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Does Google shape what we know?

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While much has been written about the technological, economic and regulatory aspects of search engines, their impact on everyday life has been largely overlooked. This essay argues that this is mainly because the role of information and knowledge has been poorly theorized in the social sciences in terms of how search engines are actually used. One way to make a start on this topic is to bring to bear two theoretical frameworks from the social study of technology – large technological systems and the domestication of technology. These allow us to see how search engines have become an infrastructure at a time when, on the one hand, the uses of the Internet as a system have become pervasive and, on the other, information seeking in the home has become a routine activity in everyday life. Several studies of search behaviour have identified the main patterns of search. What emerges is the dominant role played by Google, and that the vast majority of searches are related to leisure. The paper asks whether Google plays a gatekeeping function, and how it shapes the information we use in everyday life.

Introduction

Much has been written about the technological, economic and regulatory aspects of search engines. These writings have led, for example, to extensive policy debates and to discussions of the quality of search results. Yet we know relatively little about the impact of search engine use on everyday life, despite the fact that this has become one of the most popular activities on the Internet, second only to email (Purcell *et al.*, 2012). This essay argues that a key reason for this oversight is that everyday search behaviour does not have a natural disciplinary home: media and communication studies have barely begun to examine information seeking by means of the use of search engines. Information scientists, on the other hand, typically examine search behaviour outside its social context; for example, by gauging how users perform search tasks in a laboratory setting. A number of recent studies nevertheless provide large-scale as well as detailed findings about how people use search engines and what they search for, so that many broad patterns are clear.

What is needed is to put these findings into a coherent theoretical framework which gives due weight to how search engine technology plays a role akin to other infrastructures (roads, electricity and the like) in society, but that also puts into specific social contexts what people search for and why. The role of infrastructures has been developed by means of the 'large technological systems' perspective of Hughes (1987), which argues that these systems are particularly malleable when they first emerge, but become an almost invisible backdrop in social life as they congeal over

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time. The notion of the domestication of information and communication technologies provides the second element of such a framework by focusing on how new technologies become embedded in the fabric of everyday social life, but this idea has been applied only to search and information behaviour to a limited extent.[1] This essay pursues this embedding of technology further and argues that the domestication framework lends itself well to understanding search engine uses because these, it turns out, are to a large extent dominated by consumption, and consumption has been central to the 'domestication' framework from the start (see Silverstone and Hirsch, 1992). What the domestication framework lacks, however, is an appreciation of the larger dynamic of technological systems, and in this case particularly the overwhelming dominance of particular search engines (in different parts of the world, and in North America and Europe), Google in particular.

This essay will proceed as follows: first, it will discuss a number of disciplinary perspectives on search engine uses, and argue for an approach that combines the sociology of large technological systems with the domestication theory of media and communication studies. Second, it will analyse some key findings about search engine uses, mainly from the UK, Australia and the US, as well as comparative studies. Third, it will highlight what is not being argued in assigning a dominant role to Google, and argue that discussions of the biased or political nature of search engines have overlooked the mutuality in how users shape search engine results and search engines in turn shape the results that users seek. Finally, the essay will assess how search technology, and in particular Google, has rapidly come to play such an enormous role in our everyday lives. The essay concludes with implications and thoughts about a research agenda that includes information and knowledge behaviour in an enlarged understanding of media and communication technologies in everyday life.

Disciplinary approaches

The vast majority of studies of search engine use and information seeking have been carried out within computer science and in library and information sciences. Computer science research tends to focus on whether search engines provide us with the most 'relevant' or highly ranked results. This purely technical issue does not concern us here except in that 'relevance' is based on algorithms which aggregate queries, and developing and refining these algorithms is one of the sources of success of search engine companies. Similarly, studies within information sciences often have a rather narrow focus; for example, setting user tasks in experiments and measuring how well or poorly they achieve their goals. These experimental task studies are not central here *per se*, but which search results users click on, and the fact that they typically focus and click on only the top two or three results, as revealed, for example, by eye-tracking studies (Lorigo *et al.*, 2008), is relevant. It means that, while search engines give a very large number of results for each query, only a tiny proportion of results on the first results page matter.

Nevertheless, these disciplines do not address the larger issue of the role of technology or of knowledge and information in society. The large body of research devoted to information searching and information retrieval (the latter is the discipline with the closest fit to the study of search engines) within information science does not address, for example, the social context of the uses of search engines. This statement is not quite true since, in their review of the 17 theoretical constructs in these two domains, Jansen and Rieh note a number of studies that have addressed some of

the broader implications of information searching (the most relevant ones will be discussed below), but they say 'information retrieval researchers have paid little attention to the social aspects of information use' (2010, p.1530; but see Aspray and Hayes (2011) for essays dealing with aspects of mainly offline information).

Making a big leap from computer and information science to sociology, it becomes clear why the topics of information and knowledge have also failed to address search engine use. One reason is that little attention has been paid to the sociology of knowledge. The Marxist tradition of the sociology of knowledge used to be devoted to the 'dominant ideology thesis' (Abercrombie *et al.*, 1980), but this tradition has completely faded from view with the decline of Marxist thought (see Fuchs, 2001), although the history and political economy (often associated with Marxism) of search engines (van Couvering, 2008) is relevant to everyday life and consumption. As we shall see, the vast bulk relates to consumption and leisure. Another approach within sociology has put forward the notion of a knowledge society (Stehr, 1994), but this is mainly concerned with the role of information and knowledge in a service or a knowledge economy, rather than with users and everyday life, where studies of culture and consumption (for example, McCracken, 1988) are central to understanding new technologies. What falls between these stools is how information and content, not culture *per se*, are consumed – also online, and for the most part for leisure purposes – in everyday life.

Zimmer's (2010) review of search engine research discusses the precious few studies under his heading of 'user studies' (which include 'transaction log analyses'), all grouped under 'the use and effectiveness' or the 'user awareness' of how search engines work. The review dwells on the far more numerous studies, for example, of the political and legal aspects of search engines. What the history and sociology of technology can add to this, however, is how such technological systems come into being, how they develop over time, and how they shape uses in the sense of how we access information and knowledge. What media and communication scholars can add beyond this is an understanding of uses in the sense of what kinds of information and knowledge are routinely being sought in everyday life. These two approaches must then be brought together, which is the task of the following section.

Large technological systems and the domestication of technology

How do technological systems emerge and come to pervade society in the sense of providing an infrastructure which supports a wide range of activities? The concept that, I will argue, with some modifications, fits search engines well, is that of 'large technological systems'. This concept was developed by the historian of technology, Thomas Hughes, who used it to chart the development of such technologies as electricity, transport and communication, which grew into vast systems or infrastructures (Hughes, 1987). In their early phases, Hughes notes, these systems were still quite malleable and could take various directions. With maturity, the technological and social components increasingly intertwined, congealing and developing a momentum of their own (Hughes, 1994), which also means that their force becomes routine and inescapable (see Summerton, 1994).

This concept fits well because search engines are also becoming an accepted and unquestioned infrastructure in our lives. Yet it also does not quite fit, for three reasons: one is that search engines are only one component of a larger technological system – the Internet or the Web. What search engines do is provide access to this

system, though the way they do this has now become routine (as we see in the daily use that people make of search engines). Search engines also developed the characteristics of an infrastructure in that this larger system, the Internet/Web, has become an established part of the world's communication and information infrastructure. It is interesting to consider that this infrastructure could have developed differently and may still do so: search engines could be non-commercial, based on open source licensing, or equally they could charge money for each result. However, at this point, the model of commercial search engines based on advertising has become overwhelmingly dominant, even in such markets as Russia and China, where Google is not the main search engine.

There is another aspect that does not quite fit: other large technological systems typically have a sizeable hardware component, and this is a major reason why they become so intertwined and congealed with social forces. Power cables, roads and communications transmission all require the development of equipment on a large scale and need major socio-organizational effort (including regulatory effort) to embed this hardware. Search engines, too, require considerable hardware – power stations, cables and an organization of tens of thousands of employees (Levy, 2011) to provide search and other services. Note, however, that in comparison with the Internet/Web and with other large technological systems, this technological and social component is relatively small. The main technological system of search engines is software, which is continually being refined through the efforts of software engineers, by far the largest share of Google's workforce (Levy, 2011).[2]

Hughes (1987) argues that in the intertwining of technological and social factors, weak links in a system or bottlenecks (what he calls, borrowing military terminology, 'reverse salients') must be overcome. An example here from the development of the electricity grid is that the transmission of power was costly and required the adoption of a standardized technical solution (in this case, alternating current, which was not used everywhere). Such reverse salients are difficult to identify for search engines (although how to locate the servers both near suitably cheap power supplies and close to the bulk of users could be seen as one). This lack of fit with Hughes' concept comes back to the fact that search engines operate via the pre-existing Internet and Web, though there are limits to the dominance of this large technological system.

However, the technological system of search engines requires one other constituent element – millions of user searches. These do not require great organizational effort (all users have to do is to type www.google.com into their browser), and they do not need to be serviced in the sense of organizing user payment systems or support (as with, say, electricity or phone systems). Finally, the regulatory aspects of search engines are light in comparison with those of other large technological systems, and relate mainly to where they can and cannot operate because of censorship, for example. The market dominance of search engines, which has become the subject of regulatory scrutiny in the United States and lately in the European Union, is largely outside the scope of this paper. In any event, the core of this large technological system is the operation of an – albeit quite complex – algorithm, combined with the massive scale of the use that is made of this algorithm and the technological system that allows millions of people to use it daily.

To be sure, as with any large technological system, technological and social forces are becoming more intertwined. As Hughes (1987, 1994) shows, these entanglements grow over time, and it can be expected that as Google and other search

engines become more embedded within the infrastructure of the Internet/Web, this process will continue. For example, Google has moved into the territory of the motion picture industry and television with YouTube, and into mobile telephony with forays into software for mobile phones, and onto the turf of libraries and booksellers with GoogleBooks (note how these have raised major regulatory issues compared with Google's core business). The changing uses of these infrastructures have implications: for example, Waller (2009) notes that if people access information using Google instead of using public libraries, this is a shift not just in technological systems, but also away from a public institution to a private company. There are also growing concerns over privacy; for example, with the filter bubble effect (Pariser, 2011) whereby search engines are able to target users. These and other issues are bound to become increasingly entwined with other social forces. This, at least, is the standard path for large technological systems.

The technology of search (making use of relatively small-scale hardware) and the algorithm, working on a massive scale, shapes how content is accessed on the Web. This turns search engines, and Google in particular, into gatekeepers, a term that comes from a tradition in the study of media and political communication that has been concerned with who decides what news is being watched or read or heard, and which has begun to be applied to the Internet/Web (Barzilai-Nahon, 2008). Yet, there is also a key difference between search engines and other media in respect to gatekeeping. The whole of the technological infrastructure of the Web is made available to users (with certain exceptions), in contrast to other media, which are often national or have a limited reach. Gatekeeping in relation to search engines does not pertain to content: Google provides no content itself (or only a tiny amount), but it provides access (again with exceptions, such as censorship) to the whole of the Web's content. Thus, instead of gatekeeping it is more appropriate to speak in the case of the search engine component of this large technological system in terms of a dominant share of attention – in the sense that content is largely accessed in this way by users. Google has a dominant audience share of attention; put differently, Google determines online visibility and prominence.

Google shapes access, while users shape the information that is being sought. One perspective that has gained prominence in recent decades focuses on routine uses of technology, and especially information and communication technology, in the context of use. This is the 'domestication' framework (Haddon, 2004, 2011; Schroeder, 2007), which firmly embeds technology in its social context, at work or in the home. The advantage of this framework is that it avoids hyperbole about the implications of new technology because technology is examined from the ground up. Put differently, this is a thoroughly empirical social science perspective. This perspective, which includes historical analyses, interviews, diary studies as well as surveys, has been applied to a range of new and older technologies, including television, mobile phones and home computers. Yet, a comprehensive application of 'domestication' to search engines uses still eludes us.

The most in-depth study that draws on the domestication framework is Hektor's (2001) analysis, based on diaries and interviews of 10 Swedish participants. This study exhaustively catalogues the information-seeking patterns of the participants in their everyday lives (bus timetables, reference works, local events and the like) and where the Internet (then in its infancy) fits into their lives. A problem with this study is that it is now out of date, though it provides useful insights into ordinary information needs. Rieh (2004) has attempted a similar study of 12 northern California

participants based on activity diaries kept over a three–five day period in 2001, plus interviews and search query logs. She found that home uses of search engines are different from those at work or school, being less focused and often driven by idle curiosity. But how can a study of search in 2001 expose use in 2012, when search engines have become so much more ubiquitous?

To gain an understanding of search behaviours in everyday life, we must also include the larger forces that shape these. Sociologists of science and technology might be expected to address this topic, but they have focused on the political shaping of the biases of search engines from a normative perspective concerned mainly with the diversity of political and cultural information (see Introna and Nissenbaum, 2000). This perspective does not consider that search for political and cultural information constitutes only a small fraction of the uses of search engines, and that the most popular search queries shape the results that search engines provide. Put differently, this perspective, though useful, is concerned with the regulatory and policy aspects of search engines rather than with everyday search behaviour.

Combining the perspectives of large technological systems and of domestication enables us to gauge the social implications of new technologies in a holistic way. If search engines are not considered in context, the result is hyperbole about how the world is changing radically with new technologies. What we really need is a comparison of modern search engine use with how people met their information needs before the advent of search technology. While the broad patterns of search engine behaviour are well documented, they still need to be put in the context of pre-Internet and Web uses of information. Ideally, we would like to know not only how people search, but also how they use the search results or the information contained therein. The domestication and large technological systems perspectives have their limitations: they do not address economic, political and legal issues related to search engines, yet they have the advantage of focusing laser-like on how this technology shapes and is shaped by social life. What role do search engines play in the everyday life of users?

Search engine uses

Search engine use has become the second most common activity on the Internet, at least in the United States. A recent survey concludes that 'search is only rivalled by email both in the overall percent of internet users who engage in the activity and the percent of internet users doing it on a given day' (Purcell *et al.*, 2012, p.5). This figure has been climbing steadily since the early 2000s, so that by 2012, 59% of adults using the Internet use a search engine on a typical day. Google's share of American search engine users and the gap between Google and the next most popular search engine has also grown dramatically. Google has 83% and the next most popular, Yahoo!, has just 6%.

But we also need to know, for example, to what extent people using the Web go to a search engine rather than to a specific page. Here the Oxford Internet Survey (OxIS) for Britain (Dutton and Blank, 2011) can help, since it asks of Internet users: 'In general, when you look for information on the Internet, do you go to specific pages, use a search engine, such as Google or Yahoo!, or do you do both about the same?'. About 61% say 'mainly search engine', 15% say 'start with a specific page' and 23% say 'both about the same' (p.22). When asked: 'How frequently do you use the internet for the following purposes?', 'travel plans' are at the top of the list,

but 'information about local events', 'news' and 'health information' are also listed by more than 70% of Internet users. OxIS asks a separate question about leisure uses of the Internet (not about information seeking) where 'listen to music', 'download music' and 'play games' all reach more than 50%. However, as Waller (2011) points out, these OxIS questions could be interpreted differently from the point of view of Waller's classification of various types of searches. Why should 'listen to music' come under 'leisure', and yet 'sports information', for example, comes under information seeking in OxIS?

In any event, the key point here is that the Internet has become a major source of information and leisure for British users. Unfortunately, the larger World Internet Project, which covers 16 countries, and of which OxIS is a part, asks only about access to online information sites and searching for products online and not about search engine uses.[3] Yet we know that these users turn to the Internet first when looking for professional and personal information (rather than, say, using the telephone, visiting in person or using a directory or book (Dutton and Blank, 2011)), and we also know that Google is by far the leading search engine in Britain (see Segev and Ahituv, 2010). Google sites had a 77% share of UK searches in 2004.

There is a proviso here: a major causal chain has been suggested, with several links that are speculative. For example, it could be that many British users access specific pages, such as the BBC or an online newspaper website, without using search engines, or that they listen to music without using search engines. The causal links could be made direct only by asking users how often they use Google for the accessing of this content compared with all other media. Still, the argument made here rests on the idea that Google would be dominant if this were asked, and while this remains to be researched, evidence suggests that users use search engines in a navigational way (Broder, 2002); that is, to access content of which they are already aware.

Apart from asking people how they search when they use the Internet, what do their actual search queries tell us? Waller has had access to transaction logs to provide an analysis of the type and topic of search queries entered into Google in Australia in April 2009. Google's market share in Australia is almost 90% (Waller, 2011). She also had data from the marketing company Experian about the search terms employed by 11 lifestyle groups (broadly comparable with socio-economic stratification groups). She analysed almost 1% of all search terms for a month, extracting a sample of 60,000, which accounted for 28.7% of all search queries (a query typically consists of two or three terms). Waller then used 78 codes and amalgamated these into 15 broad subject groupings, such as 'high culture' and 'popular culture', 'ecommerce', 'weather/time/public transport' and the like.

Waller (2011) finds that queries about popular culture and ecommerce account for almost half of all search engine queries and that the distribution of topics of search query did not vary significantly across different lifestyle groups for the broad subjects of popular culture. This is surprising since others have found divides between advantaged and disadvantaged users and between expert and skilled users (for example, Robinson, 2009), and we might have expected different lifestyle groups, or groups of different socio-economic status, to search for different things. Yet it seems that, in Australia at least, users from different socio-economic groups have similar queries.

Another question that Waller addresses is whether people are searching for something in particular, or using Google to reach websites they already know: 'Only half

(52%) of all queries were informational … For almost half of the queries (48%), the searcher appeared to have a specific Website in mind' (2011, p.769). Put differently, only half the uses of search engines are truly to search for content. Leisure searches still account for one-third of these informational searches (p.773). Since she finds such a high proportion of leisure searches, she points out that 'to a searcher undertaking a leisure search, the question "Did you find what you were looking for?" is irrelevant' (p.772). It seems clear that the information science approaches mentioned earlier, focusing on how effectively or successfully people find results, provide only a limited perspective.

Waller's overall conclusion is that the search engine is not only an interface to information or a shortcut to websites, it is as much a site of leisure (2011, p.761). Further, like other studies (for example, Hindman, 2008), she finds that people looking for information on particular contemporary issues account for less than 1% of all search queries. Queries about government, including programmes and policies, account for less than 2% of all Web search queries. In short, search engines are mainly a technology for consumption, rather than one for seeking knowledge and information. It is, of course, difficult to separate leisure and consumption from other activities, though one approach is to distinguish leisure and consumption from work (including domestic work) and work-related activities (see Schroeder, 2007).

Perhaps people search for different types of content depending on where and when these searches take place? Segev and Ahituv (2010) have analysed between 150 and 200 popular search queries in 21 countries over a two year period (2004–2005) in terms of country differences, whether users search for political and economic materials, the variety of materials searched for, and how specific or general the searches are.[4] The country differences they find are interesting (though not relevant to the argument here). Here, we are concerned with how the most popular search queries can be classified. The authors make use of the open directory project (http://www.dmoz.org/), which is a volunteer effort to categorize the content of the Web.

Using this directory in their analysis of 4474 queries, Segev and Ahituv put 1950 queries into the category of art [within this category, the five largest subcategories are music (839), performing arts (265), celebrities (187), movies (174) and animation (165)]; sports (473), which contains two dozen or so different types of sports; recreation (418), with the largest subcategories being travel (247) and autos (49); and society, with the largest subcategories being holidays (181), chats and forums (69), and religion and spirituality (38). News (346), reference (197), shopping (180), business (173), games (167) and computers (86) make up the bulk of the remaining search queries, with the remaining four categories totalling 59. What is striking here is that, as in Waller's analysis (which uses different categories), well over half of all the most popular search queries are devoted to leisure (if we add only art, sports and recreation) in contrast to what we might understand as searching for information (if we put together, say, news and reference). Although the authors show that there are national differences (for example, in specific as opposed to general searches), these differences do not disturb the broad patterns found for the most popular searches.

Some further comments on these studies are in order. There are always problems with categorization: for example, there were 124 search queries in the subcategory of weather under the main category of news (346), but is weather news, or is it a search most closely related to the subcategory of holidays under society, or perhaps to the subcategory of travel under recreation? However, the broad patterns of what

people are searching for are clear: and by far the most popular searches are for entertainment (Segev and Ahituv, 2010). The open directory project classifies entertainment under art, but a number of other descriptors, such as popular culture or leisure (which Waller might use), would work equally well. A different but related categorization problem is evident in the diary study carried out by St. Jean *et al.* (2012), who group together all information behaviours on the Internet excluding communication behaviours, a categorization that highlights an inherent ambiguity.

These studies provide us with some national, cross-national and cross-class results for the most common content people search for, and provide examples of how these queries can be classified. They provide insights from several countries using a range of methodologies, but the focus of this paper is not on methodology. It merely suggests that these studies provide us with a sufficient understanding to draw a number of tentative conclusions: that search is widespread, that it consists only partly of information seeking, and that most search engine use is for leisure and consumption. We can now consider the implications arising from these everyday uses of search engines.

Discussion

As we have seen, in the sense of providing access to search results, Google shapes what we know. A large technological system has come to play an infrastructural role in our everyday lives. But Google is merely the algorithm that is shaped by what we – the users – want to find. This is quite unlike the role of other media gatekeepers, such as newspapers, where editors and others make decisions. As Granka (2010, p.370) puts it, 'aggregate analyses of Web traffic and Web behaviour' by search engines 'only reveal the tastes of mass publics … we are not expecting search engines to change innate public opinion'. Or, more pithily: 'aggregate traffic merely reflects mass tastes' (p.371). Google and other search engines do not shape our attention, but they channel it. Put differently, whereas other media and information sources provide the content of our attention, Google focuses it.

Yet there is one modification that should be made to Granka's statement: yes, insofar as users' attention is shifting to content on the Web, we should expect search engines to play an important role, at least in how information is accessed. This point can best be understood by presenting it *in extremis*: if the Web (which, again, is relatively new), were the only source for our information and knowledge, then Google (primarily) and other search engines would be shaping practically all we can access via search. This recalls the famous first sentence of Luhmann (2000, p.1) about the mass media: 'Whatever we know about our society, or indeed about the world in which we live, we know through the mass media'. Indeed: what we know through the Web, we know, or at least get to, through Google. Hindman (2008) has coined the term 'Googlearchy', a hierarchy in the link structure of political websites in which top sites receive most attention by far, while many sites receive little or no traffic. This idea is an important complement to the idea of Google's dominance. Yet, as Hindman himself notes, political websites are a tiny fraction of total online content.

The domestication of technology perspective enables us to understand what our routine search engine uses are, and thus how the information we search for shapes search engines results. Search engines only shape how we get to these results. Or, to make an analogy with other infrastructures, electricity allows us to use appliances, it

does not decide which ones we use or how we use them. This allows us to put into perspective a number of arguments about the social implications of search engines. For example, Introna and Nissenbaum (2000) have argued that search engines are biased and thus that the politics of search engines matters. At the core of Introna and Nissenbaum's argument are two ideas: the first is that there is no transparency about Google or other search engine algorithms. This is true; no one apart from Google's engineers knows just how search engines work. Brin and Page (1998) based their original idea for a search engine on the notion of hyperlinks as citations; that is, the more links (citations) a page gets, the more others must want to read it (which is the notion behind PageRank). This is still the underlying (algorithmic) basis of search, and relies on having enough users to do this well. As Granka (2010) notes, there is no single, neutral algorithm: in fact, to assess the 'authoritativeness' of a website, and to avoid spamming, Google uses many rules. Yet, the underlying idea of PageRank still governs search. The problem, again, is that there is no way of knowing just how this mechanism really works, it is a 'black box'.

Introna and Nissenbaum's second key argument is that search should not be left to market mechanisms since the Web is a public space, a public good (see also Simpson, 2012). Thus, market competition among search engines will not necessarily reflect, or provide access to, less visible sites that are needed to sustain an open and diverse public space. This may be true from the normative perspective of Introna and Nissenbaum, and their argument is important for regulatory and policy issues concerning market competition. However, it is hard to see what search engines are biasing us towards. Consider Google's 'contentless' aim of maximizing its audience and market share of attention. Each search or click counts as one 'vote' for what people would like to read or see or hear on the Web (Google even suggests what we should vote for, with its autocomplete function, which predicts and finishes our incomplete search terms). This may be a completely non-transparent regime, but it depends entirely on support from a mass audience: if Google had insufficient users, it would decline. Its results would become ever poorer as it could no longer update them in the light of the changing content of the Web. Google's dominance thus relies on its users. No one, with the possible exception of engineers within Google or other large search engine companies, knows what market share, or what number of continuous users, is needed to keep a search engine working adequately.

It could be argued that people have many ways to access Web pages without search engines, such as bookmarks and links which they are sent. However, as we have seen, this is not how most people 'find' information most of the time: they use search engines as an easy means to access Web pages they already know. While alternatives exist, in practice, these common uses of search in accessing the Web dominate and thus shape everyday life. The link between how these widespread uses reinforce the power of the algorithm, and *vice versa*, can once again be emphasized here. Or, to put it the other way around, it would nowadays be difficult to see how the Web could be accessed without search engines, which is how this technological system and its key algorithmic component have become deeply embedded in everyday life.

It is true, of course, that Google has become a commercial behemoth and needs to generate huge revenues to sustain itself.[5] Yet this revenue seeking does not necessarily bias 'organic' (non-advertising) results as opposed to 'sponsored' (advertising) results, although there continue to be debates about the connection between them.[6] Yet apart from this, search results are based on the algorithm and the ways in which

it has been refined over the years. So far, the system has escaped entanglement with other social forces. Roads and cars require a lot of regulation because they affect many other parts of society; search engine results are less entangled. There are exceptions, such as censorship of results, and these have partly curtailed Google's dominant position.

The hardware infrastructure of power plants and fibre optic cables, though complex and requiring considerable resources, is largely separated from users and results. Other infrastructures, such as those required for road transport and electric power, are much more extensive, visible and physically demanding. All that users see of search engine infrastructure is a simple rectangular box, a logo on their screen, and then the search engine results pages. The remainder of the system, the Internet/Web, provides the bulk of the infrastructure, such as the software system and the Internet provider, and this is more evident.

To be sure, thousands of engineers have been engaged in efforts to improve the algorithm, and the hardware that supports it, in the course of Google's short life. The power of the technology rests on a mathematical formula about how web pages are linked to other web pages, combined with the power that this algorithm obtains from millions of users every day. The latter are therefore as much part of Google's dominance as the algorithm itself. There is no other technological system where the users and uses of the technology reinforce such a dominant position. Concern here is with dominance in the commercial sense (see Pollock, 2010) and thus with sponsored results (advertising). Yet in fact, from the consumer side, the product is free. Google dominates in that it has a dominant share of searches performed, where dominant means, say, more than two-thirds. (Pollock points out that the threshold more commonly employed in determining monopolistic behaviour is 50%.) This two-thirds market share applies in nearly all countries. The most important exceptions are China, where Baidu dominates search engine uses (62% in 2009), and Russia, where Yandex dominates (60% in April 2012). Google's global share of search engine use in 2013 was 84%.[7]

It is also worth noting that consumers are not the only search engine users; there are also those who want online visibility, even if they are not advertisers. Academics are an example. If we subtract advertisers (and thus sponsored results), these others include all those who would like to have an audience for the information they provide, such as bloggers, non-commercial news media, non-governmental organizations, and many more. Ideally, the demand of consumers for information should be met by the supply of information providers. However, in this competition for attention, information providers equally do not have much of a choice: how visible they are or how much their web pages are accessed depends to a large extent on search engines.

The thrust of the argument can be appreciated by pitting it against two widespread ideas about Google. The first is that of Eric Schmidt, the executive chairman of Google during antitrust hearings in the US Senate, that 'it's also possible not to use Google search … the competition is just one click away'.[8] This is more true in theory than in practice. Google derives its dominance from the number of its users, and from how its algorithm has been refined. It is not clear how fleeting this dominance is. It may not be destined to be undone by Schumpeter's creative destruction (see Collins, 1986): it is conceivable that Google will maintain its advantage for some time, just as other large technological systems have done. The second misleading idea is that Google maintains its power through its political or social position. To

be sure, there are instances of such entanglements: caving in to Chinese government censorship before the decision to abandon mainland China (see Jiang, 2014), and in relation to techniques to prevent gaming visibility rankings, and lobbying governments in relation to communications policy. Yet the statement is misleading because the technology depends on the mechanism whereby the most relevant results are calculated. If Google no longer provided the results people were seeking, then its position would presumably decline, despite its political and social influence. A brief contrast can be made with Facebook, which also provides users with a free service. Facebook's overwhelmingly dominant position, however, is based on the well-known network effect, whereby users are locked into the networks of their contacts. They are unable to switch to another network in which their contacts are not members. Google's dominance, in contrast, is based on its first mover advantage whereby the vast majority has used and continues to use its service without being locked-in by other users (Arthur, 1989).

It is important not to exaggerate the significance of Google's dominance. Google does not, for the most part, control content. It is a gatekeeper and controls visibility, but it does so largely in a way that is shaped by the content that users seek. Its power lies in the fact that a large part of our everyday lives is dominated, and thus shaped, by using the technology of one company. Google's slogan 'Don't be evil' seems apt here, as the potential for harmful control is high. Yet, any such harm would also harm the company. Indeed, increasing user awareness that Google knows a lot about people's habits (and may be divulging them to security agencies) is beginning to have adverse consequences for its reputation. Another Google maxim is apposite: 'Google's mission is to organize the world's information and make it universally accessible and useful'. The mission is about organizing rather than producing content, though it suggests a degree of omniscience. Google's control may be likened to that of a company that owns the electricity grid (a large technological system) while the electricity is provided by other companies. Or again, it can be compared with a company controlling the infrastructure of a medium such as newspapers or television while separate companies control the content. Despite such works as *The Googlization of Everything* (Vaidhyanathan, 2011) and *Search Engine Society* (Halavais, 2008), not everything is being Googlized. Nor do we live in a society pervaded by search. Such books offer many insights into the policy aspects of Google and search engines, but neither analyses the specific implications of how and for what searchers search.

Conclusions

This paper has argued that the technological shaping exercised by Google should not be exaggerated. It has put to one side arguments about the regulatory and policy issues related to bias and the economics of search engine competition, partly because they do not bear on the topic here, and partly because the vast bulk of searches are for leisure and consumer purposes. But if we consider that the technology works (and this applies not just to Google, but to other search engines) in combination with user searches, this combination shaping how we access what we come to know. And insofar as searches are related to leisure (again, excluding advertising, which has not been addressed here), the vast bulk of this mutual shaping is, indeed, not very significant for our everyday lives.

It is possible, however, to separate leisure searches from searches that are socially important. For example, one might take a normative perspective, which explicitly puts a premium on information which could be regarded as essential to social and individual well-being (Simpson, 2012). This would include access to information about health, to diverse cultural heritage, to accurate scientific information and the like. While these areas make up a small proportion of content searched for, they make clear how important it is that the technology works to enhance certain social and ethical values, ensuring accessibility, diversity and reliability. How technological systems and everyday search behaviour shape each other may not necessarily do justice to these values, even if the technology, to repeat Granka's words, reflects mass tastes. Whether this should be Google's task or the task of other search engines could be debated. This paper has concentrated on the narrower topic – how search engines shape, and are shaped by, what we want to know.

There are sufficient (though still quite diffuse) data to begin to understand the social implications of search engine uses in everyday life. However, a systematic account of the implications of search from a domestication perspective and from the perspective of large technological systems must do far more: it must put the uses of search engines into the context of how people normally (without resorting to the Internet/Web) search for leisure and other content, and thus how search engines complement and displace other forms of information behaviour. This paper has relied on search query logs, interviews and diary studies of others. A full account of search engine uses in everyday life would require ethnographic richness and would need to examine search in a number of everyday contexts in the home and at work. Rieh (2004) provides a start here, but only for a small number of participants, in the early days of search, and for a brief period.

Finally, the paper notes differences in how various researchers categorize search queries: some using art as a major category while others use popular culture for the same content. Some put information and what would normally be considered communication behaviour into the same pot, and still others separate information and leisure. What is needed is a sociology of (online) knowledge that separates and categorizes information in a consistent way. Research might then distinguish between which information is essential in everyday life and thus subject to critical analysis and normative ideas about how search engines should provide content, and which information is not essential. Computational tools for aggregating and sorting data that can help are already available. At the same time, the need to understand a technology that has come to play an important role in our everyday lives so very quickly – only the mobile phone has had a greater, more rapid impact – is urgent.

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Notes

1. Haddon (2004) discusses whether the domestication of technology should be labelled a framework or a theory, and opts for the former.
2. See http://insidesearch.blogspot.co.uk/ [accessed April 2012].

3. See http://worldinternetproject.com/_files/_Published/_oldis/917_2012_wip_report_third.pdf [accessed April 2012].
4. The authors use the Yahoo! search engine for the US because Google allows analysis only with its Google Zeitgeist tool (http://www.googlezeitgeist.com/#en/) for a restricted period for American searches. However, the authors note that there is broad comparability between searches in Google and in Yahoo! We also see here, as in Waller's analysis, the problems of social science relying on commercial digital tools and transactional data (see Savage and Burrows, 2007).
5. According to Google's annual investor report, http://investor.google.com/pdf/2010_google_annual_report.pdf, 96% of its revenue in 2010 came from advertising.
6. There is, of course, a connection between organic (non-advertising) and sponsored link (advertising) results, as Yang and Ghose (2010) have shown. Further, search engine optimization also shapes results, organic and sponsored (van Couvering, 2008; Berman and Katona, 2011). Note, however, that Google and other search engines also try to counter efforts at 'gaming' their rankings.
7. See http://en.wikipedia.org/wiki/Web_search_engine#Market_share [accessed January 2014].
8. See http://www.nbcbayarea.com/blogs/press-here/Schmidt-on-Antitrust-Competition-is-One-Click-Away-130300333.html [accessed April 2012].

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