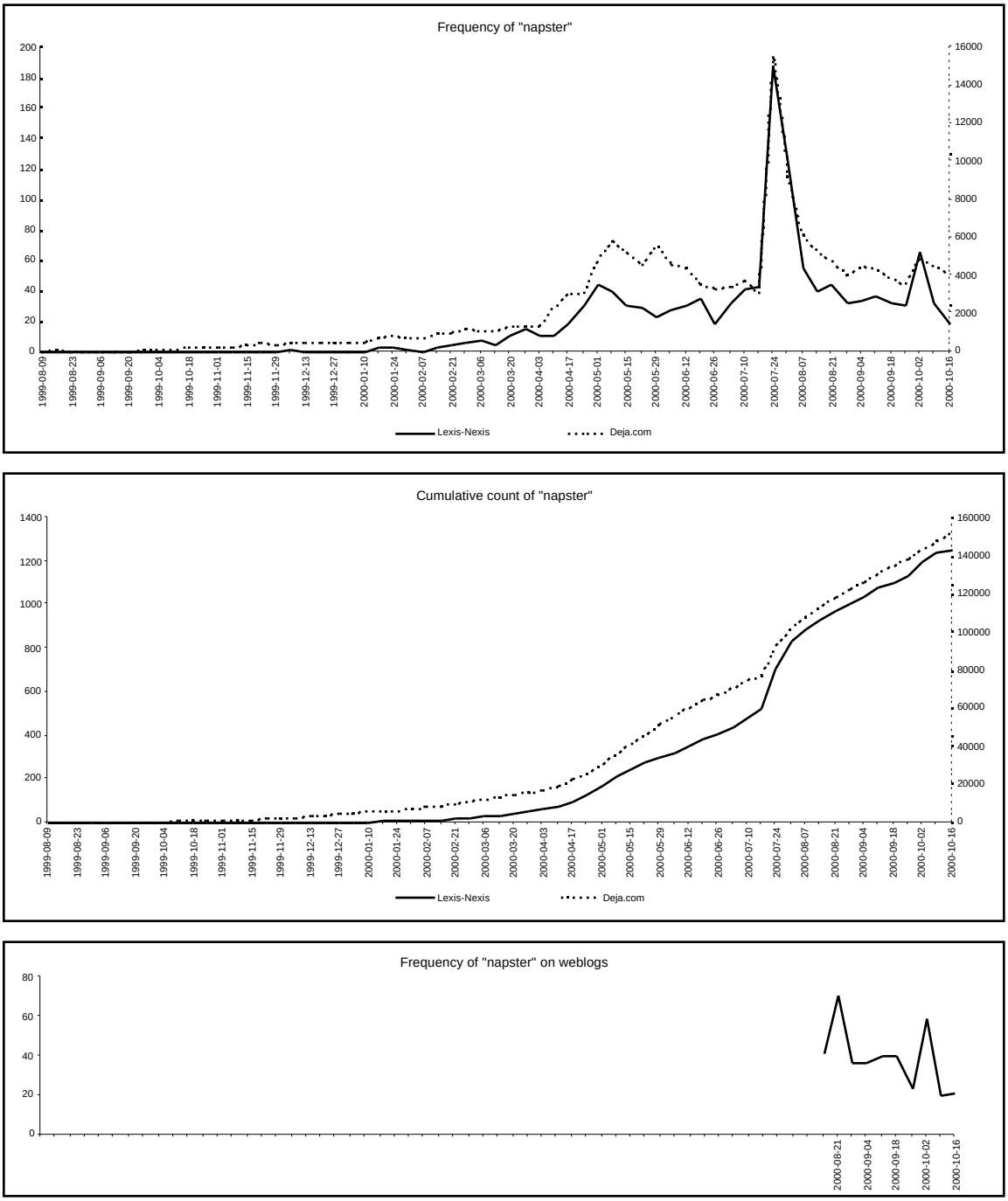






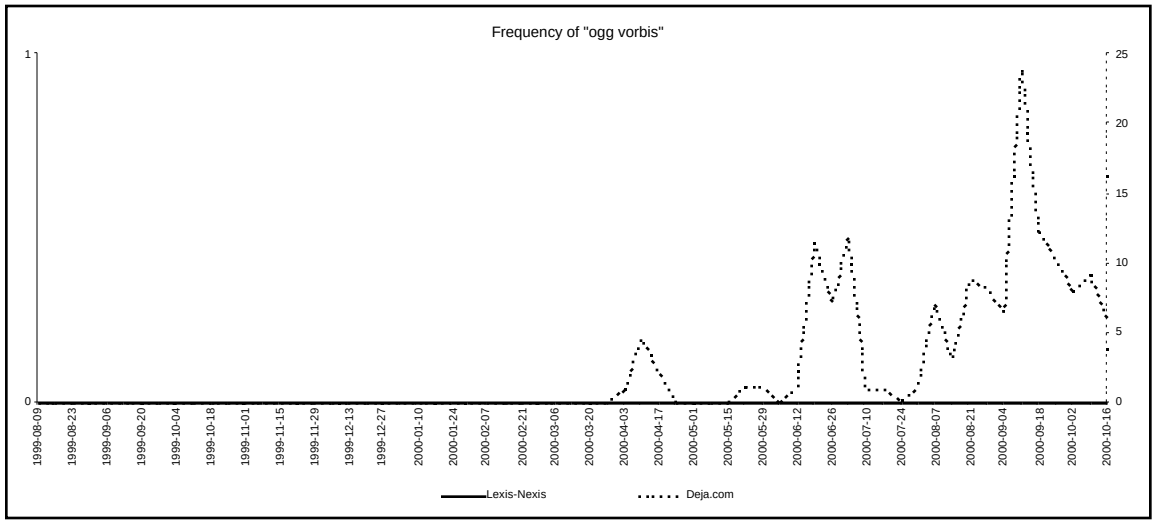
Napster

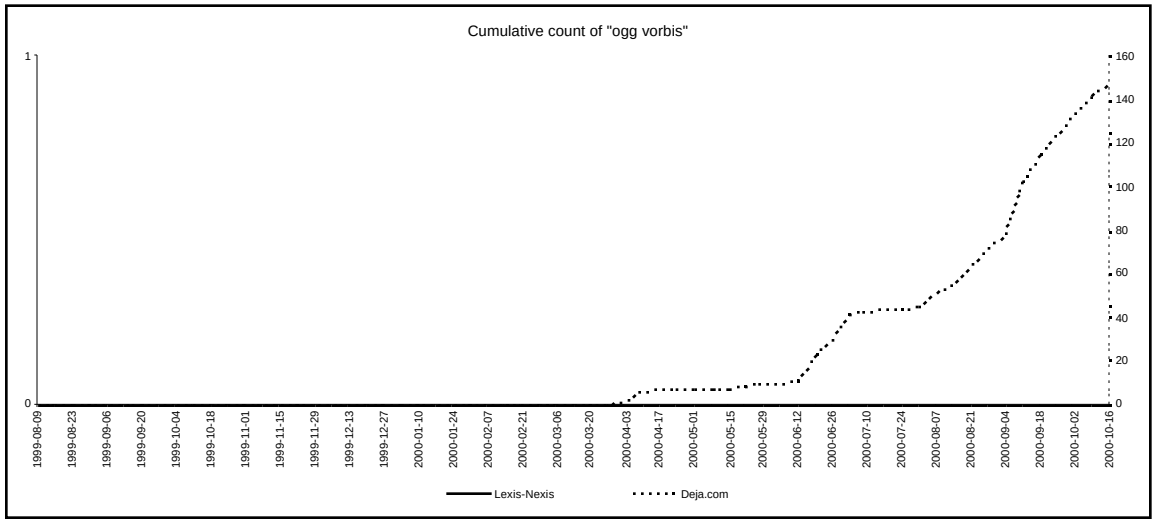
An application used for sharing MP3 music files over the Internet. At the end of July 2000 the Recording Industry Association of America was given an injunction against Napster, which was then relieved temporarily.

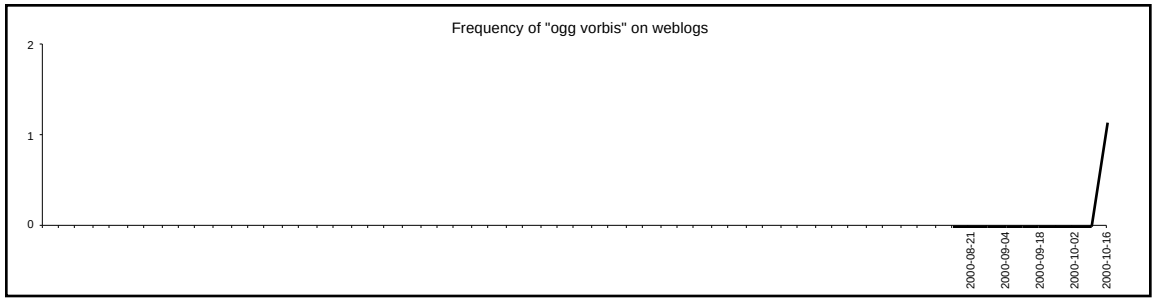


Ogg Vorbis

An open-source digital music format, an alternative to MP3.

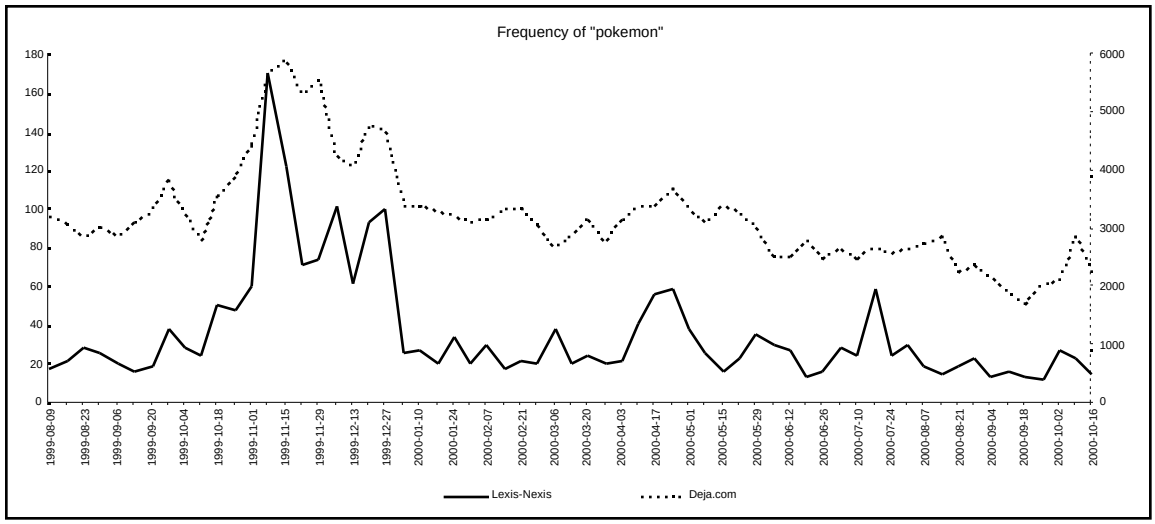


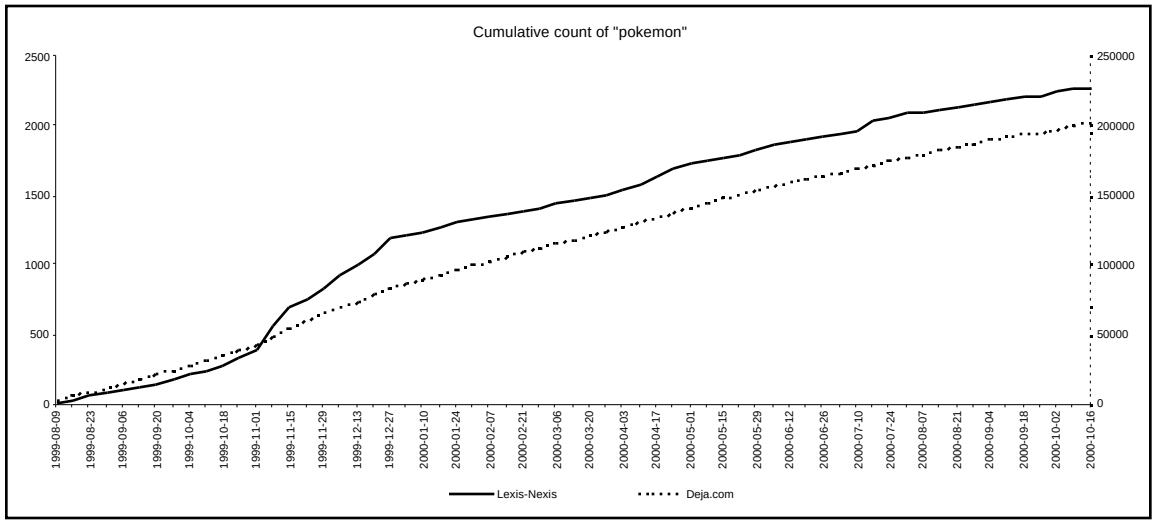


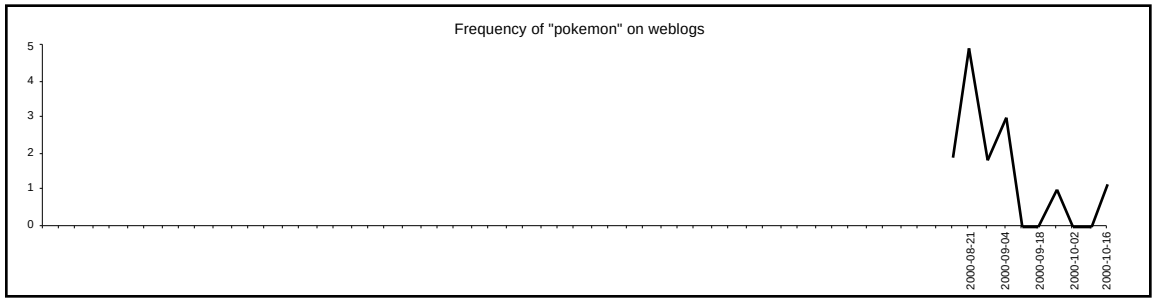


Pokemon

The cartoon/movie/toys/etc. In November 1999 *Pokemon The First Movie* opened in America.

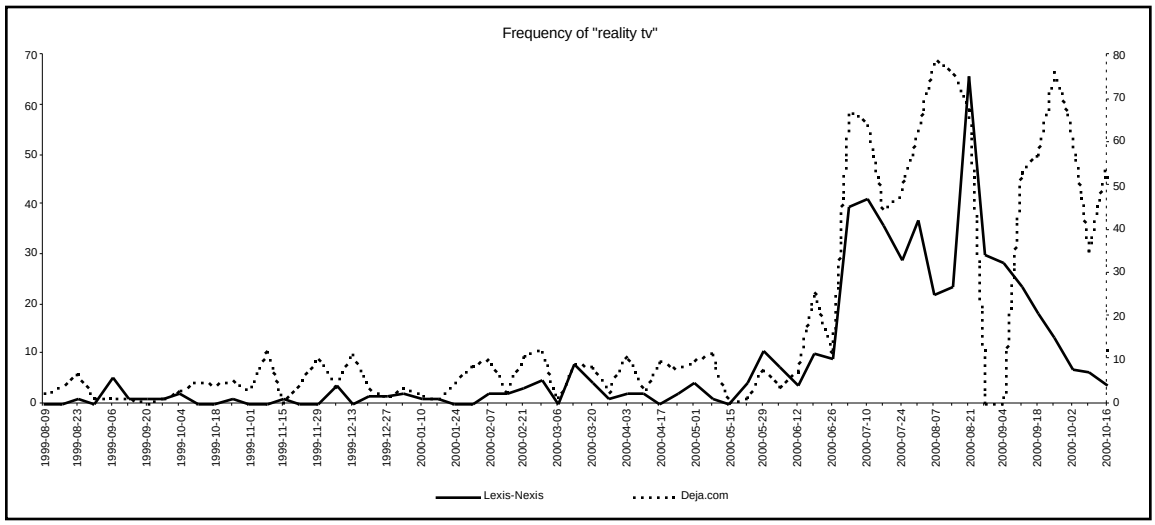


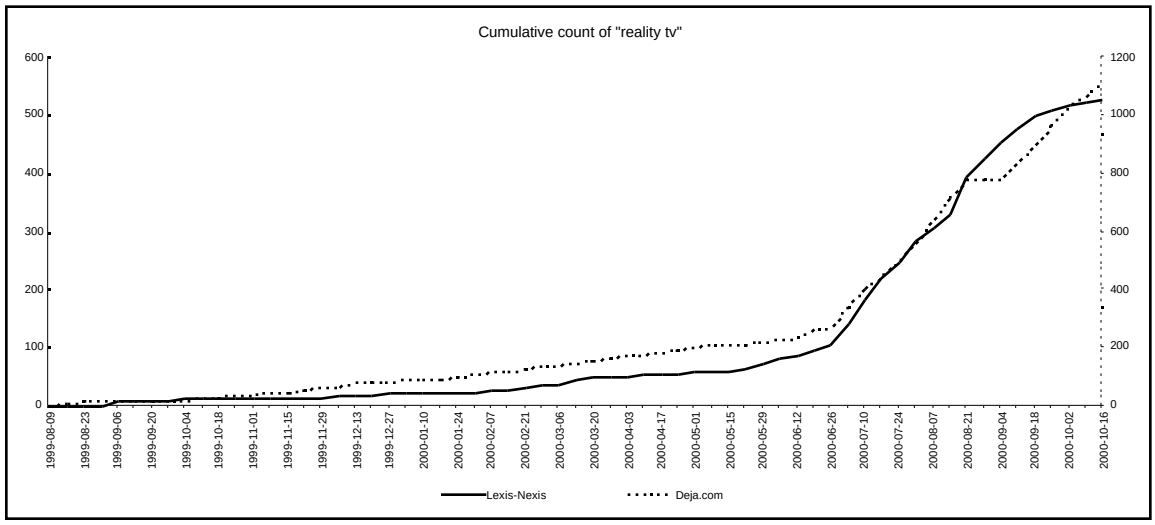


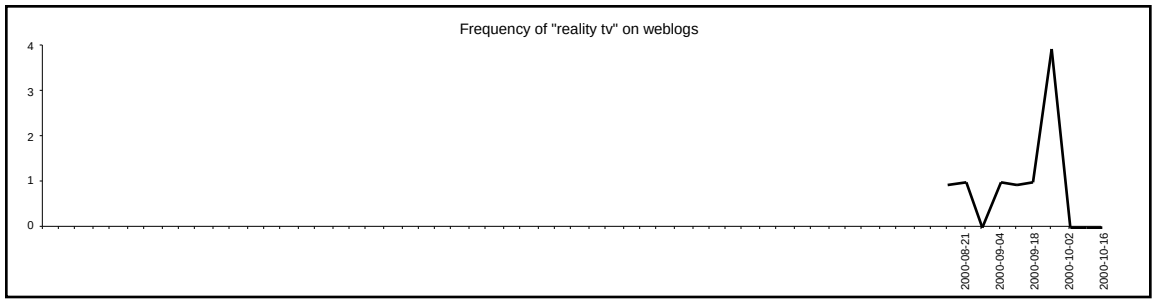


Reality TV

A generic term for TV shows based around real people, often put in artificially controlled conditions, such as *Survivor* and *The 1900 House*. At the beginning of July *Big Brother* begins in the US. At the end of August 2000 *Survivor* reaches its climax. There is a gap in Deja.com's archive around August/September 2000 so no data is available.

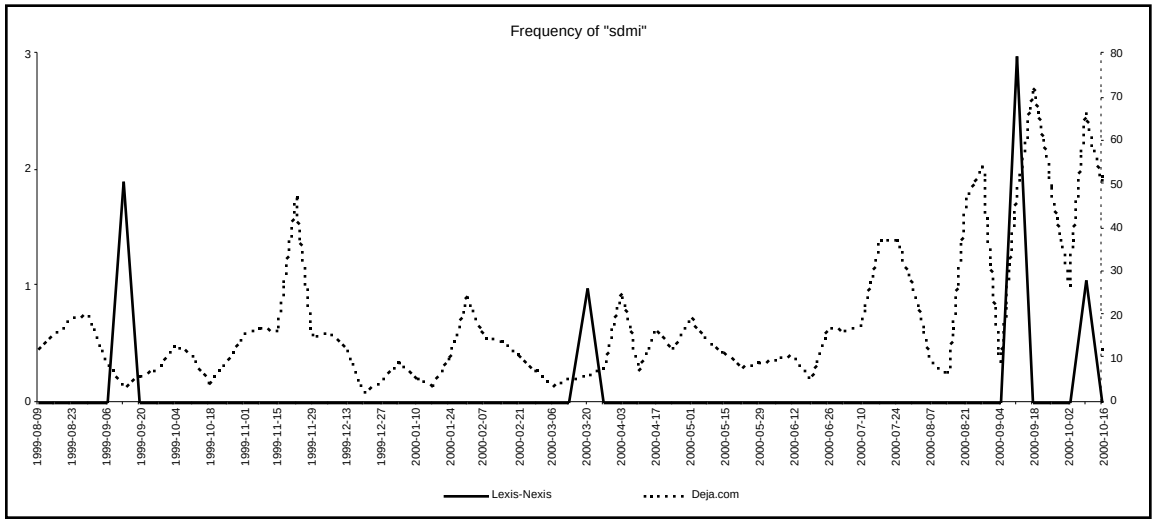


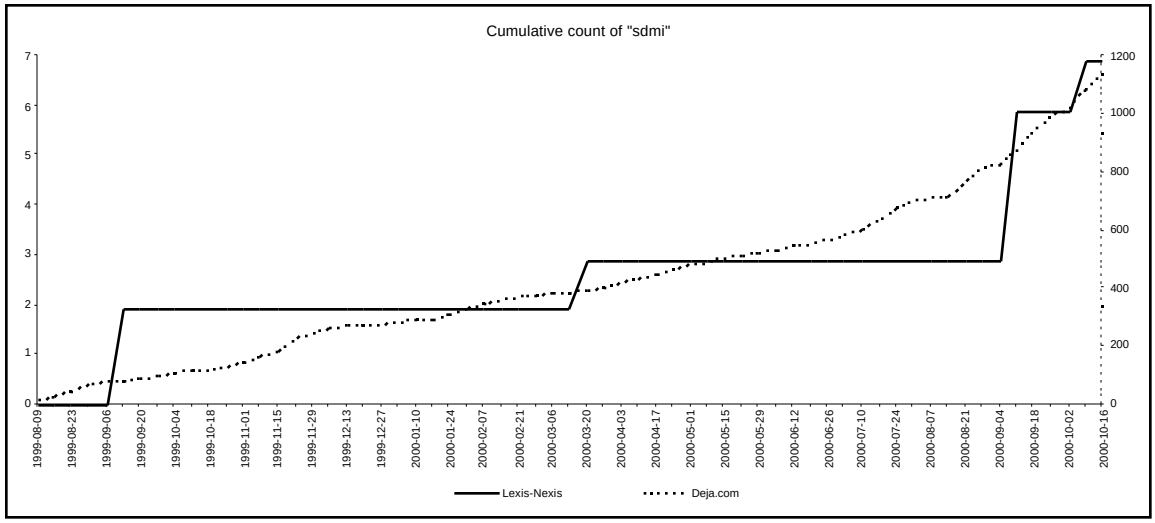


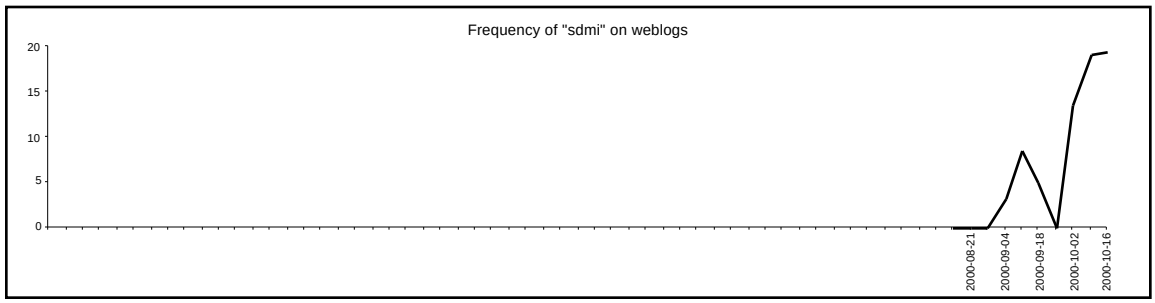


SDMI

The Recording Industry Association of America's Secure Digital Music Initiative. The Usenet peak in September 2000 is caused by a competition opened to crack the SDMI security. This is followed three weeks later by an announcement that it has been cracked.

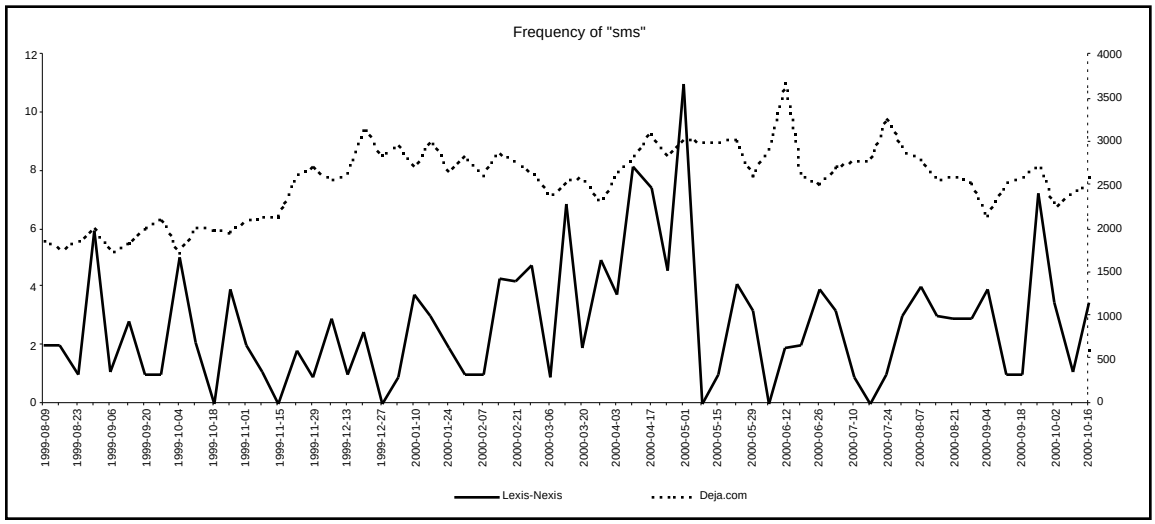


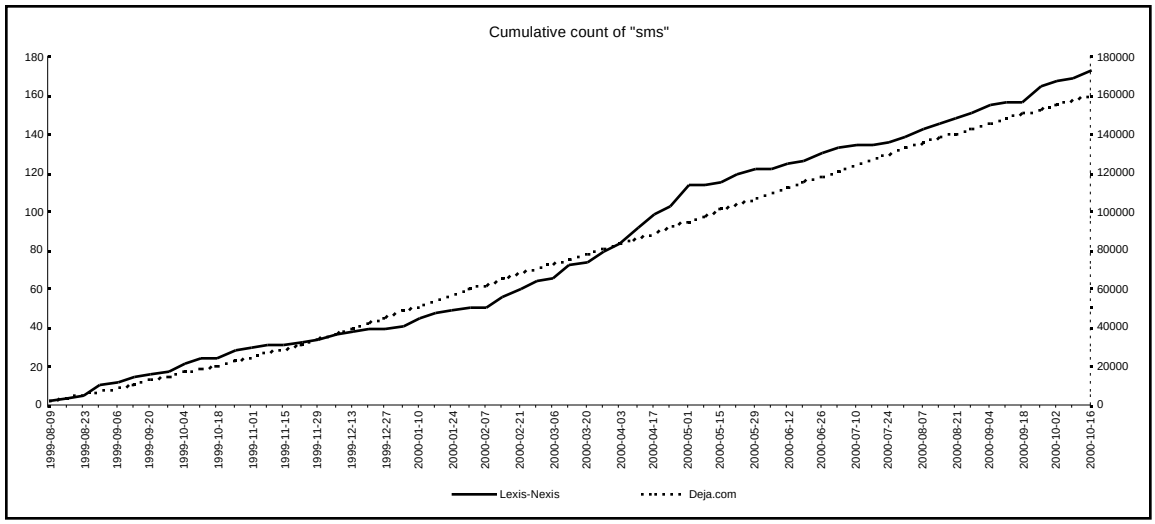


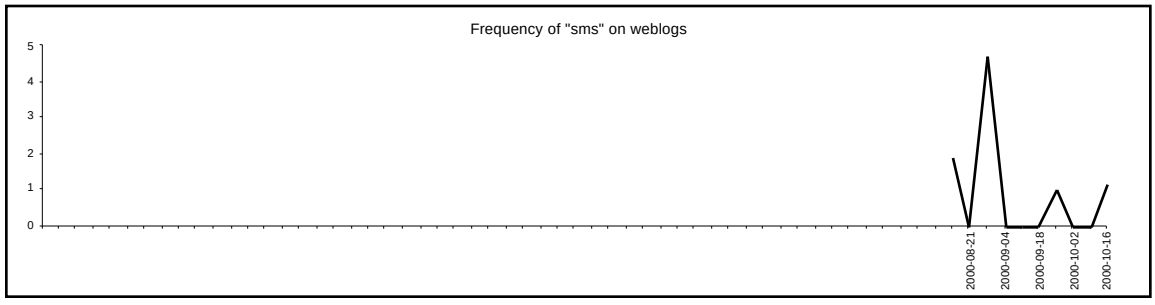


SMS

Short Message Service, a method of sending text messages between cellular phones. One problem is highlighted by the May 2000 Lexis-Nexis peak which is largely a result of Siemens buying Shared Medical Systems Corp. (or, SMS).

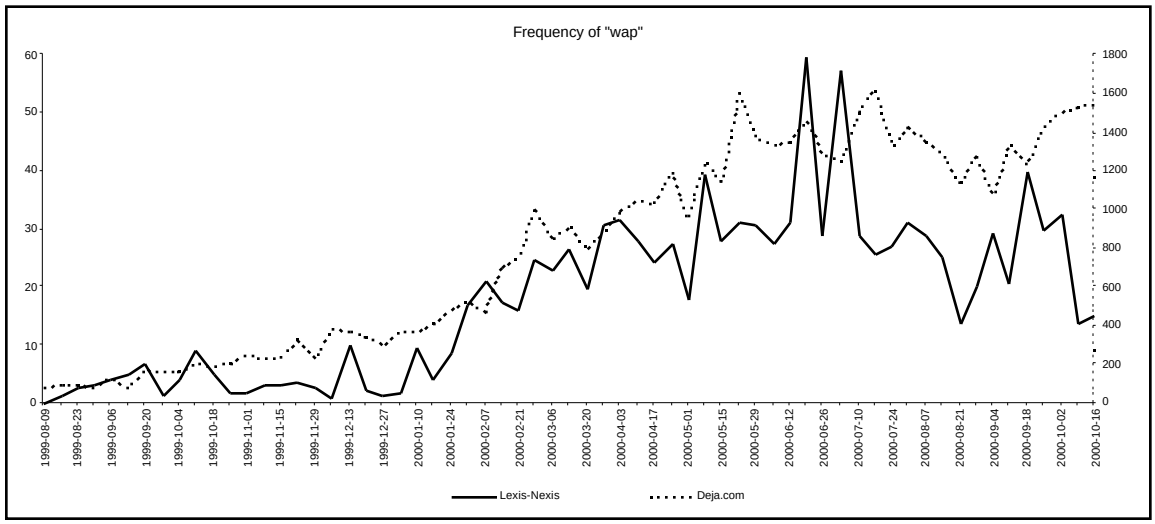


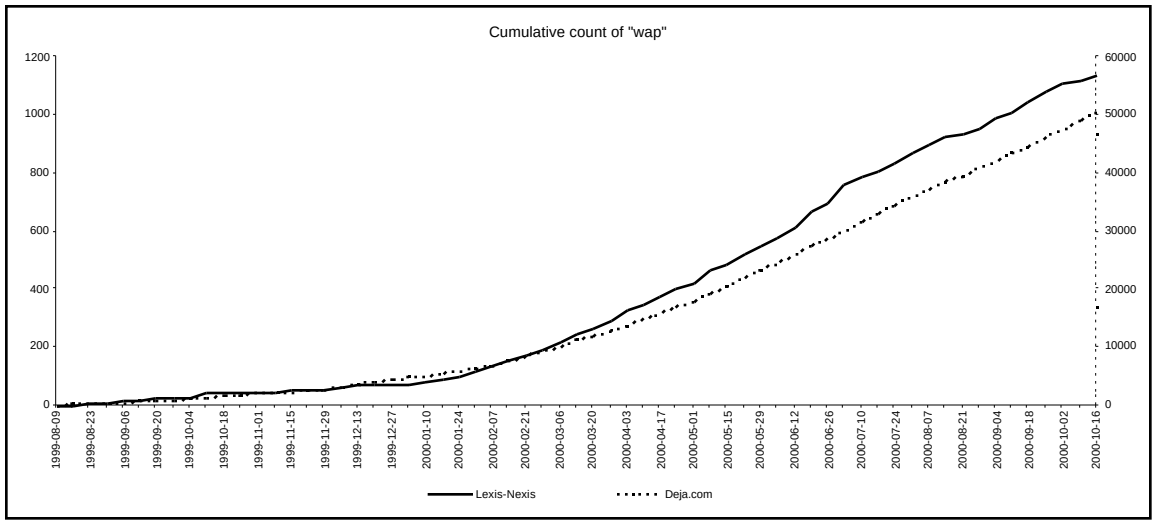


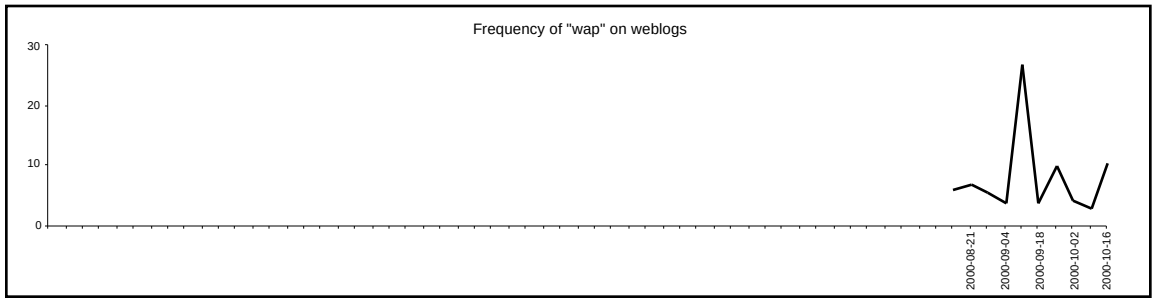


WAP

Wireless Application Protocol, a means of accessing portions of the Internet with cellular phones. The two Lexis-Nexis spikes in June/July 2000 are not prompted by any one news story.

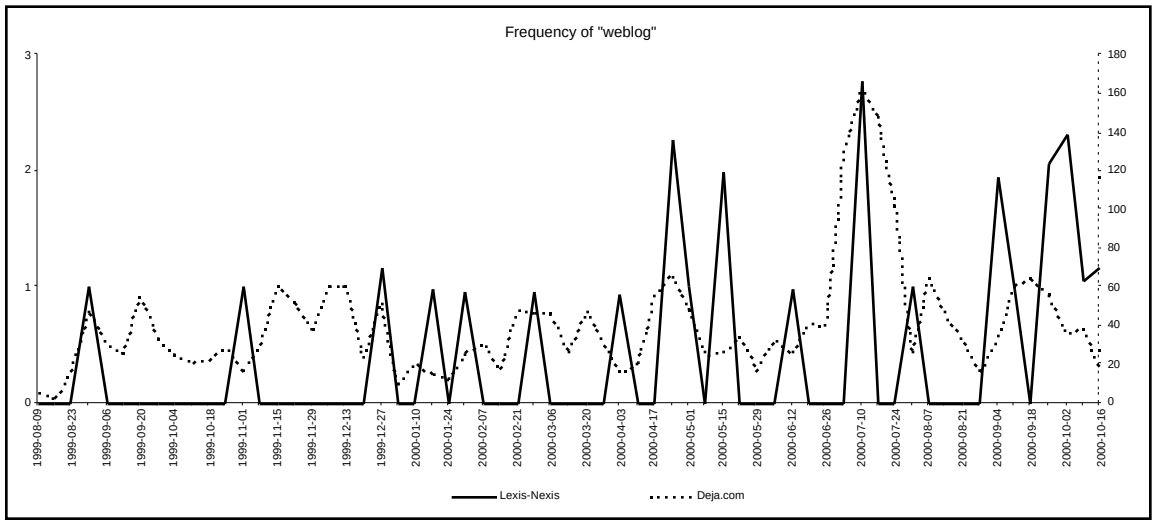


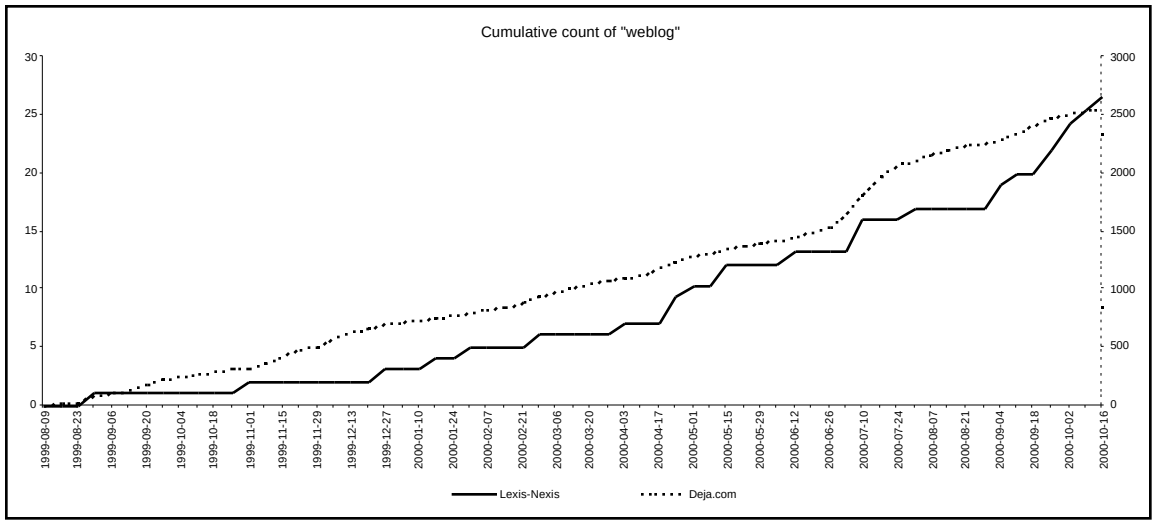


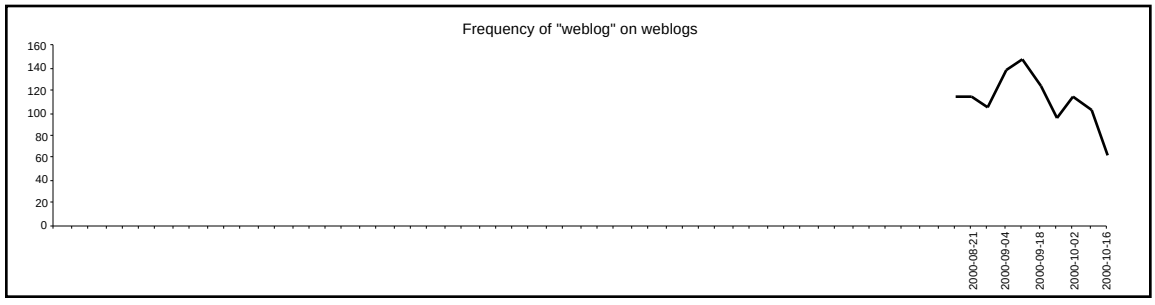


Weblog

A website frequently updated with news and links, often maintained by one person. A large part of the July 2000 peak on Usenet is the result of maybe two posters who refer to their own weblogs in their email signature.

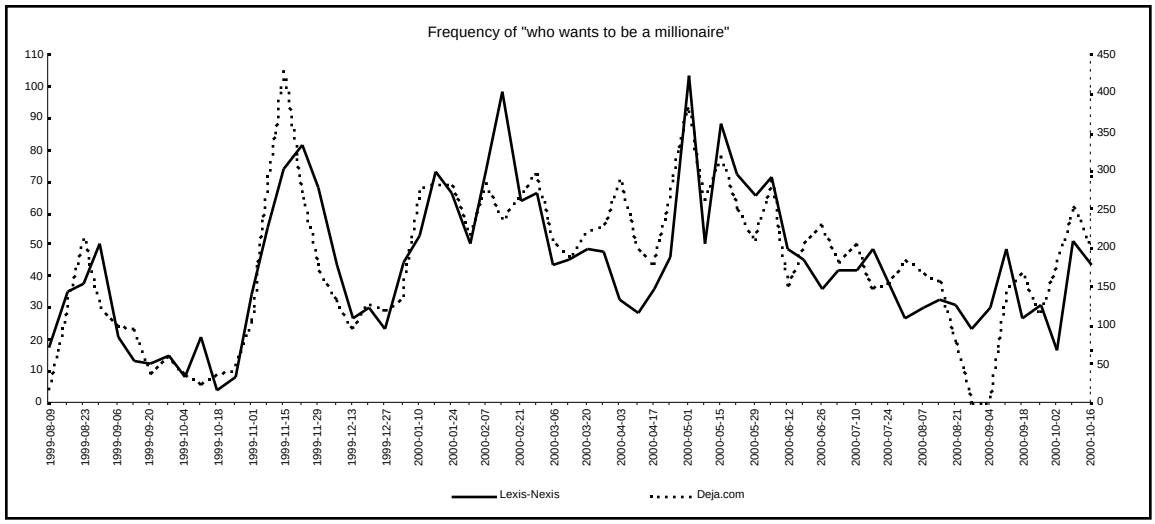


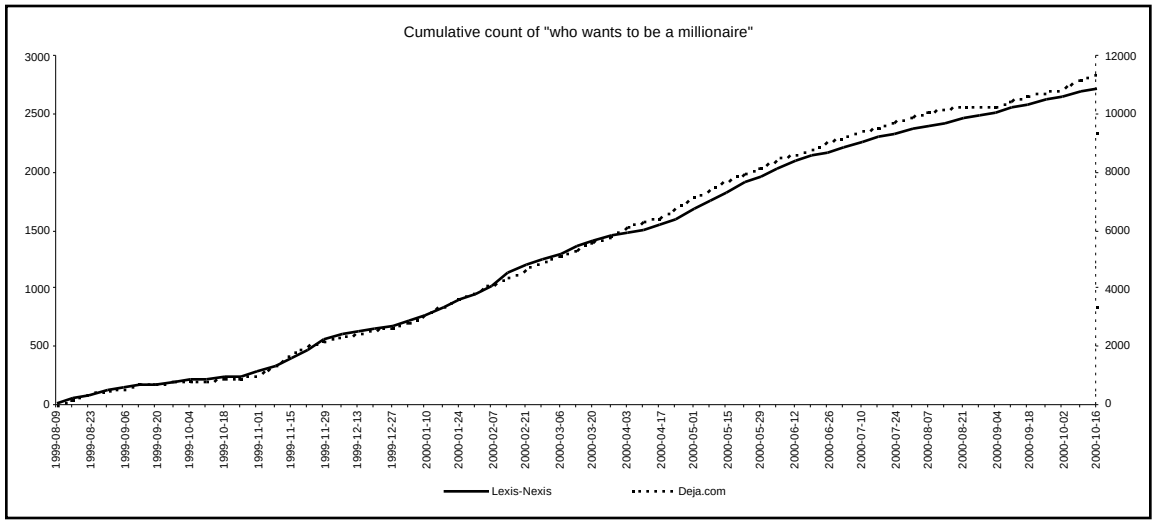


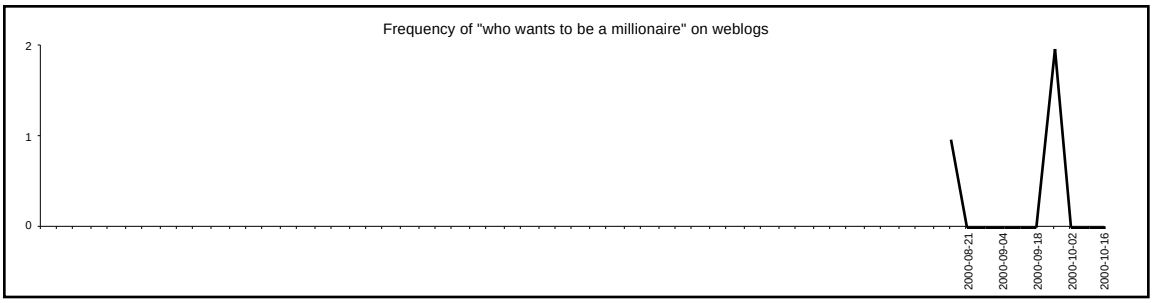


Who Wants to Be a Millionaire?

The TV game show. The show finished in August/September 1999 and there were a variety of copycat programmes preparing for broadcast. In November 1999 the show does well in the sweeps and a man wins $1 million. The show is on air in February and May 2000, the latter time including a celebrity edition. There is a gap in Deja.com's data around August/September 2000.






Frequency of "who wants to be a millionaire" on weblogs
2
1
0
2000-08-21
2000-09-04
2000-09-18
2000-10-02
2000-10-16

APPENDIX B – WEBLOGS

There has been more discussion about how to define a weblog than is probably healthy. A basic description that most people would probably agree with is "a website or page that is updated frequently (often daily) with short pieces of copy, usually links to other sites with commentary, or more personal material about the author." The biggest arguments are whether a weblog is purely a daily(ish) list of links to other places or whether it should or could include personal information along the lines of usually more lengthy journals found online.

Weblogs (or "blogs," as they are often called) are based around links to other sites, pages or news stories, often with comments by the weblogger. In this case the weblogger is acting more like an editor than an author, picking out things he/she thinks is worth visiting. Some feature more thoughtful and longer pieces. Some are updated many times a day with small snippets of the weblogger's daily life. It is a fairly incestuous world, in which one weblog will often link to others (some go as far as to actively court reciprocal links back).

Weblogs have been around in form, if not name, for years with pages such as Mosaic's 'What's New'[32] dating from 1993. Justin Hall's 'Links from the Underground'[33] was perhaps the first such page that reflected an individual's personality, as most weblogs do today. Or the first that anyone remembers. In 1997 Dave Winer's company, Userland, released a version of their Frontier software that made it easier to

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[32] *www.ncsa.uiuc.edu/SDG/Software/Mosaic/Docs/old-whats-new/*
[33] The story of 'Links from the Underground' can be found here: *www.links.net/vita/web/story.html*

quickly update such pages, as demonstrated by Winer's own Scripting News.[34] Later that year Jorn Barger was the first to use the term "weblog" to describe the front page of his site, Robot Wisdom.[35]

The number of weblogs increased exponentially in 1999, a year in which other weblog-building tools were released, such as Pitas, Blogger and EditThisPage. Suddenly there were hundreds and then thousands, as more people began realising how easy it was to create a website that people might want to visit frequently. Articles began to appear in online magazines and news websites, and in many print publications. At the time of writing, this process of writing articles about this "new" phenomenon shows no sign of slowing.

While weblogs have grown out of personal enthusiasm, there are an increasing number of professional weblogs providing a quick way to get a grip on the mammoth daily flow of new material available online. As mentioned earlier, Jim Romenesko's MediaNews was bought by Poynter, and other publications such as *The Guardian* have started their own weblogs.[36]

This brief background to weblogs has drawn on material by Jorn Barger[37] and Rebecca Blood.[38]

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[34] *www.scripting.com*
[35] *www.robotwisdom.com*
[36] *www.guardianunlimited.co.uk/weblogindex/*
[37] *www.robotwisdom.com/weblogs/*
[38] *www.rebeccablood.net/essays/weblog_history.html*

APPENDIX C – LIST OF TRACKED WEBLOGS

The weblogs that have been tracked for at least some of the duration of the project. A few ceased publication part-way through, and some were added as the project progressed, when they appeared on the two source websites.

/usr/bin/girl	*www.stormwerks.com/linked/*
2020 Hindsight	*2020Hindsight.editthispage.com/*
Andrea's Weblog	*andrea.editthispage.com/*
Anita's LOL	*anitar.pitas.com/*
Apathy	*electrobacon.com/apathy/*
AppleSurf	*www.myapplemenu.com/applesurf/*
Array	*array.editthispage.com/*
Backup Brain	*www.backupbrain.com/*
Barbelith	*www.barbelith.com/*
Bifurcated Rivets	*catless.ncl.ac.uk/Lindsay/weblog/latest.html*
Bird on a wire	*students.washington.edu/lwinn/bird/*
BirdBrain's Nest	*brdbrain.editthispage.com/*
Blackholebrain	*blackholebrain.editthispage.com/*
Bling	*www.davidgagne.net/*
Bluishorange	*www.bluishorange.com/*
BookNotes News	*booknotes.weblogs.com/*
Bovine Inverse Experience, The	*bovineinversus.com/*
Bradlands, The	*www.bradlands.com/*
Bump	*www.bump.net/*
Calamondin	*www.calamondin.com/*
Camworld	*www.camworld.com/*
Cardhouse Weblog	*www.cardhouse.com/links/weblog.htm*
Catherine's Pita	*catwoman.pitas.com/*
Cocky Bastard	*www.prehensile.com/cocky.htm*
Ctrl-alt-ego	*www.ctrl-alt-ego.com/blog.html*
Curmudgeon Teaches Statistics, A	*cuwu.editthispage.com/*
Dack.com	*dack.com/*
Daily Report	*www.zeldman.com/coming.html*

Dandot.com/today	*www.dandot.com/today/*
Eatonweb	*weblog.mercurycenter.com/ejournal/*
Ethel the Blog	*stommel.tamu.edu/~baum/ethel/blogger.html*
Evhead	*www.evhead.com/*
Flutterby	*www.flutterby.com/*
Geegaw.com	*www.geegaw.com/*
Genehack	*genehack.org/*
Ghost in the Machine	*www.geocities.com/kevincmurphy/weblog.html*
GirlHacker's Random Log	*www.girlhacker.com/log.html*
GmtPlus9	*www.bekkoame.ne.jp/~aabb/plus9.html*
Good Morning Silicon Valley	*www.mercurycenter.com/svtech/reports/gmsv/*
Hack the Planet	*wmf.editthispage.com/*
Haddock Directory	*www.haddock.org/*
Harrumph!	*www.harrumph.com/*
Have Browser, Will Travel	*jim.roepcke.com/*
Highindustrial	*highindustrial.com/*
Hit-or-miss.org	*www.hit-or-miss.org/*
Inessential.com	*inessential.com/*
Jeff's Weblog	*ican.editthispage.com/*
Joel on Software	*joel.editthispage.com/*
Keithbrowndotcom	*www.keithbrown.com/*
Kitschbitch	*www.kitschbitch.com/*
Kottke.org	*kottke.org/*
Lake Effect	*www.wwa.com/~dhartung/weblog/*
Looka!	*www.gumbopages.com/looka/*
MacInTouch	*www.macintouch.com/*
Malapropism	*wondergurl.com/malaprop/*
Manila Newbies	*weblogs.userland.com/manilaNewbies/*
Mattl.com	*www.mattl.com/*
Medley	*www.uncorked.org/medley/*
Megnut	*www.megnut.com/*
Memepool	*www.memepool.com/*
MetaFilter	*www.metafilter.com/*
Metajohn	*metajohn.com/*
Metascene	*members.tripod.com/amused_2/weblog.html*
Mike's Weblog	*www.larkfarm.com/weblog.asp*
More Like This	*www.whump.com/moreLikeThis/index.php3*
Mr. Pants	*www.misterpants.com/01/*
MrBarrett.com	*www.mrbarrett.com/*
NetDyslexia	*netdyslexia.editthispage.com/*
No London	*nolondon.qwe.as/*
Obscure Store	*www.obscurestore.com/*
Onfocus	*www.onfocus.com/*

Ooine.com	*www.ooine.com/*
Peterme.com	*www.peterme.com/*
Philly Future	*phillyfuture.editthispage.com/*
Pith and Vinegar	*www.pocketgeek.com/pith/*
Pop Culture Junk Mail	*www.popculturejunkmail.com/*
Prolific	*prolific.org/*
Q Daily News	*q.queso.com/*
QubeQuorner	*qube.weblogs.com/*
RC3.org Daily	*rc3.org/*
Re-run	*www.bryanjbusch.com/lately/*
Rebecca's Pocket	*www.rebeccablood.net/*
Riothero	*www.riothero.com/*
Robot Wisdom	*www.robotwisdom.com/*
Saturn.org	*saturn.org/*
Scripting News	*www.scripting.com/*
Sheila's Web Site	*sheila.inessential.com/*
Slashdot	*slashdot.org/*
Spicy Noodles	*spicynoodles.com/*
Strange Brew	*50cups.com/strange/default.asp*
Stuffed Dog, The	*www.stuffeddog.com/*
Swallowing Tacks	*www.swallowingtacks.com/*
TBTF Log	*tbtf.com/blog/*
Tomalak's Realm	*www.tomalak.org/*
Traumwind	*traumwind.editthispage.com/*
Twernt	*twernt.com/weblog/*
View from an Iowa Homestead	*vfih.editthispage.com/*
View From the Heart	*viewfromtheheart.editthispage.com/*
Web Queeries	*www.hit-or-miss.org/queeries/*
Weblog Shmeblog	*www.jish.nu/*
Weblog Wannabe	*www.wannabegirl.org/*
Webloglog	*trenchant.org/webloglog/*
Wetlog	*www.wrongwaygoback.com/*
Whim and Vinegar	*gooddeed.net/blog/*
Xblog	*www.xplane.com/xblog/*
Zope Newbies News	*weblogs.userland.com/zopeNewbies/*

The following sites are not included as they are either professional sites or do not fit my definition of a weblog:

Arts & Letters Daily	*cybereditions.com/aldaily/*
Blogger	*www.blogger.com/*
Discuss.Userland.com	*discuss.userland.com/*

Dr. Dobb's Web Site (news page)	*www.ddj.com/news/*
Linkwatcher Metalog	*www.linkwatcher.com/metalog/*
Monkeyfist Collective	*monkeyfist.com/*
Need to Know	*www.ntk.net/*
O'Reilly Network	*www.oreillynet.com/*
Onlinejournalism.com	*ojr.usc.edu/content/ojc/*
SalonHerringWiredFool.com	*www.salonherringwiredfool.com/*
XML.com	*www.xml.com/pub/*

The following sites are not included as they were not being updated when the project began:

Blogging, Italian Style	*www.ouch.vms1.com/*
OneSwellFoop	*www.oneswellfoop.com/index.html*
Running Tally	*www.nullmeansnull.com/tally/*

The following site is not included as it is not in English:

Alt0169	*www.alt0169.com/*