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Cloud Computing Online Search, and Advertising:

Market Overview

By

Dr George R. Barker

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Introduction

This working paper is one of a series planned on the regulation of cloud computing and developments in online search and advertising. This paper thus provides an overview of the online search and advertising markets in the context of recent developments in cloud computing. This paper provides the context for further work planned, for example, on the obstacles to competition in the online advertising and search markets.

In what follows, we first provide a brief overview of recent developments in online search and advertising and then turn to discuss cloud computing.

Online Search and Advertising

Demand for Search and Online Advertising

The demand for online search and advertising is derived from the transactions or sales and purchases they make possible. For example, people derive value from music, cars or houses or other goods or services of primary interest and undertake search to reap these benefits. To the extent online search and advertising services reduce what are called transaction costs, or the sand undermining the smooth operation of markets, they can add value or contribute to the efficient operation of these markets. The demand for online search and advertising services is thus derived from the value the services unleash or create in other markets.

The demand for online search and for online advertising services is thus derived from markets for final consumer goods and services (or from business-to-consumer [B2C] transactions), and from factor markets (or from business-to-business [B2B] transactions). In these markets, search and advertising can be undertaken by either buyers or sellers. Thus, a buyer can search for cars or houses and they can also place ‘wanted’ advertisements. Similarly, sellers can search for buyers or place for-sale advertisements. Which predominates—‘for sale’ versus ‘wanted’ ads—will tend to reflect the nature of competition and the relative cost benefit of buyer versus seller advertising in particular markets at particular points in time. In situations of shortage, of course, there are likely to be more wanted ads than in the context of a surplus, where there will tend to be more ‘for sale’ signs.

Supply and the Role of Intermediaries

Search has value then because of the price advantage or quality improvement that might be secured from further search for a ‘better deal’ with respect to any primary good or service the searcher is interested in—such as a house or a car. Online search is, however, also costly. Potential searchers, then, can be understood to weigh the benefits against the costs. Where the benefit of search is minimal it might not justify the cost. Where the cost of search falls then more search will take place, and more ‘primary’ transactions will be realised as a result—for example, in cars or houses or other final goods or services of primary interest.

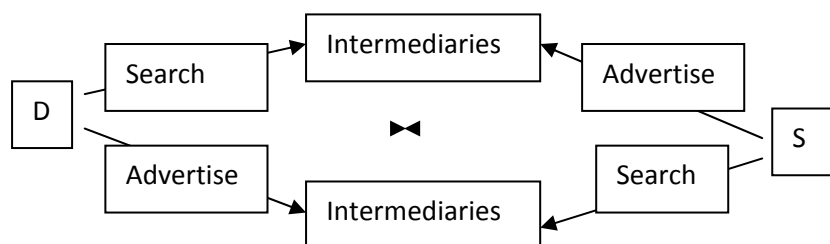
The cost of online search and advertising also no doubt depends on how it is organised. In this regard, search is an intermediate activity that one can engage in either directly or by hiring intermediaries who provide search services to help. The market for search, then, involves on the one side those

seeking to find a 'better deal', and on the other intermediaries providing search services that can help in that activity, by being lower cost or offering better quality than doing it yourself.

Similarly, advertising has value because of the price advantage or quality improvement one might secure from reaching out for a 'better deal' on the primary good or service one is interested in. Advertising similarly also has costs, which will depend on the way it is organised. Thus, advertising is similarly an intermediate activity an advertiser can engage in themselves or they can hire intermediaries who provide advertising services to help. The market for advertising, then, involves on the one side those seeking to make a 'better deal', and on the other intermediaries providing advertising services that can help in that activity, by being lower cost or offering better quality than doing it yourself.

The Simplified Market for Search and Advertising Services

The diagram below shows the simplified market relationships for online search and advertising services. On the left-hand side, one has the demand for particular goods and services (for example, houses or cars). On the right-hand side, one has the supply of the goods and services. As indicated, both buyers (on the left) and sellers (on the right) have the choice to search for relevant opportunities or advertise their interest to the market. In this they can then engage intermediaries, as indicated in the middle panel of the diagram.



Who Pays for Intermediary Services?

There are always at least two ways an online intermediary can be paid for their services. They can be paid by the advertiser or by the searcher. It is a two-sided or indeed a multi-sided market. Who pays and on what terms can have effects of the efficiency of the operation of the market.

The Evidence on Online Search and Advertising

In what follows, we review the evidence on online search and advertising services.

Online Search

Before there were web search engines there was a complete list of all webservers. The list was edited by Tim Berners-Lee and hosted on the CERN webserver. One historical snapshot from 1992 remains. As more and more webservers went online, the central list could not keep up. On the NCSA site, new servers were announced under the title 'What's New!' but no complete listing existed anymore.

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The very first tool used for searching on the Internet was Archie.¹ The program downloaded the directory listings of all the files located on public anonymous File Transfer Protocol (FTP) sites, creating a searchable database of file names; however, Archie did not index the contents of these sites. The rise of Gopher (created in 1991 by Mark McCahill at the University of Minnesota) led to two new search programs: Veronica and Jughead. Like Archie, they searched the file names and titles stored in Gopher index systems.

JumpStation (released in December 1993) was probably the first WWW resource-discovery tool to combine the three essential features of a web search engine (crawling, indexing and searching) as described below. The first 'full text' crawler-based search engine was probably WebCrawler, which came out in 1994. Unlike its predecessors, it let users search for any word in any web page, which has become the standard for all major search engines since. Also in 1994 Lycos (which started at Carnegie Mellon University) was launched, and became a major commercial endeavour. Soon after, many search engines appeared and vied for popularity. These included Magellan, Excite, Infoseek, Inktomi, Northern Light and AltaVista.

Yahoo! was initially among the most popular ways for people to find web pages of interest. Then about 2000, the Google search engine rose to prominence. The company achieved better results for many searches with an innovation called PageRank. This iterative algorithm ranks web pages based on the number and PageRank of other web sites and pages that link there, on the premise that good or desirable pages are linked to more than others. Google also maintained a minimalist interface to its search engine. In contrast, many of its competitors embedded a search engine in a web portal.

Microsoft first launched MSN Search in the autumn of 1998 using search results from Inktomi. In early 1999, the site began to display listings from Looksmart blended with results from Inktomi except for a short time in 1999 when results from AltaVista were used instead. In 2004, Microsoft began a transition to its own search technology, powered by its own web crawler (called msnbot). Microsoft's re-branded search engine, Bing, was launched on 1 June 2009. On 29 July 2009, Yahoo! and Microsoft finalised a deal in which Yahoo! Search would be powered by Microsoft Bing technology.

Today the best data on the search and online advertising market in Australia come from Hitwise,² a global online competitive intelligence service that collects data directly from ISP networks to aid website managers in analysing trends in visitor behaviour and to measure website market share.³ The Hitwise product is a commercial platform whereby customers pay Hitwise a premium to access data reports for their vertical. A common use of Hitwise is to measure market share on the Internet. Each

¹ The name stands for 'archive' without the 'v'. It was created in 1990 by [Alan Emtage](#), a student at [McGill University](#) in [Montreal](#).

² In 2006, Hitwise was valued at £180 million and was subsequently acquired by Experian for \$240 million on 19 April 2007.

³ Competitors in the Internet market research space include [AdGooroo](#), [Alexa](#), [comScore](#), [Netcraft](#), [Quantcast](#) and [Spyfu](#).

day, Hitwise provides insights on how 10 million US Internet users interact with more than 1 million websites, across more than 160 industries.

According to Hitbox,[9] Google’s worldwide popularity peaked at 82.7 per cent in December 2008. July 2009 rankings showed Google (78.4 per cent) losing traffic to Baidu (8.87 per cent) and Bing (3.17 per cent). The market shares of Yahoo! Search (7.16 per cent) and AOL (0.6 per cent) were also declining. In the United States, Google held a 63.2 per cent market share in May 2009, according to Nielsen NetRatings.[10] In the People’s Republic of China, Baidu held a 61.6 per cent market share for web search in July 2009.[11]

The industry is thus characterised by significant network effects that favour market dominance by one or a few players. Given Australia’s smaller market—relative to the United States and Canada—it is more likely to be highly concentrated. We see this in the market today. Thus, Hitwise data from October 2008 presented below show that whereas Google dominates search advertising services globally, with a 72 per cent share, it holds an even greater dominance in Australia, with a nearly 91 per cent share locally. Google thus has a more dominant position in Australia than in the United States. Thus, where there are three major search advertising platforms in the United States and Canada (Google, Yahoo! and Microsoft), there are only two major advertising platforms in Australia (Google and Yahoo!). The table below summarises shares of search advertising services (by query volume).

	Worldwide	Australia
Google and partners	72%	90.57%
Yahoo! and partners	14%	2.3%
Baidu	6%	N/A
Microsoft	3%	3.83%
Other	5%	3.3%

(Source: Hitwise, October 2008)

On 5 May 2010, Hitwise announced that Google’s share continued to fall—now accounting for 71.40 per cent of all US searches conducted in the four weeks ending 1 May 2010. Yahoo! Search, Bing and Ask received 14.96 per cent, 9.43 per cent and 2.18 per cent, respectively. The remaining 78 search engines in the Hitwise Search Engine Analysis Tool accounted for 2.03 per cent of US searches.

Percentage of US searches among leading search engine providers			
Domain	March 2010	April 2010	Month-over-month percentage change
www.google.com	69.97%	71.40%	2%
search.yahoo.com	15.04%	14.96%	-1%
www.bing.com*	9.62%	9.43%	-2%
www.ask.com	3.44%	2.18%	-37%
<i>Note: Data are based on four-week rolling periods (ending 27 March 2010 and 1 May 2010) from the Hitwise sample of 10 million US Internet users. Figures are for web searches only.</i>			
<i>* This includes executed searches on Bing.com but does not include searches on Club.Live.com.</i>			

Source: Experian Hitwise

Hitwise further claims that search engines continue to be the primary way Internet users navigate to key industry categories. Comparing March 2010 with April 2010, Automotive, Business and Finance, Entertainment, News and Media, Shopping and Social Networking categories showed double-digit increases in their share of traffic coming directly from search engines.

Among the top-three search engines, Google sent the most visits to the four categories below. Google's percentage of upstream traffic grew for the Automotive, Shopping and Travel categories. Yahoo! Search saw gains in the Automotive and Shopping categories. Bing saw double-digit growth among two categories—Health and Shopping—including a 105 per cent increase in the Health category.

Percentage of US upstream traffic from search engines among verticals									
Domain	Google			Yahoo! Search			Bing**		
	April 2009	April 2010	Year-over-year percentage change	April 2009	April 2010	Year-over-year percentage change	April 2009	April 2010	Year-over-year percentage change
Automotive	20.25%	22.46%	11%	4.16%	4.44%	7%	1.46%	2.84%	95%
Health	33.88%	31.79%	-6%	5.99%	4.87%	-19%	1.93%	3.96%	105%
Shopping	17.28%	19.94%	15%	3.71%	3.87%	4%	1.26%	2.52%	100%
Travel	27.91%	29.72%	6%	4.92%	4.34%	-12%	1.82%	3.12%	71%
<i>Note: Data are based on monthly upstream traffic from the Hitwise sample of 10 million US Internet users. Figures are for web searches only.</i>									
<i>** This includes executed searches on Bing.com, Live.com and MSN Search but does not include searches on Club.Live.com.</i>									
Source: Experian Hitwise									

Online Advertising

In Australia, the nascent online search and display advertising market is already worth more than AU\$1.5 billion and is expected to double in size over the next three years, in line with global forecasts. Online advertising in Australia is further dominated by search as follows

- AU\$816 million—48 per cent search
- AU\$478 million—28 per cent display
- AU\$408 million—24 per cent classifieds.

Search-related advertising managed by Google again dominates this market segment. As noted, when an Internet user performs a search on the Google search engine, the search engine displays links selected and ranked through automatic algorithms. The links triggered by this search are the 'natural' links. In addition, Google offers a paid service called 'AdWords' through which third parties can reserve one or more keywords that trigger an advertising link that is displayed either above the natural results or at the right of the natural results. These are the 'sponsored' links.

The paid referencing service called AdWords thus enables any third-party economic operator, by means of the reservation of one or more keywords, to obtain the placing—in the event of a correspondence between one or more of those words and those entered as a request in the search engine by an Internet user—of an advertising link to its site. That advertising link is accompanied by a short commercial message. Together, that link and that message constitute the advertisement ('ad') displayed under the advertising link.

A fee for the referencing service is payable by the advertiser for each click on the advertising link. That fee is calculated on the basis, in particular, of the 'maximum price per click', which the advertiser agreed to pay when concluding with Google the contract for the referencing service, and on the basis of the number of times that link is clicked on by Internet users.

A number of advertisers can reserve the same keyword. The order in which their advertising links are then displayed is determined according to, in particular, the maximum price per click, the number of previous clicks on those links and the quality of the ad as assessed by Google. The advertiser can at any time improve its ranking in the display by fixing a higher maximum price per click or by trying to improve the quality of its ad.

Google has set up an automated process for the selection of keywords and the creation of ads. Advertisers select the keywords, draft the commercial message and input the link to their site.

Cloud Computing⁴

Cloud computing is where computing resources are accessed from a virtual online 'cloud' rather than a local desktop or organisational data centre. Cloud computing is a rapidly growing trend and is highly interlinked with the development of Web 2.0. This said, it needs to be appreciated from the outset that conceptually at least cloud computing and Web 2.0 are quite distinct. Specifically, the key concept of Web 2.0 is making new forms of online connection between people, services and applications, while the key concept of cloud computing is the detachment of computing resources from any even notional location.

It can at first be difficult to understand just what is so different about cloud computing. It has, after all, been common practice to access remote computing resources across a network for many years—be these resources websites on the Internet or applications and files stored in a corporate data centre. The easiest way to start delving into the cloud computing paradigm shift is therefore perhaps to take a look at what new services are now becoming available.

Software as a Service: 'SaaS'

The first key development signalling the popular growth of cloud computing is the development of software as a service or 'SaaS'. This is where computer applications are accessed directly over the Internet, rather than being installed on local desktops or data centre servers. Commercial software as a service offerings currently include online project management tools from Clarizen, as well as

⁴ Much of the discussion in this section is taken from ExplainingComputers.com An Online Text by Christopher Barnett; see <http://www.explainingcomputers.com/cloud.html>

customer relationship management (CRM) and human resource applications available from Salesforce, Employease and Zoho. As reported by ZDNet, IBM has also recently joined the ‘cloud computing bandwagon’ with the launch of a new ‘web-based social networking and collaboration service for business’ called Bluehouse.

A number of online office applications are now also available for tasks including word processing and making databases, spreadsheets and presentations. These include Google Docs, Blist, SlideRocket and a wide variety of tools from Zoho, and they allow anybody to create or upload documents into the cloud. Documents created with these applications can subsequently be recalled and worked on from any kind of computing device with an Internet connection. They can also be collaboratively shared.

All of the aforementioned online office applications are currently free. More sophisticated offerings, however, are also available and are starting to enter mainstream corporate use. For example, the ‘Premiere Edition’ of Google Apps (which includes a supported version of Google Docs along with e-mail and collaborative video-sharing tools) is increasingly being rolled out in the place of traditional Microsoft software. For example, as reported by Silicon.com, following a successful trial, the Telegraph Media Group recently moved all of its 1,400 employees to Google Apps, and in doing so expects to cut its software costs by 80 per cent over three years in addition to facilitating new means of collaborative document authorship.

Hardware in the Cloud

In addition to software as a service, cloud computing also includes the development of ‘hardware as a service’ or ‘HaaS’. This is where computer-processing capacity is purchased over the web. Amazon, for example, now offers a web service called Elastic Compute Cloud or EC2. This allows users to purchase computer-processing power online from Amazon, and on the basis of the processor cores, storage and data transfer they require in each ‘instance’. Google has also launched a similar service called App Engine, which permits developers to run web applications on Google’s infrastructure.

Hardware as a service can offer many advantages. Amazon, for example, highlights how EC2 is: elastic—because it allows users to increase or decrease their requirements within minutes; flexible—because users can choose the specification of each individual instance of computing power; inexpensive—as no dedicated capital investment is required; and reliable—as EC2 makes use of Amazon’s proven data centres and network infrastructure.

In addition to Amazon’s EC2 offering, other current suppliers of hardware as a service include GoGrid and 3tera, both of which allow companies to replace their computing infrastructure with virtual servers hosted within their online cloud.

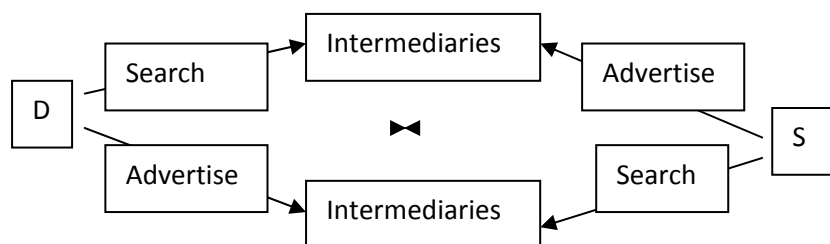
Utility Computing

In his book *The Big Switch*, Nicholas Carr compares the growth of cloud computing with the development of the electricity network about a century ago. Before that time businesses had to generate their own power and therefore had to choose their location based on the available means of generation, such as moving water to drive a wheel or a supply of coal. With the availability of a reliable electricity grid to which they could connect, firms were, however, increasingly freed from such constraints to focus on the other aspects of their business.

We could thus be just entering an age in which both individuals and organisations will be able to dispense with a large home computer or corporate data centre, and instead connect far leaner computing devices to cloud computing resources that will fuel their information-processing requirements. It is therefore hardly surprising that cloud computing is also being referred to as ‘grid computing’ or ‘utility computing’. In parallel, many new, low-cost ultra-mobile computers—such as the Eee PC and Acer Aspire One—are starting to be termed ‘computing appliances’ due to the way in which they are intended to be used out-of-the-box with no user software installation to access the emerging cloud of utility computing services. Thin client computing desktop devices designed to access their applications and even operating systems online are also becoming increasingly common as individuals and organisations embrace computing in the cloud.

The Rules of the New Online Marketplace and the Auctioneer

The diagram below shows the value chain for the online search and advertising service segment of the earlier diagram. It is clear that the transactions identified in the value chain will require governance or rules governing their conduct.



There are a few issues worth mentioning here briefly, although we shall discuss many of them more fully in a separate working paper on regulatory policy. These are

- property rights and privacy issues
- principal agent problems
- collusion and market bypass
- implications for existing regulation of related markets.

Privacy and Opting In or Out

One might want to search for information using an intermediary but not ‘advertise’ one’s interest. The question is whether it should be ‘opt in’ or ‘opt out’. Should one have to agree to allowing one’s private information being sold—or should one have to opt out?

Principal Agent Problems

Welfare losses are likely to emerge to the extent the incentives of the intermediaries are not aligned with the welfare of their principals.

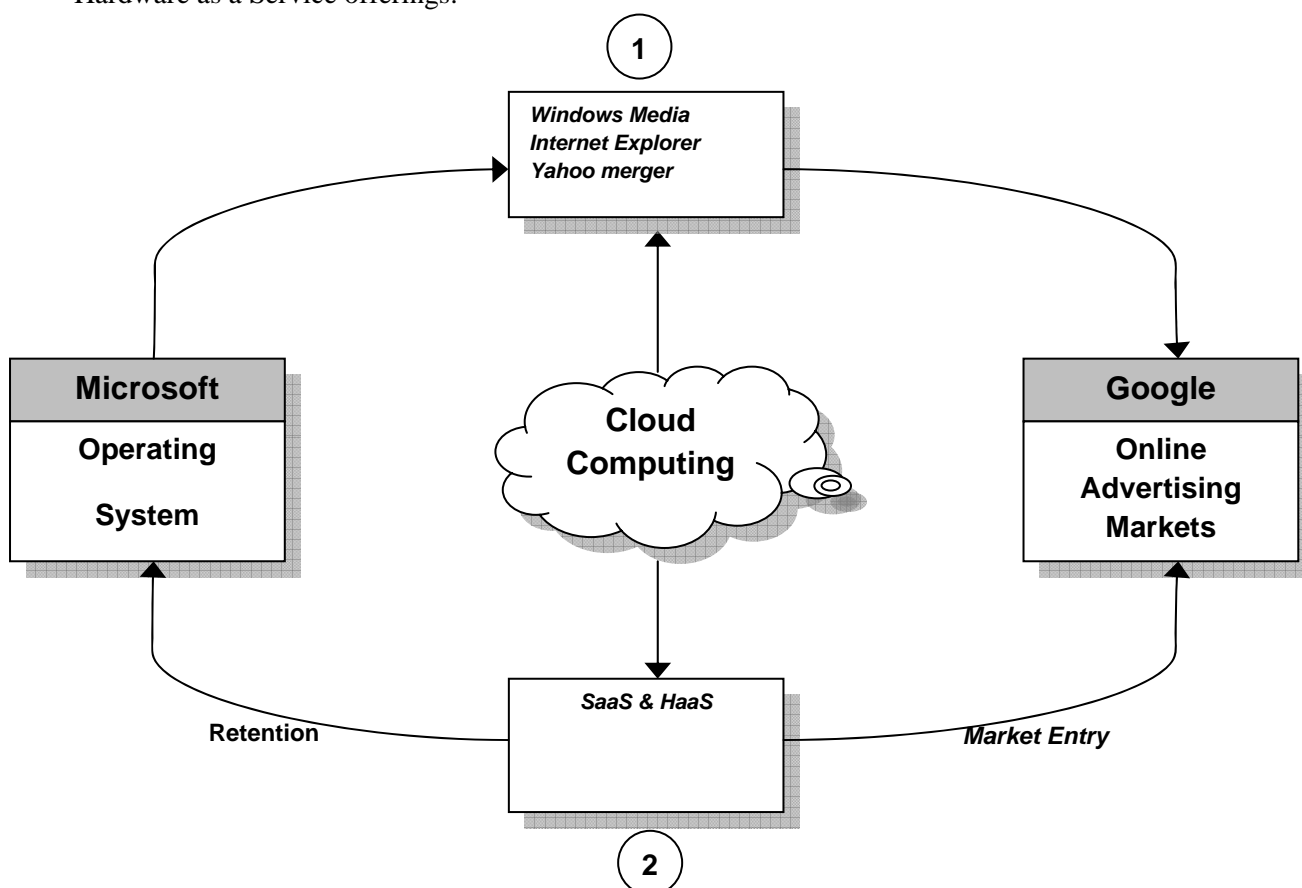
Collusion—Market Bypass and Forestalling

Markets solve information problems. One of the problems with the lower leg of the above diagram could be market bypass where the firm seeks to ‘forestall’ or bypass the market to contract at a less than fully informed price.

Implications for Current Regulations

In addition, the combined development of the online search and advertising market and cloud computing has implications for existing regulation of current markets. As indicated on the left-hand side of the diagram below, Microsoft no doubt historically has had a strong market position in traditional operating systems markets. This dominance has led over time to it becoming increasingly subject to more extensive regulation. While Google (on the right-hand side) has developed a strong position in online advertising markets, given how recent this development has been it has tended to escape regulation to this point.

The advent of cloud computing now brings the two companies into greater competitive rivalry with, for example, Google entering the operating system market with Software as a Service (SaaS) and Hardware as a Service offerings.



As indicated in the diagram, cloud computing thus has implications for more traditional markets including the operating system market on the left, but also for more recent markets such as the online search and advertising markets on the right. For example—in

- *operating systems markets*—cloud computing enhances competition in operating systems markets; companies such as Google, Amazon and IBM have launched SaaS and HaaS product offerings online to challenge Microsoft
- *online advertising markets*—Google's attempts to leverage its dominance of the online advertising market and use cloud computing to enter the operating systems market are being

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counter-posed by Microsoft's entry into the online advertising market through its launch of Bing and its merger with Yahoo.⁵

The growth of competition potentially undermines the rationale for regulation of Microsoft's OS product offerings—including Windows Media and Internet Explorer—as indicated in the top left-hand branch of the above diagram. As we shall discuss in a separate working paper, given recent market developments there is a need to be careful to achieve 'regulatory balance' and not allow under-regulated new entrants to gain unfair competitive advantages against their potentially over-regulated incumbents. Any regulatory strategy, however, will need to be tailored to local conditions in particular regions—requiring detailed law and economics analysis.

⁵ This, however, required Microsoft to obtain regulatory approval for its merger with Yahoo.