

# **This is the future: a reconstruction of the UK business web space (1996-2001)**

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## **INTRODUCTION**

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10 The Internet developed as a commercial space thanks especially to the World Wide  
11 Web, which has rapidly and dramatically changed the way in which companies  
12 operate, sell, communicate. While the Internet was widely perceived as a tool for  
13 scientific research and for education, the introduction of the World Wide Web  
14 promoted the interest on part of companies and the fast development of a commercial  
15 web space.<sup>i</sup> Already in 1996, two years after the introduction of the web, the Financial  
16 Times wrote that the Internet was being transformed from “an academic and computer  
17 hobbyist's plaything” to a “new communications and distribution medium, an online  
18 shopping mall”;<sup>ii</sup> many business management studies of the time stressed that  
19 companies had to go online.<sup>iii</sup>

20 This paper aims to reconstruct the web space created by British companies (defined  
21 as companies registered in the United Kingdom, with the exclusion of international  
22 companies' subsidiaries) between 1996 and 2001, a time framework in which the  
23 digital world started to spread, but it was not as common and as pervasive as it would  
24 be in the following decade. Through a quantitative as well as qualitative analysis of

web archives, this research will collect data on how many UK companies first opened a website or online presence, which business sectors were the most receptive, and what was the rationale for British companies to open a web presence in the mid-Nineties. By doing so, the paper will provide a first look into how the business world perceived the arrival of the World Wide Web as a new tool for communication and for interaction, notably in its “geographically unconstrained” characteristics. In particular, the paper will analyse the usage of web directories both as a tool for companies to be visible online in the pre-Google era of the web, and as a methodological means to reconstruct a particular web space in its historical dimension. The dispersed and ephemeral nature of the web makes it very hard to reconstruct its size and structure, especially in the past; however, thanks to web archives it is possible to carry out at least a partial reconstruction of the historical web and of its specific sub-spaces.

In the first section, the research will map the UK business space as preserved by the Internet Archive. In the second section, a quantitative analysis of the dataset will show which businesses seem to have been the most proactive on the web, and the relation between a company’s online presence and its geographical base. The third section will describe the context and rationale in which the web space identified by the dataset was created. In all three sections, archived web directories have been a fundamental resource both for the quantitative and qualitative aspects of this research.

## **1. RECONSTRUCTING THE UK COMPANIES’ WEB SPACE IN THE 1990s**

Drawing a complete image of the World Wide Web in its first decade of existence is an arduous task. According to the British Internet services company Netcraft, the

number of websites (as in unique domain hosts) existing in 1996 was about 257,000; by 2001 the size had grown to more than 29 million<sup>iv</sup> [Figure 1].

How much of this space was produced by British companies, and which companies contributed to it? In order to provide an answer to this question, we discuss an approach based on connecting data openly available on the web. In particular, we worked on three sources: Companies House's list of registered businesses in the UK; WHOIS records; the Internet Archive<sup>v</sup>.

Companies House is the United Kingdom's registrar of companies, a government agency. Its database is available online for download.<sup>vi</sup> In March 2015, the dataset contained 3,556,639 companies; filtering down to companies that were active between 1996 and 2001, we can find details of 655,645 companies and their registration information, such as address, phone number and business sector [Annex III].

In theory, a comparison between the list of UK companies active between 1996 and 2001 and the historical WHOIS records from the same period would allow us to map which companies opened their websites (or at least registered their domains) in the timeframe taken into consideration, as well as gathering their domain name. Unfortunately, the WHOIS protocol does not hold historical records and provides current registration information only. Furthermore, just like the Internet Archive, it only allows queries by domain name: it is not possible to search using ownership details in place of a domain. This means that domain registration information are only accessible from a website address, not from a company's details. Therefore, going in a circle, in order to investigate WHOIS records and the Internet Archive and find British companies' websites from the 1990s, it is necessary to first compile a list of web addresses from the 1996-2001 period that belonged to UK businesses. This was

possible thanks to one the most important tools to navigate the World Wide Web in the pre-Google era: web directories<sup>vii</sup>.

## **1.1 THE USAGE OF ARCHIVED WEB DIRECTORIES**

In 1996, 1998 and 1999, a series of studies on the use of the World Wide Web on part of British companies were published on the “International Journal of Information Management”. The studies were conducted by the Department of Information Studies at the University of Sheffield. In 1996, the first study claimed that the total number of companies’ websites on the World Wide Web was 20,000.<sup>viii</sup> In August 1998 this figure was 364,000<sup>ix</sup> and the last study reported half a million companies’ websites in March 1999 – of which about 14,000 created by UK businesses<sup>x</sup>. These studies were based on the information given by the business directories available online, particularly the “Yahoo! Business directory” and the “Yahoo! Regional Business directory”.

Before search engines, aggregators and social media became the entry door for information seeking activities, web directories were the common way to explore and browse information on the web. Curated directories as well as user-contributed directories created a taxonomy of links from the most varied classifications. In this study, the directories preserved in the Internet Archives were used as the entry door to the archived web in the same way in which directories were the entry doors to the live web in the period analysed.

Firstly, the Internet Archive was accessed through two search engines devised by the UK British Library, in collaboration with the Big UK Domain Data for the Arts and Humanities project<sup>xi</sup>: The AADDA<sup>xii</sup> and Shine Application - Version 1.0<sup>xiii</sup> allow

to research the “.uk” domains originally archived on the Internet Archive’s Wayback Machine, and acquired by the British Library for its UK Web Archives. While the Wayback Machine only allows research through a specific domain,<sup>xiv</sup> with AADDA and Shine it is possible to run a research through keywords. Thanks to this tool, a keyword research was conducted in order to retrieve as many UK business directories as possible. Word combinations such as “UK companies websites”, “UK Business directory/ies” and “UK company/ies list” were used.<sup>xv</sup> Directories used in the literature of the time, such as “Askalex”, “Kelly’s Web” and “ThomWeb” were also searched.<sup>xvi</sup> Many of these directories are still present in the archives; some of them were part of international search engines, such as “Yahoo.com”, or “Yell.co.uk”, the online version of the Yellow Pages. Other directories were category-specific, such as the one provided by ABPI, the Association of British Pharmaceutical Industry,<sup>xvii</sup> or the list of barristers and solicitors’ websites provided by the personal website of Delia Venables, a computer consultant for lawyers.<sup>xviii</sup> The most cited British directory at the time seems to be “The UK directory”, a list of 8600 URLs that claimed to collect “all the WWW sites in the UK”<sup>xix</sup> divided by category. Other directories were created as part of the services offered to its users by a specific website. For example, the largest directory found was created by “Waternet”, a company specialised in delivering water supplies to offices. In 1999, they published a list of 15,834 URLs which they claimed to be the complete list of UK companies’ websites with a “.co.uk” domain.<sup>xx</sup> Interestingly, one of the aforementioned studies reports that in August 1998 the “Yahoo! Regional Business Directory”, the most complete directory available, comprised about 14,000 companies.<sup>xxi</sup>

Not all directories retrieved were useful for the purpose of this study.<sup>xxii</sup> Many simply provided a list of companies registered in the UK, without any reference to

possible online presence. Others were displayed as search engines, without the possibility to access the list of links that composed the database; as archived web pages, the search engine is no longer operative and therefore useless for the purpose of this study [see Picture 1]. Of the directories whose database was accessible and that listed actual companies' websites, a selection of four was made, based on their size and on the number of crawled instances within the Wayback Machine. The analysed directories were the aforementioned "Waternet", "The UK Directory" and "Yell", plus "DMOZ", a user-edited directory project [see Picture 2]. The directories appeared on the Internet Archive between 1996 and 1999 [see Figure 2].

The content and structure of the directories were collected into a database through a process of web scraping. Thanks to this collection, it was possible to enquire WHOIS current data and the Internet Archive, thus creating a dataset of information associated to each link. This system, though not as exhaustive as if it were possible to access historical data on domain registration, still allowed to analyse the links to actual archived websites, reconstructing the UK companies' web space as it was organised at the time by the directories taken into account.

Two different scraping processes were implemented. The first step used a Google Chrome plugin simply called "Web Scraper":<sup>xxiii</sup> a custom profile was created for each of the directories, matching the specific hypertext structure. The plugin crawled each of the directories collecting category information as well as links, titles and descriptions as and where available. The data were then exported into CSV files and cleaned in a spreadsheet programme. Through this system, a total of 23,739 individual links were collected; a number that is coherent with the figures on the size of the UK business companies given by the aforementioned studies.<sup>xxiv</sup>

After mapping the directories, the second step was to gather information on how the unique links collected by the directories were archived by the Wayback Machine. A custom script was written in Javascript and executed in Node.js in order to read the collected CSV data and run queries to the Wayback Machine. The script is available under an open source licence on Github.<sup>xxv</sup> The script retrieved the URL to the Wayback Machine instance as well as the date of the first and latest crawl and the total number of scans occurred.

Finally, the same script was used to gather current WHOIS data for the domains. WHOIS data is openly available, however in order to limit abuse most servers providing WHOIS databases for free restrict the number of requests that can be run by the same computer in a specified time. To circumvent this limitation, an inexpensive bulk research service was purchased;<sup>xxvi</sup> this service was provided through an API (Application Programming Interface). With this method, for each link gathered it was possible to retrieve the date of registration, the date of the last update, information on the registrar and registrant (name, address, contacts, website),<sup>xxvii</sup> and the current date of contract expiration.<sup>xxviii</sup> Three types of data were gathered for each of the 23,739 links:

#### 1. Information on the business as recorded by the directory

- business category
- business name
- business description
- original URL

#### 2. Information on the presence of the link on the Internet Archive

173 - archived URL

174 - first crawl

175 - last crawl

176 - number of instances available

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178 3. Information on the current WHOIS registration

179 - WHOIS registration date

180 - WHOIS last update

181 - WHOIS expiration date

182 - WHOIS registrar information

183 - WHOIS registrant information

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185 The combination of these data allows for interesting analyses; however, it is important  
186 to state beforehand that the dataset created incurred important limitations.

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## 188 **1.2 LIMITATIONS OF THE METHOD**

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190 The dataset acquired [Annex 2] is an excellent starting point to analyse the UK  
191 business web space as it was in the Nineties. However, a series of important  
192 limitations must be kept in mind when working with the data.

193 First of all, because it was beyond the scope of this paper to manually check the  
194 almost 24,000 links that compose the dataset, and because a domain present in a  
195 directory has not necessarily been crawled by the Internet Archive, it was necessary to  
196 work with the information on the websites provided by the directories. However, this  
197 information is prone to errors and not homogeneous. Different directories gave



different data and each of them was organised according to its own guidelines. For example, some companies could be listed as UK companies even though they were not based in Britain; other directories could have listed domains that were not companies' websites, but websites offering services to companies, such as chamber of commerce, universities, etc. It is important to keep in mind that these collections were the results of a selection made by the curators, sometimes with a contribution on part of the users. Furthermore, the data are skewed by the way in which the Internet Archive and the directories operate.

These limitations particularly affect the two most interesting data available: the business category and the creation date. As neither the directories nor the Companies House dataset provide information on the companies' size, understanding which types of businesses went online in the Nineties can be only attempted through information regarding the business category; this will be analysed in the next session.

The creation date would theoretically allow to understand the evolution of the UK business web space over time and which type of companies created this space, but it is an extremely problematic datum. First of all, knowing exactly when a website was put online is next to impossible; WHOIS provides the year of the domain registration, the Internet Archive the year of the first crawl [Figure 3]. The data tell us that the largest amount of companies' domains was registered in 1996, with a second smaller peak in 1999. These data go against the general trend of companies' websites as given by the literature, which show a large constant increase between 1996 and 1999 (from 20,000 to 364,000 to 500,000 websites).<sup>xxix</sup> This could mean that most of UK companies registered their domain very early, in 1996; however, there is no evidence to support this possibility. The data could show a gap in the dataset, further complexity in what WHOIS records as "registration date", or a combination of the two. Furthermore,

almost 20% of the domains appear to have been registered after the website was first listed in the directory. All websites analysed should have been registered no later than February 2001, the date of the most recent directory instance analysed. This could mean a passage of ownership, or the migration to a different server and registrant; in any case there is no guarantee that the website currently registered on WHOIS is the same as the one listed by the directories at the time.

If the claims made by Waternet were true (with the partial confirmation from the information we have on the “Yahoo! Regional Business Directory”), we can consider the dataset an exhaustive, if not complete, list of UK companies’ websites in the period taken into account. However, it is very difficult to understand how this web space evolved between 1996 and 2001 in terms of size. The analysis of the business categories, though also incurring important limitations, gives a better picture of which type of companies created this web space, and why.

## **2. SURFING THE WEB: A STUDY ON BUSINESS CATEGORIES**

This session provides an examination of the dataset based on the information regarding business categories. At first, a comparison between the registered businesses and relative websites divided by category was attempted, in order to give a glimpse of the relations between the number of companies registered in the UK and the number of companies’ websites created in the 1996-2001 period.

In second instance, and more successfully, the analysis has focussed on the categorisation provided by the directories for the web space. This not only helps to understand which businesses were more attracted by the Internet, but it also allows to

reflect on the taxonomies created by the directories, and therefore on the ways in which users searched for companies' websites.

## **2.1 COMPARING COMPANIES HOUSE AND THE DOMAINS DATASET**

The first step in the analysis of the domain dataset was a comparison with the list of UK registered companies provided by Companies House [Annex III]. If there were 23,739 UK business web domains and 655,645 British companies active between 1996 and 2001, this means that the percentage of UK companies that opened a website in this timeframe is around 3.62%.

Unfortunately, a further comparison between the websites' categories (as indexed by the directories) and the overall number of companies per category (as indexed by Companies House) was largely inconclusive. The lack of standardisation provided by each dataset made the data completely aleatory and useless to compare. To begin with, DMOZ listed more than 300 categories, the UK Directory only 7. Waternet, the largest directory available, did not provide a description, a category, or even the name of a company: the links were simply listed in alphabetical order, without any detail. Yell, the online version of the Yellow Pages, listed the websites both by company's name, in alphabetical version, and by category. For what concerns the categories, the web pages were organised with 25 links on each page. The Wayback Machine only crawled the first page for each category, and therefore each category appears to have 25 links. This is the reason why the Yell directory as it was retrieved is only composed of 475 websites: 25 links times 19 categories.

Furthermore, the data are not uniform between the different categories, WHOIS and Companies' House. WHOIS does not provide information on the business category;

273 Companies' House utilised the United Kingdom Standard Industrial Classification of  
274 Economic Activities (UKSIC), introduced in 1948 to classify business establishment  
275 for administrative purpose. The directories used completely different approaches; their  
276 objective was not to frame or contextualize a certain company, but to provide useful  
277 information to their users. It must also be stressed that business categorization is an  
278 extremely complex matter: Companies House provides more than a thousand  
279 categories, of which the most popular (after Real Estate, that had 60,000 entries alone)  
280 are "Other professional, scientific and services", "undifferentiated goods" and "none  
281 supplied", for a total of 127,997 entries [see Annex II].

282 A tentative comparison between Companies House and the directories' taxonomies  
283 was attempted anyway, through an aggregation of macro-categories both for  
284 Companies House and for the directories [see Annex II]. Eleven categories that  
285 seemed more uniform were selected and analysed; these were Construction, Food  
286 Manufacturing, Advertising and Marketing, Computer services, Civil Engineering,  
287 Real Estate, Printing, Mining, Financial activities, Legal services and Employment  
288 [see Figure 4]. Most categories showed a percentage between the number of registered  
289 companies and the number of websites around 1%. The four most represented  
290 categories were Employment, with 14% of companies having a website; Legal  
291 activities with 4.03%; Financial Services with 5.08%; and Mining with 2.87%. All  
292 categories represent large sectors, and it is interesting to find not only services, but the  
293 secondary sector as well. In general, large companies seem to have gone online early  
294 irrespective of their sector; in 1999, the first thirty British companies listed on the  
295 London Stock Exchange<sup>xxx</sup> all had full operating websites, that are all preserved in the  
296 Internet Archive.<sup>xxxi</sup> With regards to the primary sector, the UK directory also listed 81  
297 websites as "Agriculture Companies"; the names suggest mostly farms and

agricultural service manufacturers and providers. It was not possible to run a comparison with Companies House's primary sector companies because they were categorised in a too scattered manner. The other interesting information obtainable is the large quantity of Employment-dedicated websites, 488 on a total of 3456 registered companies. In a sector strongly based on the exchange of information between parties, employers and job seekers, it is not surprising that the migration to online databases that could be updated and consulted in real time represented a real game changer for the business.

However, this is too little information to come to definite conclusions on what were the most proactive categories on the web compared to the overall number of companies for the same sector. The category aggregation and comparison is too vague and too many categories are left out to be able to reach valuable results. Concentrating on the categories through which the directories organised the business web space was more meaningful to have a glimpse of which type of companies were online.

## **2.2 CATEGORISING THE BUSINESS WEB SPACE**

Looking at the 300 categories provided by the three directories taken into consideration, a clear macro division is immediately apparent between "national" businesses, in which only the business category is indicated, and "local" businesses, in which the catchment area of a website is specified alongside (or in the place of) the type of business. Categories such as "Scotland – Motoring" or "England – East Sussex" are by far the most popular way of indexing companies' websites: 2279 companies in total were listed under "England" (1343), "Scotland" (468), "Wales" (350) and "Northern Ireland" (118).

When reading the business description provided by the directories, the companies defined as “local” seem to be offering mostly business-related or general services, and many of them are industrial or financial sectors, so not necessarily small businesses; however, they are qualified *in primis* according to their location. This showed the need to provide a geographical space to the UK companies that opened a website, like print directories would do, and before interactive maps allowed for a different type of territorial research.

Leisure activities and services such as restaurants, cinemas, hotels and beauty centres are mostly missing from the categories list. This could be because the directories catalogued these companies under “Entertainment” or “Leisure” rather than “Business”; however, it is probable that most of these business websites were categorised simply under “Local activities”, meaning that the directories were mostly concerned in offering to the users a list of the various services offered in the area rather than then listing the websites/webpages available for a business.

On the contrary, “Shopping” escape this “localisation”. The category, one of the most popular, is mostly composed of shops, with taxonomies such as “Shopping – clothing” or “Shopping – pets”. It included retail sectors such as music shops and jewellery, auctions and furniture, items for children and bookshops.<sup>xxxii</sup> A quick look into the items that are available in the archive shows that large chains such as Debenhams and Costcutter are represented as much as small local businesses selling specialised items. In particular, antiques and memorabilia were the most represented sub-category. It seems clear that the web promoted already in the Nineties the delocalisation of shopping in favour of one single virtual market, not just for large retailers but also for the smallest activities.

After local businesses, the most represented categories are International Business and Trade services, Motoring Dealers, Legal and Financial Services, Shopping, Real Estate, Recruitment. Unsurprisingly, as already mentioned with regards to Recruitment, business that had the most to gain from faster interaction possibilities between buyers and sellers seem to have gone online early. For example, from a sample analysed it seems that many Motoring and Computer websites offered the possibility to post ads of people selling used items.

It is also extremely interesting to notice that one of the most popular category is “Directory”, and that other categories often have sub-sections like “Shopping – directory”, “Legal services - directory”, “International Business and Trade – directory”. Section 2.3 will be dedicated to this particular category of companies’ websites.

Finally, the data collected through the methodology outlined were compared with the information provided by the business literature of the time. C. Greaves et al. reported in 1999 the companies’ web classification as given by the Yahoo! Business directory,<sup>xxxiii</sup> comparing UK’s companies websites to the overall number of companies’ websites [see Figure 5]. According to the “Yahoo! Business Category”, which is now lost, the most popular UK companies’ websites were Computer-related businesses (19%), Transport (10%), Entertainment (10%), Engineering (10%), Financial Services (6.2%) and Real Estate (6.2%). The “Miscellaneous” category was still the most popular. These data tend to confirm what written with regards to which business companies took an early interest in the web; the differences in percentages could be given by the different way of categorising the websites: for example, the lack of the categories Recruitment/Employment is probably due to the fact that “Yahoo!”

put these companies under the specific sector that they served (for example, Engineering Recruitment under Engineering).

The comparison with the general trend of business websites outside Britain, though referred to the previous year, is also very interesting in showing that UK companies were following the same trend of other nations (at this stage, namely the U.S.), in building their web space.

### **2.3 THE “DIRECTORY” CATEGORY**

As explained in section 1.1, this study analysed a sample of directories that were not category-specific and that allowed to access the list of domains they included. This analysis suggests that the directories available on the web were many more than the 20 found through the keyword research with AADDA and Shine [see Annex I], and also that most directories linked not only to unique websites, but to lists of other directories. In the dataset created from the scraping of the four directories selected, more than 400 websites were categorised as “Directories”. Of these, 112 were general directories that offered different types of websites; 177 were business-related directories, where to find chambers of commerce and trade companies; 72 were “Property Directories”, search engines to find retail estate managers according to be type of property sought (for this reason, it would not be wrong to consider them under the “Real Estate” category, as websites created by real estate companies); 54 were shopping directories, which listed a mix of online retail and local shops.

Here again, a regional dimension to the World Wide Web emerges, because many directories aimed to collect lists of websites of interest to a local area, from local shops to restaurant, schools and other services. For example, a directory called “Shop North”



396 listed all the shop websites hosted by “Domain.co.uk” that were based in the North of  
397 England.<sup>xxxiv</sup>

398 Many of these directories were also businesses in themselves, as they made money  
399 through advertising and by having companies paying to have their website listed in the  
400 directory. Some directories also offered a freemium service for more visibility. The  
401 category “Directory” could also help explaining the lack of leisure services as specific  
402 websites: restaurants, cinemas and beauty centres took advantage of these directories  
403 rather than opening their own expensive website. They were effectively specialised  
404 and enhanced phonebooks; sometimes they would simply state the address and phone  
405 number of a business, but often used the freedom in space and multimedia possibilities  
406 provided by the Internet to add more information such as pictures, a list of facilities,  
407 opening times [see Picture 3]. The descriptions were always positive, as the directories  
408 were meant to serve as suggestions even when they were not directly advertising;  
409 while users were welcome to contact the website administrator with suggestions, user-  
410 generated reviews were far from sight.

411 In 1999, a study conducted by the Scottish Business Information Centre evaluated  
412 seven general Business Directories available on the web.<sup>xxxv</sup> Unfortunately, none of  
413 these directories has been preserved on the Internet Archive apart from EYP (the  
414 precursor of Yell) and Kelly’s Web, which were only available as search engines  
415 [Picture 1]. The study was overall negative about web directories compared to print  
416 sources. In particular, the report outlined the lack of recalls in case of spelling  
417 mistakes and the lesser comprehensiveness compared to equivalent printed directories,  
418 “despite the claims of the Web”.<sup>xxxvi</sup> Unfortunately it is not possible to take a deeper  
419 look into how EYP and Kelly’s worked, but it seems that the inability of browsing the

full catalogue, especially without a recall for spelling mistakes, was a serious shortcoming compared to the analogue versions available.

Indeed, by the early noughties, most of these directories had been cancelled, or they were not updated anymore. Sophisticated and automated search engines had changed by then the way in which people accessed the web, the costs of creating a website had dropped, and user-generated platforms were about to make service suggestion lists redundant. In 2001 directories were still indicated as an important digital space for companies; however, early experts in digital markets warned that “the WWW is the ultimate self-publishing environment”, and that the most effective way to gain from an online presence was to open a full corporate website.<sup>xxxvii</sup> Nowadays, directories have been substituted by independent websites, retrieved through the main search engines, social networks, interactive maps, globalised user-generated content websites. Of the general directories analysed that are still available online, Yell and the UK Directory now offer mostly digital marketing services to companies;<sup>xxxviii</sup> DMOZ still exists as an ongoing experiment to build a human-edited directory of the web, but it should be considered an exception.<sup>xxxix</sup>

However, in the period analysed these directories were not just a mean to organise and make accessible the business space, but they were a specific form of uploading content online – a place for businesses to advertise and promote themselves which represented an intermediate passage from the traditional printed resources to the more sophisticated search engines that changed the way in which we retrieve information online.

### **3. THE RATIONALE BEHIND BRITISH COMPANIES’ WEBSITES**

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446 After the analysis of the dataset, a look at the literature of the time will help to confirm  
447 several of the trends outlined, as well as give some information on the debate over the  
448 usage of the World Wide Web on part of businesses.

449 The user-friendly front-face, the flexibility, and the interactivity of the web  
450 immediately enticed companies towards online advertising and direct sales.<sup>xi</sup> The  
451 number of Internet users in the UK grew exponentially during the Nineties (from  
452 420,000 in 1993 to 7 million in 1998, 10 million in 2000 and 18 million in 2001);<sup>xli</sup>  
453 furthermore, Internet users were strong spenders, with higher incomes than average,  
454 especially in the earliest years (1996-1997).<sup>xlii</sup> In 1996, the business literature agreed  
455 that companies had to go online, though not necessarily open an independent website;  
456 the careful usage of emails and/or webpages on a directory could be enough.<sup>xliii</sup> A full  
457 website was considered, still in 2001, a noticeable investment, but also as the most  
458 important for a company's online presence.<sup>xliv</sup>

459 Apart from business-related press, the guides and services offered by the newly  
460 established Internet services providers were very interesting sources to understand  
461 how companies approached the Internet in the mid-Nineties. In the period under  
462 analysis, opening a website required necessarily the service of professionals. Platforms  
463 to create and self manage websites or blogs, such as "Wix.com" or "Blogspot.co.uk",  
464 all appeared after the period taken into account. In 1996 Abracadabra, a website design  
465 and hosting company based in Birmingham, charged £250<sup>xlv</sup> a year for a 5-page  
466 website. The price included "5 full html pages in colour", the storage on a commercial  
467 World Wide Web server for one year, the indexation on the major internet directories,  
468 copies of the website on floppy disk to be accessed offline, and the e-mailing of  
469 promotional flyers to specialist internet newsgroups, announcing the opening of the

new website. The price did not include the creation of animation (£150 each), special graphics and logos (£50 each), or the on-line research for a hypertext 'links' page (from £25 per hour). Weekly e-mail promotion of the site started at £75 per year.<sup>xlvi</sup> Global Internet, an Internet service provider based in London, offered up to 5MB of space on servers for £99 as annual rental, £79 for each additional 5MB.<sup>xlvi</sup>

This quick estimate gives an interesting overview of what Internet services providers offered to companies. The aforementioned studies conducted in the Nineties outlined that the reasons for a company to go online were the usage of email, not only as office tools but to communicate with the clients; collaboration with other companies or remote offices through shared workstations, research and development through shared information. However, the web in particular allowed two fundamental innovations that were indicated as the main reasons for companies to open a website: universal visibility and online sales.

### **3.1 VISIBILITY**

Like with any other means of communication, companies aimed to use the web for promoting their services and products. Being linked from other websites and directories was fundamental to gain online visibility. In fact, it is important to remember that advertising on the Internet caused several protests. Before the development of the web, Internet was mostly about chats, newsletters, discussion groups and emails: private or semi-private means of communication in which advertisement was perceived as breach of privacy. Furthermore, connections were paid for by the minute and by the megabyte, a scarcity system in which users were annoyed by having to waste money and bandwidth with advertisement. Internet services

495 providers discouraged “sending flyers” through the emails if not in very small doses,  
496 and warned about the risks of “spamming”<sup>xlviii</sup> - a term that started to circulate in that  
497 period and that derives from a Monty Python sketch.<sup>xlix</sup>

498 It was specifically the web, not the Internet, that provided terrific opportunities for  
499 companies, especially for smaller businesses. First of all, websites corresponded to  
500 “virtual headquarters” as elegant and as visible as those of a large multinational,  
501 offices that were opened 24 hours a day to provide information to potential customers.<sup>1</sup>  
502 The web flattened the costs of communication, cutting on traditional mailing and  
503 printing methods. Furthermore, it made it possible for even the smallest company to  
504 run competitive tracking, gathering information on what its competitors were doing.<sup>li</sup>

505 Another important piece of advice to companies was that the approach to build  
506 contents on the websites had to be radically different from that for television, flyers  
507 and other media.<sup>lii</sup> The most important difference was that while traditional  
508 advertisement was imposed to potential customers engaged in other activities (from  
509 driving to checking the mail to watching TV), in the digital space the viewers had to  
510 willingly visit a company’s website. A website had to actively try to attract viewers  
511 through an opposite strategy to that of television: rather than focusing on sales  
512 pressure and hype, websites should offer real useful information on the products and  
513 services, content that potential customers would want to access. “Your competitors  
514 may try and sell by giving out the minimum of information but the maximum of sales  
515 pressure. That just won't work on the Internet” warned the Internet guide offered by  
516 the provider U-net.<sup>liii</sup> “In the Web, content really *is* king - wrote in 2001 marketing  
517 expert Steven Armstrong – users have nearly complete control when surfing”.<sup>liv</sup> In  
518 other words, users had to want to visit a website, it could not be imposed on them like  
519 a commercial. For this reason, actual information about the company and product

presentations rather than pure advertising were, and still are, two of the main features of companies' website. More than marketing hype, websites were filled with corporate material, including annual reports and technical financial details, important for press offices to communicate with journalists. Furthermore, especially in the case of small and medium-size enterprises (SMEs), websites were filled with information on the business sector where the company operated, content that people interested in a specific business might want to see. For example, a make-up artist from London had a website full of beauty tips and hair-styling suggestions: content that promoted loyalty building to the website by providing free information [see Picture 4].<sup>lv</sup>

It is interesting to notice that from a small sample of 300 websites analysed, most of them were organised to mimic either shops or indexes. In the first case, the home page corresponded to an entrance door, often accompanied by animation and sounds, followed by an "enter" button that allowed to come into the virtual boutique. Alternatively, the homepage was composed of a table of content that asked, like a virtual clerk, which type of information did the customer need. In many cases the homepage also provided technical information about which software should be used to better navigate on the website and which type of bandwidth did the website require. Sometimes viewers could choose between different versions of the website according to the characteristics of their connection.

### **3.2 ONLINE SALES**

Apart from visibility, the other main reason for companies to go online was, unsurprisingly, the possibility of online sales. Already in 1994, a study described the "virtual mall" possibilities given by the multi-media capabilities of the web.<sup>lvi</sup> "A good

virtual shop should make the customer feel as if they might actually be out shopping in the real world<sup>lvii</sup> wrote a study in 1996. In the UK, online sales took off more slowly than in the United States, mostly because of doubts about the security systems of online payments.<sup>lviii</sup> However, by October 1999 the Financial Times reported that shoppers had spent £2 billion in the past twelve months, with a tenfold increase compared to the previous year.<sup>lix</sup> The UK directory for secure online stores listed 178 stores in February 1999<sup>lx</sup> and already 252 three months later,<sup>lxi</sup> ranging from auctions to travel agencies to toys and baking services.<sup>lxii</sup> According to the directories analysed, 175 websites provided online sales between 1996 and 2001, together with 54 shopping directories. In total, 1342 companies were indexed on Companies House as retailers through e-mail or the web.

Tesco and Sainsbury's were the first large retail chains to offer online sales services.<sup>lxiii</sup> In May 1998, Sainsbury's was offering an online shopping service via credit card, home delivery included. In order to activate the account it was necessary to visit a local store and create a personal catalogue of specific brands and goods from which to choose: not all products were sold online, and not all areas were served. However, the system allowed to create different shopping lists to order a whole set of products in one click.<sup>lxiv</sup> Full online shopping without pre-registering in a store seems to be available from the year 2000.<sup>lxv</sup> In January 1998, Tesco developed a special software called Tesco Home Shopper, which allowed to browse more than 20,000 products offline, connecting to the Internet only to send orders and check prices updates. However, only the Greater London area and Leeds were served.<sup>lxvi</sup> Again by 2000, online shopping had become more similar to what it is today, not bounded by special software or geographical areas.<sup>lxvii</sup>

569 Interestingly, it was not just the largest companies (such as British Airways,  
570 Thomas Cook, Vodafone) that provided functioning online sales at the start of the  
571 millennium. The research found small personal businesses such as Jennifer Granger's,  
572 a self-employed who sold home made house dolls sketches online,<sup>lxviii</sup> or the "Japanese  
573 Centre", a London-based consultancy agency for Japanese students in London.<sup>lxix</sup>

574 In particular, antiques, memorabilia and independent bookstores quickly started to  
575 use the web as a place where to attract clients interested in niche material from  
576 everywhere. Second-hand bookstores were particularly attentive to the new medium,  
577 as the web gave them the possibility to advertise their full catalogues online and to  
578 find potential buyers beyond those who would visit the physical store.<sup>lxx</sup> Bookstores in  
579 general were strongly present online, though often they did not have their own  
580 payment system and referred to Amazon. As a matter of fact, the UK branch of  
581 Amazon was established in 1998 with the acquisition of "Bookpages"  
582 ([www.bookpages.co.uk](http://www.bookpages.co.uk)), one of the largest online British bookstores at the time.<sup>lxxi</sup>

583 For all the smaller retailers, again, directories played an important part in building  
584 "online malls" from which it was possible to access single shops that offered online  
585 sales. Shops were listed both as "local" businesses and as "category businesses".  
586 While the general "online malls" created by directories did not survive the  
587 development of Amazon and other international giants of online general retail, many  
588 shops and smaller businesses continues to sell online; by 2010 Great Britain enjoyed  
589 the largest per capita e-commerce market in the world.<sup>lxxii</sup>

590  
591 Overall, it seems that the reasons for companies to open a website could be  
592 summarised as taking advantage of the faster way to transmit information, whether  
593 under form of advertisement or competitive-tracking, and of the distance-free



interactions allowed with potential clients, which was particularly important in the case of niche retailers, such as memorabilia, or in the case of user information-based businesses like Recruitment. Initially, these functions passed mostly through the usage of online directories for visibility and of the email for communication; from the early noughties however, opening an independent website was considered the most effective investment.

The main difference compared to previous available media was in the type of information provided: not simple blasting, but notions on the products, on the company, and on anything that would please visitors that wanted more information.

Throughout the years, it seems that webpages within specialised directories tended to diminish in parallel to the expansion of the web, search engines, and the constant decrease in the costs of opening a full website. At the same time, despite an increase in multimedia features, the type of content remained centred on giving information on products and services rather than simple advertisement.

## **CONCLUSIONS**

The creation of companies' websites mark the general evolution of the Internet from a private or semi-private mean of communication, almost an extension of the telephone and the fax, to a public space, in which the business sphere had a predominant role. A comparison between the overall number of websites as reconstructed by Netcraft [see Figure 1] and the data offered by the aforementioned studies from the Nineties on the live business web space, shows that companies' websites alone represented 7.78% of the total web sphere in 1996, 15.1% in 1998 and 15.7% in 1999.<sup>lxxiii</sup> This only

619 included companies' websites, without taking into account the new online businesses  
620 that were created by and for the World Wide Web. With companies' websites, an  
621 important part of the Internet became a virtual reality full of shops, advertising and  
622 showcases, in which every type of business had access to similar spaces, if not to the  
623 same visibility.

624 While a precise definition of the web space is a nearly impossible task, especially  
625 when referred to the past, web archives make it possible to regain access to the lost  
626 world of the web that used to be. The first objective of this paper was illustrating a  
627 methodology to reconstruct quantitatively a precise portion of the early web.  
628 Notwithstanding the limitations outlined in section 1.2, web directories are a  
629 fundamental tool to access the archived web, just as they were to access the live web  
630 of the time. Although it was beyond the scope of this paper to investigate the relations  
631 between archived directories and the rest of the archived web sphere, this research  
632 wanted to focus on the importance of these directories for the new type of historical  
633 research offered by web archives. First of all, they allow the quantitative  
634 reconstruction of specific web spaces that would otherwise be impossible to map, both  
635 because the task of gathering and describing again the domains would be too daunting  
636 and because they conserve the memory of many links that have not been saved by the  
637 Internet Archive, but that existed at the time in which the directory was on the live  
638 web. Secondly, and even more importantly, web directories allow to study the way in  
639 which the past web sphere was organised for the users, the researching modalities and  
640 the type of navigation offered by the early web. Placed in between phonebooks and  
641 Google, directories accompanied the evolution of information retrieval from printed  
642 collections to keyword research. They marked the passage from "human-made" listing  
643 to complex research algorithms that went hand in hand with the development of the

web. For companies that wanted to be present online, webpages within larger directories were an intermediary passage before opening an independent website – an evolution that seems to have accompanied the development of search engines and the obsolescence of web directories, and that would require further studies.

The second objective of the paper was to compare the quantitative data gathered with the general context in which companies' websites went online in the UK, in order to reflect on what drew businesses to the web in its early years of existence. Even though with severe limitations, the reflections generated by the study of the web space as mapped through the business directories found confirmation in the studies of the time and in the reconstruction of the debate around companies and the web. This analysis gives back a picture of the World Wide Web as an ideal place for businesses of all sizes, a new medium in which British companies immediately took interest, attracted by the possibilities for interaction, online sales, network building with their customers and clients. In particular, businesses could retain their geographical delimitation and catchment areas while opening to the possibility of building a remote and potentially worldwide clientele.

Overall, the present results only draw some tentative conclusions on the actual composition of the UK business web space in its early years; however, with a more exhaustive enquiry of the available directories and with more powerful means of analysis for the comparison of the data provided by the directories and by the WHOIS protocol, it will be possible to further investigate these and other aspects of the development of business websites and their influences on the larger web sphere. In this sense, this paper hopes to offer a useful set of tools and to serve as a starting point for further research on the history of the business web sphere.

**ANNEX I:**

Musso M. and Merletti F., *Annex 01\_list of directories* [xlsx]. Available at <  
<http://fm.to.it/uk-web-annex1>>

**ANNEX II:**

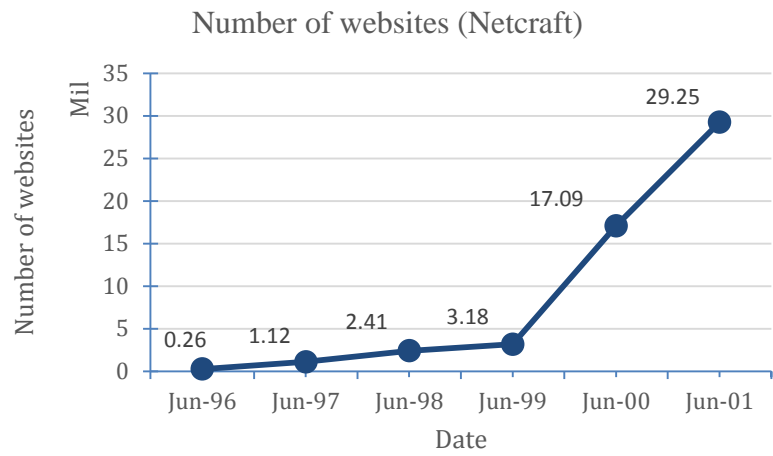
Musso M. and Merletti F., *Annex 02\_domain dataset* [xlsx]. Available at <  
<http://fm.to.it/uk-web-annex2>>

**ANNEX III:**

Musso M. and Merletti F., *Annex 03\_UK Companies active between 1994 and 2001* [xlsx].  
Available at <<http://fm.to.it/uk-web-annex3>>

**FIGURE 1: TOTAL NUMBER OF WEBSITES 1996-2001**

Period	Websites
June 1996	257,601
June 1997	1,117,255
June 1998	2,410,067
June 1999	3,177,453
June 2000	17,087,182
June 2001	29,254,370



Source: Netcraft, March 2015 Web Server Survey. Available at:

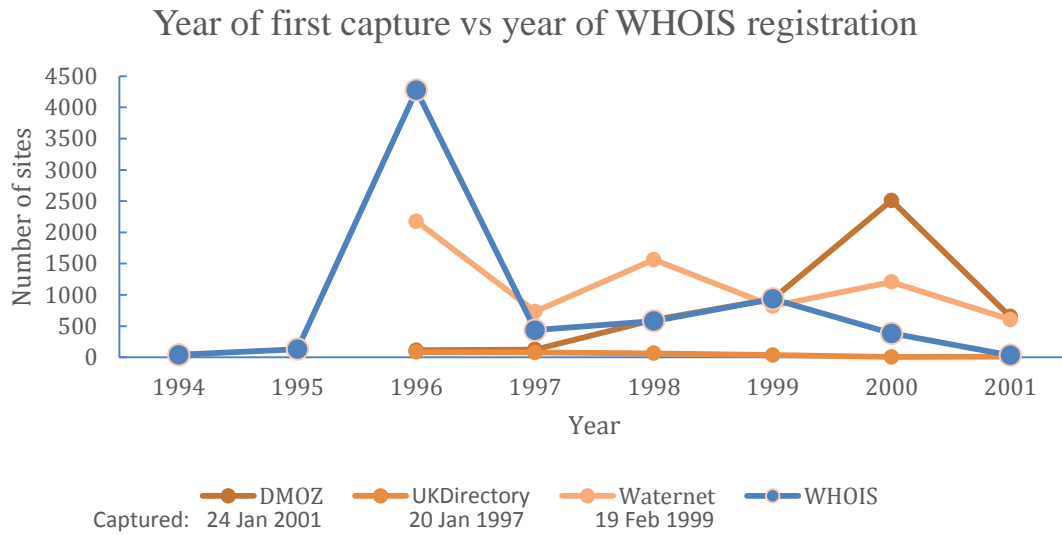
<http://news.netcraft.com/archives/category/web-server-survey/> [Accessed 12 April 2015].

## **FIGURE 2: DIRECTORIES ANALYSED**

<b>Name and Address</b>	<b>1<sup>st</sup> crawl</b>	<b>Last crawl</b>	<b>Crawl analysed</b>	<b>No of links</b>
<b>UK Directory</b>	19 Dec 1996	Still live	20 Jan 1997	388
<a href="http://web.archive.org/web/19961219105803/http://www.ukdirectory.com/">http://web.archive.org/web/19961219105803/http://www.ukdirectory.com/</a>				
<b>DMOZ</b>	9 Feb 1997	Still live	24 Jan 2001	8048
<a href="https://web.archive.org/web/20001003162214/http://dirt.dmoz.org/Regional/Europe/United_Kingdom/Business_and_Economy/">https://web.archive.org/web/20001003162214/http://dirt.dmoz.org/Regional/Europe/United_Kingdom/Business_and_Economy/</a>				
<b>Yell</b>	16 Jun 1997	2000 (live as Yell.com)	05 Jun 2000	475
<a href="http://web.archive.org/web/19970616081900/http://www.yell.co.uk/yell/web/companyaz.html">http://web.archive.org/web/19970616081900/http://www.yell.co.uk/yell/web/companyaz.html</a>				
<b>Waternet</b>	19 Feb 1999	2003	19 Feb 1999	15,834
<a href="http://web.archive.org/web/19990219194117/http://www.water.net.uk:80/ukcompanies/">http://web.archive.org/web/19990219194117/http://www.water.net.uk:80/ukcompanies/</a>				
<b>Total number of links gathered:</b>				<b>24,745</b>
<b>Links appearing in multiple directories:</b>				<b>1,006</b>
<b>Unique links gathered:</b>				<b>23,739</b>

Sources: Annex I and Annex II

**FIGURE 3: REGISTRATION YEAR AND CATEGORIES**



Source: Annex II

**FIGURE 4: COMPARISON OF WEBSITES / REGISTERED COMPANIES BY CATEGORY**

CATEGORY	COMPANIES HOUSE	DIRECTORIES (DMOZ, UK Directory)	%
41 Construction of buildings	26143	5	0.01
10 Manufacture of food product	2748	5	0.18
73 Advertising and market research	3510	28	0.79
62 Computer programming, consultancy and related activities	29780	291	0.97
42 Civil engineering	4266	42	0.98
68 Real estate activities	60462	594	0.98
18 Printing and reproduction of recorded media	3807	54	1.41
07 Mining	139	4	2.87
64 Financial service activities, except insurance and pension funding	16595	643	3.87
69 Legal and accounting activities	6699	270	4.03
78 Employment activities	3456	488	14.12

Source: Annex II and III; for details of aggregation, see Annex II



**FIGURE 5: COMPANIES' WEBSITE ACCORDING TO SIC CATEGORIES**  
**IN THE UK AND IN GENERAL**

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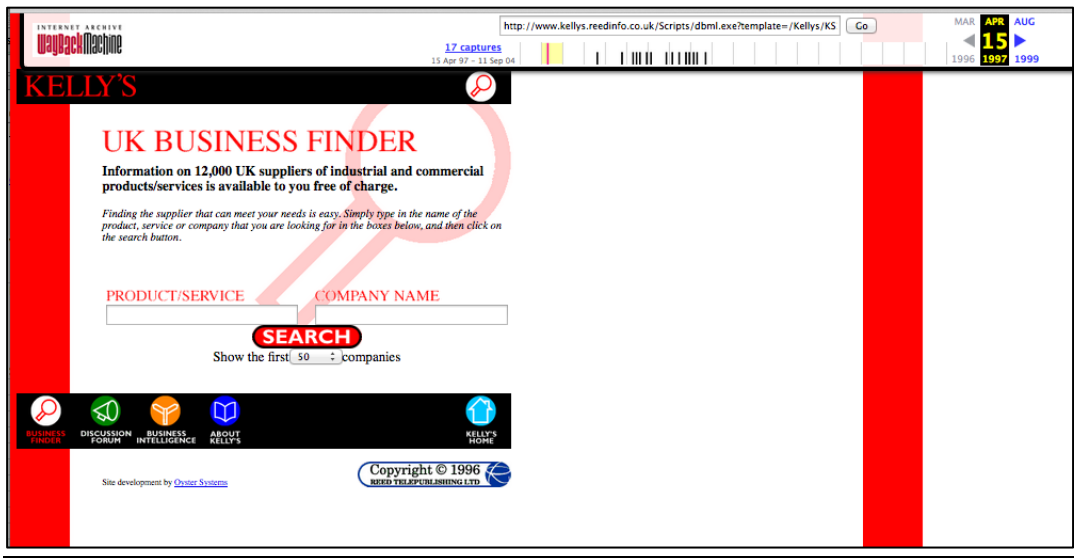
Table 1  
Web sites according to the standard industrial classification

	UK (1998) (%)	Ng (1997) (%)
Financial services	6.70	4.52
Real Estate, renting and business	6.20	10.40
Computer related	19.10	16.63
Internet related	5.10	1.72
Transport, travel storage and communication	10.20	6.25
Utilities	0.80	0.38
Construction	2.50	3.25
Education	1.10	0.72
Retailing	2.40	3.49
Mining and quarrying	0.10	0.18
Agriculture	0.75	0.60
Publishing	3.90	4.47
Entertainment	10.01	14.07
Food	3.50	3.35
Engineering and manufacturing	10.00	14.07
Scientific and environmental	2.00	1.33
Miscellaneous	14.30	10.94
Shopping centres	0.30	0.80
Health	2.60	5.11

Source: Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web,  
with particular reference to UK companies, *International Journal of Information  
Management*, Vol. 19: 449-470

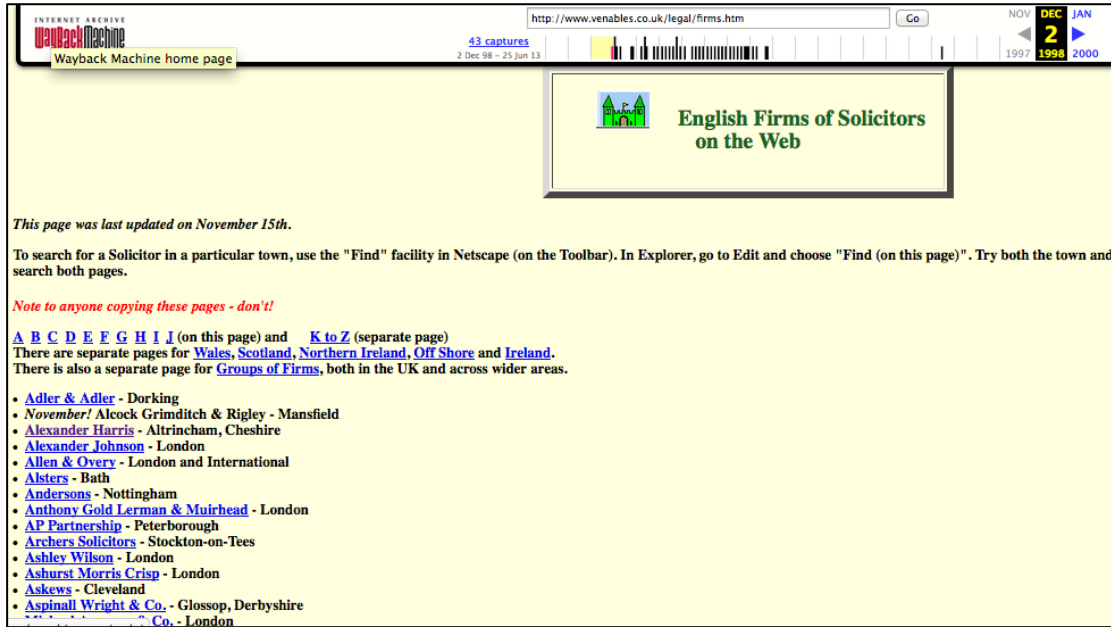
**PICTURE 1: ARCHIVED SEARCH ENGINES AND DIRECTORIES**

**Kelly's Web**



Source: Kelly's UK Business Finder,  
<<http://web.archive.org/web/19970415015024/http://www.kellys.reedinfo.co.uk/Scripts/dbml.exe?template=/Kellys/KS1.dbm>> [Internet Archive, site captured 15 Apr. 1997]

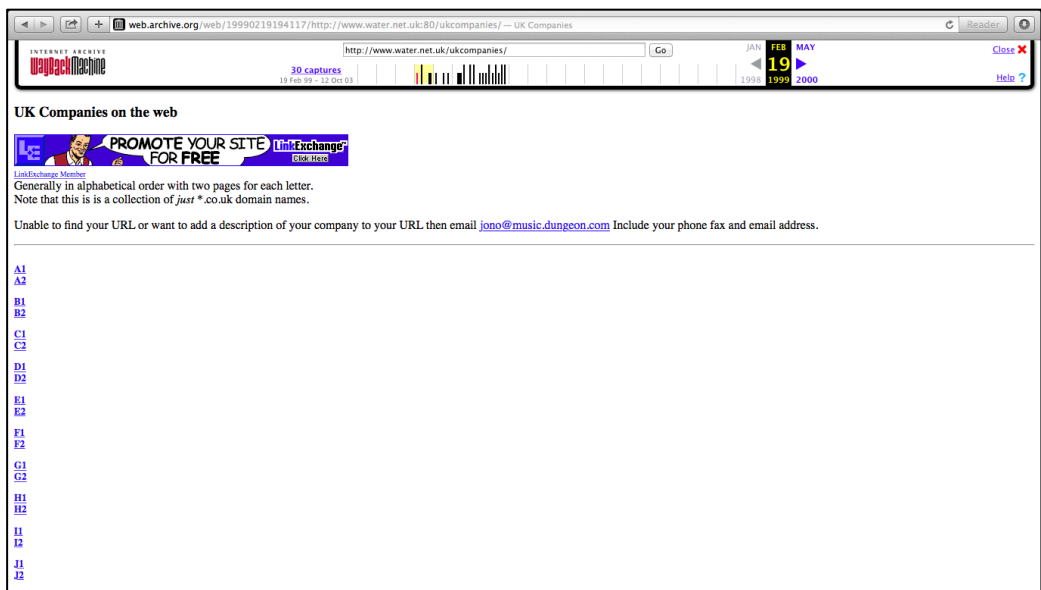
**Delia Venables**



Source: Delia Venables, English Firms of Solicitors on the Web,  
<[http://web.archive.org/web/19981202064024/http://www.venables.co.uk/legal/firms.  
htm](http://web.archive.org/web/19981202064024/http://www.venables.co.uk/legal/firms.htm)> [Internet Archive, site captured 2 Dec. 1998]

**PICTURE 2: DIRECTORIES ANALYSED**

**Waternet**



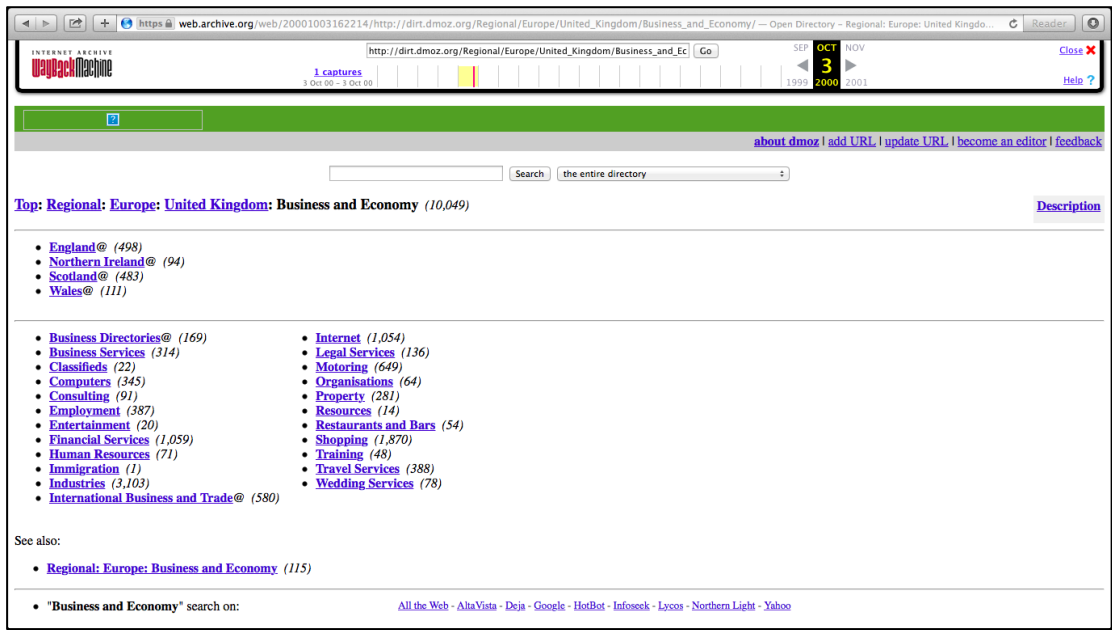
Source: Waternet, UK Companies on the web,  
<<http://web.archive.org/web/19990219194117/http://www.water.net.uk:80/ukcompanies/>> [Internet Archive, site captured 19 Feb. 1999]

**Yell**



Source: UK Yellow Web,  
<<http://web.archive.org/web/19970616081900/http://www.yell.co.uk/yell/web/companyaz.html>> [Internet Archive, site captured 16 Jun. 1997]

DMOZ

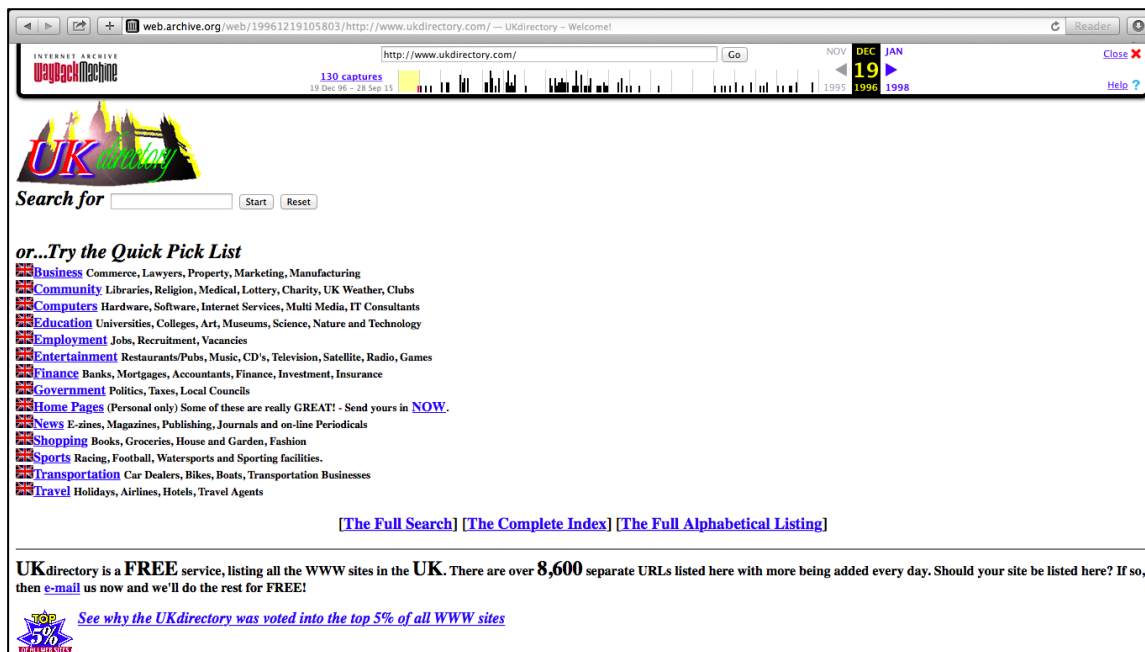


Source: DMOZ,  
<[https://web.archive.org/web/20001003162214/http://dirt.dmoz.org/Regional/Europe/United\\_Kingdom/Business\\_and\\_Economy/](https://web.archive.org/web/20001003162214/http://dirt.dmoz.org/Regional/Europe/United_Kingdom/Business_and_Economy/)> [Internet Archive, site captured 03 Oct. 2000]

789 UK Directory

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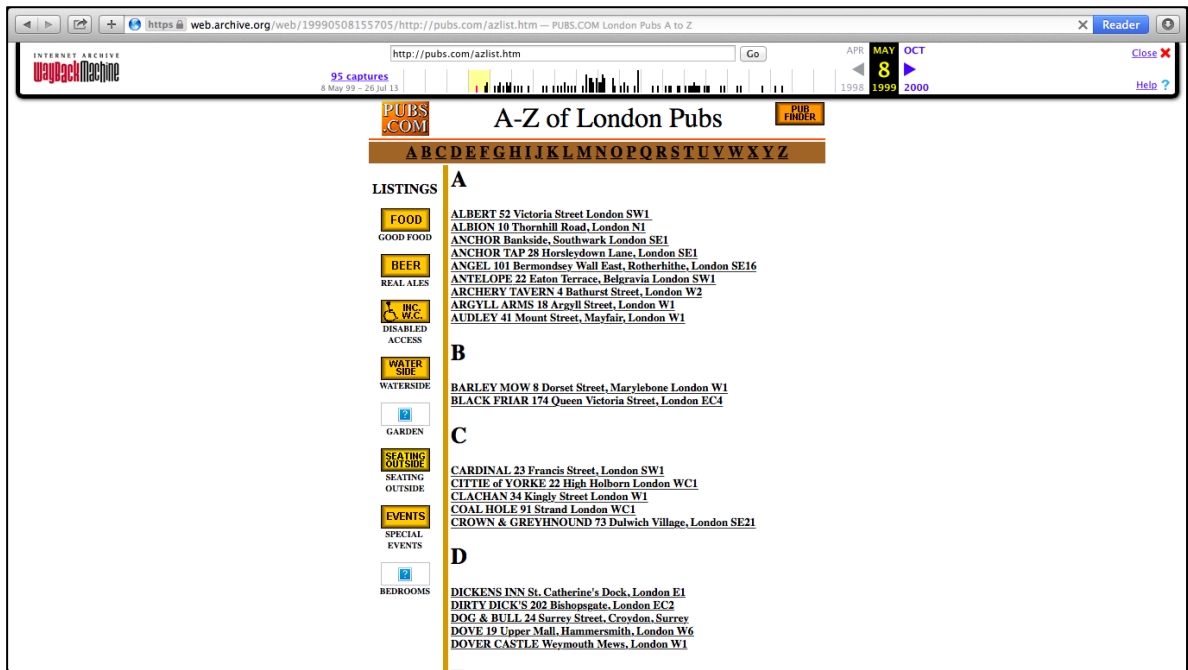
794 Source: UK Directory,

795 <<http://web.archive.org/web/19961219105803/http://www.ukdirectory.com/>> [Internet

796 Archive, site captured 19 Dec. 1996]

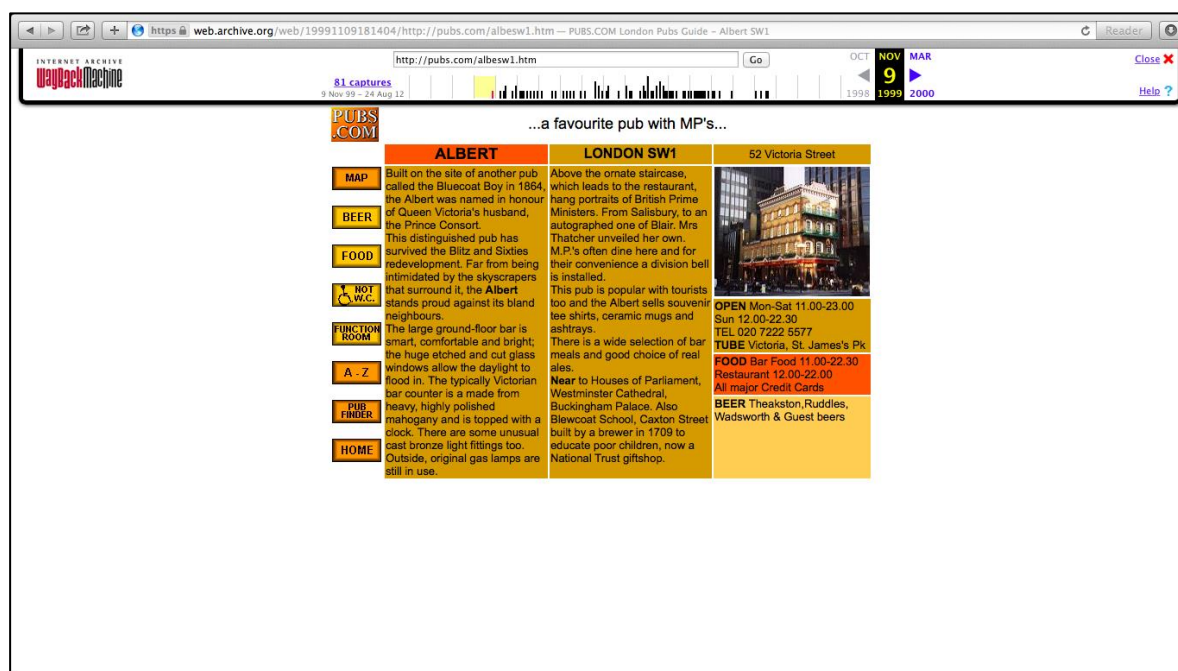
797

**FIGURE 3: PUB.COM DIRECTORY**



Source: Pubs.com,  
<<https://web.archive.org/web/19990508155705/http://pubs.com/azlist.htm>> [Internet  
Archive, site captured 8 May 1999]





810

811

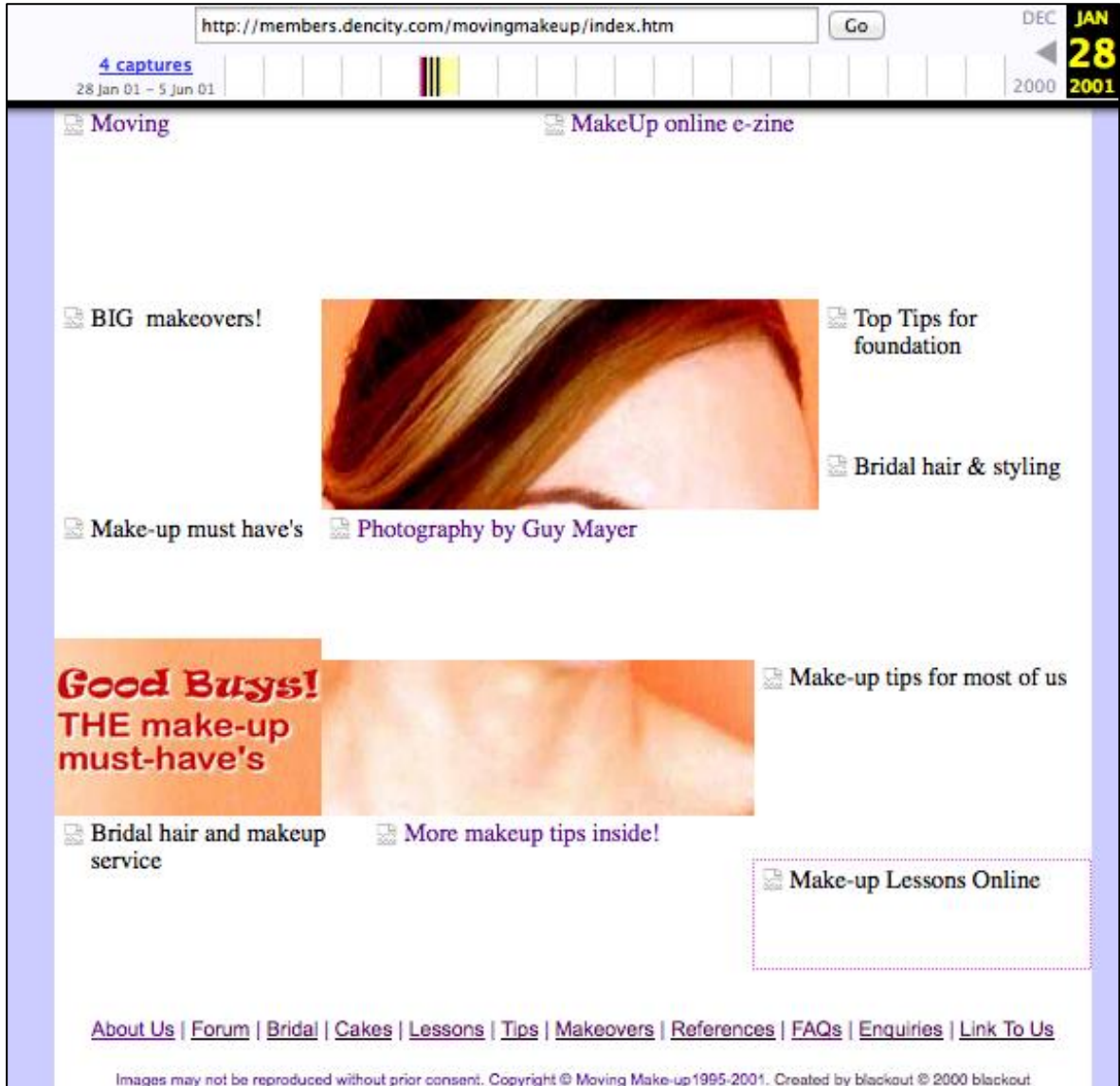
812 Source: Source: Pubs.com,

813 <<https://web.archive.org/web/19990508155705/http://pubs.com/azlist.htm>> [Internet

814 Archive, site captured 8 May 1999]

815

**PICTURE 4: MOVING MAKE-UP HOME PAGE**



Source: Moving Make-up,  
<<https://web.archive.org/web/20010128101100/http://members.density.com/movingmakeup/index.htm>> [Internet Archive, site captured 28 Jan. 2001]

- <sup>i</sup> Ng, Pan and TD Wilson (1998) Business Use of the World-Wide Web: a report on further investigation. *International Journal of Information Management* Vol. 18: 291—314
- <sup>ii</sup> Barber, Clark, Cookson, Corzine, Dawkins et al., Financial Times [London (UK)] 28 Dec 1996: 09. Accesses through: Cambridge University Library website <[https://global.factiva.com/ha/default.aspx-/?&\\_suid=142359373446409079159650146318](https://global.factiva.com/ha/default.aspx-/?&_suid=142359373446409079159650146318)> [Accessed 3 November 2014].
- <sup>iii</sup> Such as Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of Information Management* Vol. 16: 83—102; Ng, Pan and TD Wilson (1998) Business Use of the World-Wide Web: a report on further investigation. *International Journal of Information Management* Vol. 18: 291-314; Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web, with particular reference to UK companies, *International Journal of Information Management*, Vol. 19: 449-470; Goode (2002) Management Attitude Towards the World Wide Web in Australian Small Business, *Information System Management*, vol. 19 45-48
- <sup>iv</sup> Netcraft, March 2015 Web Server Survey. Available at: <<http://news.netcraft.com/archives/category/web-server-survey/>> [Accessed 12 April 2015].
- <sup>v</sup> Internet Archive, Wayback Machine. Available at: <<http://archive.org/web/>>.
- <sup>vi</sup> Companies House, Free Company Data Product. Available at: <[http://download.companieshouse.gov.uk/en\\_output.html](http://download.companieshouse.gov.uk/en_output.html)> [Accessed 1 February 2015].
- <sup>vii</sup> Google will appear for the first time in 1998
- <sup>viii</sup> Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of Information Management* Vol. 16: 83—102
- <sup>ix</sup> Ng, Pan and TD Wilson (1998) Business Use of the World-Wide Web: a report on further investigation. *International Journal of Information Management* Vol. 18: 291-314
- <sup>x</sup> Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web, with particular reference to UK companies, *International Journal of Information Management*, Vol. 19: 449-470
- <sup>xi</sup> Big UK Domain Data for the Arts and Humanities. Available at: <<http://buddah.projects.history.ac.uk/>> [Accessed 22 May 2015].
- <sup>xii</sup> UK Web Archive, AADDA - Analytical Access to the Dark Domain Archive (1996-2010). Available at: <<http://www.webarchive.org.uk/aadda-discovery/search>>
- <sup>xiii</sup> UK Web Archive, Shine Application. Available at: <<http://www.webarchive.org.uk/shine>>
- <sup>xiv</sup> Internet Archive, Wayback Machine. Available at: <<http://archive.org/web/>>
- <sup>xv</sup> For the full list of item searched, please refer to Annex I
- <sup>xvi</sup> See Coll and Murray (1999), UK companies directories on the Web, *Business Information Review*, vol. 16(1). For a full list of terms searched, please refer to Annex I
- <sup>xvii</sup> Abpi – The Association of the British Pharmaceutical Industry, <<http://web.archive.org/web/19961023052832/http://www.abpi.org.uk/abpimem.htm>> [Internet Archive, site captured 23 Oct. 1996].
- <sup>xviii</sup> Delia Venables, English Firms of Solicitors on the Web, <<http://web.archive.org/web/19981202064024/http://www.venables.co.uk/legal/firms.htm>> [Internet Archive, site captured 2 Dec. 1998].
- <sup>xix</sup> UK directory, <<http://web.archive.org/web/19961219105803/http://www.ukdirectory.com/>> [Internet Archive, site captured 19 Dec. 1996]
- <sup>xx</sup> Waternet, UK Companies on the web, <<http://web.archive.org/web/19990219194117/http://www.water.net.uk:80/ukcompanies/>> [Internet Archive, site captured 19 Feb 1999]
- <sup>xxi</sup> Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web, with particular reference to UK companies, *International Journal of Information Management*, Vol. 19: 449-470
- <sup>xxii</sup> For a full list, see Annex I
- <sup>xxiii</sup> Web Scraper. Available at: <<http://webscraper.io>>
- <sup>xxiv</sup> Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web, with particular reference to UK companies, *International Journal of Information Management*, Vol. 19: 449-470
- <sup>xxv</sup> Francesco Merletti, *UK-companies-scraper*. Available at Github, <<https://github.com/mjs2020/uk-companies-scraper>>
- <sup>xxvi</sup> Bulk Whois Api. Available at: <<https://bulk-whois-api.com>>
- <sup>xxvii</sup> The Registrar is the organisation through which a company reserved its domain. The Registrant is the owner of the domain - an accurate comparison between the registrant data and the company data allows to identify false negatives and false positives.
- <sup>xxviii</sup> See Annex II
- <sup>xxix</sup> Such as Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of*

*Information Management* Vol. 16: 83—102; Ng, Pan and TD Wilson (1998) Business Use of the World-Wide Web: a report on further investigation. *International Journal of Information Management* Vol. 18: 291-314; Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web, with particular reference to UK companies, *International Journal of Information Management*, Vol. 19: 449-470; Goode (2002) Management Attitude Towards the World Wide Web in Australian Small Business, *Information System Management*, vol. 19 45-48

<sup>xxx</sup> London Stock Exchange, 2015. Reference and historical data. [online] Available at:

<<http://www.londonstockexchange.com/products-and-services/reference-data/reference-data.htm>> [Accessed 10 July 2014].

<sup>xxxi</sup> Previous research on UK companies' website by Marta Musso

<sup>xxxii</sup> For a complete list, see Annex II

<sup>xxxiii</sup> Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web, with particular reference to UK companies, *International Journal of Information Management*, Vol. 19: 449-470

<sup>xxxiv</sup> see Annex II

<sup>xxxv</sup> Coll and Murray (1999), UK companies directories on the Web, *Business Information Review*, vol. 16(1)

<sup>xxxvi</sup> Coll and Murray (1999), UK companies directories on the Web, *Business Information Review*, vol. 16(1)

<sup>xxxvii</sup> Armstrong, S. *Advertising on the Internet: how to get your message across on the World Wide Web*.

London: Kogan Page 2001, pp.15-30

<sup>xxxviii</sup> See The UK Directory, 2015 [online] Available at: <<https://www.ukdirectory.co.uk/add.asp>> [Accessed 15 February 2016] and Yell Business, 2015 [online] Available at: <<https://business.yell.com/products/>> [Accessed 15 February 2016]

<sup>xxxix</sup> dmoz (2016) [online] Available at <<https://www.dmoz.org/>> [Accessed 15 February 2016]

<sup>xl</sup> Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of Information Management* Vol. 16: 83—102

<sup>xli</sup> See Internet attitudes, demographic survey results published. *Internet Business News*, 01 Dec. 1995 [online]. Available from: <libsta28.lib.cam.ac.uk:2206/docview/190907902/fulltex> [Accessed 10 February 2016]; Copps, A. UK Web users leap by a million. *The Times*, 18 Nov. 1998 [online]. Available from: <<https://libsta28.lib.cam.ac.uk:2052/ga/default.aspx>> [Accessed 10 February 2016]; UK Web users top 10 million for first time. *Marketing Week*, 27 Jul. 2000 [online]. Available from:

<<http://search.proquest.com/docview/228093386/fulltext/B80>> [Accessed 10 February 2016]

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