1 # This is the future: a reconstruction of the UK business

2 # web space (1996-2001)

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8 ## 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.[i] 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"; [ii] many business management studies of the time stressed that

19 companies had to go online.[iii]

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

25 web archives, this research will collect data on how many UK companies first opened

26 a website or online presence, which business sectors were the most receptive, and what

27 was the rationale for British companies to open a web presence in the mid-Nineties.

28 By doing so, the paper will provide a first look into how the business world perceived

29 the arrival of the World Wide Web as a new tool for communication and for

30 interaction, notably in its "geographically unconstrained" characteristics. In particular,

31 the paper will analyse the usage of web directories both as a tool for companies to be

32 visible online in the pre-Google era of the web, and as a methodological means to

33 reconstruct a particular web space in its historical dimension. The dispersed and

34 ephemeral nature of the web makes it very hard to reconstruct its size and structure,

35 especially in the past; however, thanks to web archives it is possible to carry out at

36 least a partial reconstruction of the historical web and of its specific sub-spaces.

37   In the first section, the research will map the UK business space as preserved by

38 the Internet Archive. In the second section, a quantitative analysis of the dataset will

39 show which businesses seem to have been the most proactive on the web, and the

40 relation between a company's online presence and its geographical base. The third

41 section will describe the context and rationale in which the web space identified by the

42 dataset was created. In all three sections, archived web directories have been a

43 fundamental resource both for the quantitative and qualitative aspects of this research.

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45

46 **1. RECONSTRUCTING THE UK COMPANIES' WEB SPACE IN THE 1990S**

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48 Drawing a complete image of the World Wide Web in its first decade of existence is

49 an arduous task. According to the British Internet services company Netcraft, the

50   number of websites (as in unique domain hosts) existing in 1996 was about 257,000;

51   by 2001 the size had grown to more than 29 million[iv] [Figure 1].

52   How much of this space was produced by British companies, and which companies

53   contributed to it? In order to provide an answer to this question, we discuss an

54   approach based on connecting data openly available on the web. In particular, we

55   worked on three sources: Companies House's list of registered businesses in the UK;

56   WHOIS records; the Internet Archive[v].

57   Companies House is the United Kingdom's registrar of companies, a government

58   agency. Its database is available online for download.[vi] In March 2015, the dataset

59   contained 3,556,639 companies; filtering down to companies that were active between

60   1996 and 2001, we can find details of 655,645 companies and their registration

61   information, such as address, phone number and business sector [Annex III].

62   In theory, a comparison between the list of UK companies active between 1996 and

63   2001 and the historical WHOIS records from the same period would allow us to map

64   which companies opened their websites (or at least registered their domains) in the

65   timeframe taken into consideration, as well as gathering their domain name.

66   Unfortunately, the WHOIS protocol does not hold historical records and provides

67   current registration information only. Furthermore, just like the Internet Archive, it

68   only allows queries by domain name: it is not possible to search using ownership

69   details in place of a domain. This means that domain registration information are only

70   accessible from a website address, not from a company's details. Therefore, going in a

71   circle, in order to investigate WHOIS records and the Internet Archive and find British

72   companies' websites from the 1990s, it is necessary to first compile a list of web

73   addresses from the 1996-2001 period that belonged to UK businesses. This was

74   possible thanks to one the most important tools to navigate the World Wide Web in

75   the pre-Google era: web directories[vii].

76

77   **1.1 THE USAGE OF ARCHIVED WEB DIRECTORIES**

78

79   In 1996, 1998 and 1999, a series of studies on the use of the World Wide Web on part

80   of British companies were published on the "International Journal of Information

81   Management". The studies were conducted by the Department of Information Studies

82   at the University of Sheffield. In 1996, the first study claimed that the total number of

83   companies' websites on the World Wide Web was 20,000.[viii] In August 1998 this

84   figure was 364,000[ix] and the last study reported half a million companies' websites in

85   March 1999 – of which about 14,000 created by UK businesses[x]. These studies were

86   based on the information given by the business directories available online,

87   particularly the "Yahoo! Business directory" and the "Yahoo! Regional Business

88   directory".

89   Before search engines, aggregators and social media became the entry door for

90   information seeking activities, web directories were the common way to explore and

91   browse information on the web. Curated directories as well as user-contributed

92   directories created a taxonomy of links from the most varied classifications. In this

93   study, the directories preserved in the Internet Archives were used as the entry door to

94   the archived web in the same way in which directories were the entry doors to the live

95   web in the period analysed.

96   Firstly, the Internet Archive was accessed through two search engines devised by

97   the UK British Library, in collaboration with the Big UK Domain Data for the Arts

98   and Humanities project[xi]: The AADDA[xii] and Shine Application - Version 1.0[xiii] allow

99   to research the ".uk" domains originally archived on the Internet Archive's Wayback

100   Machine, and acquired by the British Library for its UK Web Archives. While the

101   Wayback Machine only allows research through a specific domain,[xiv] with AADDA

102   and Shine it is possible to run a research through keywords. Thanks to this tool, a

103   keyword research was conducted in order to retrieve as many UK business directories

104   as possible. Word combinations such as "UK companies websites", "UK Business

105   directory/ies" and "UK company/ies list" were used.[xv] Directories used in the literature

106   of the time, such as "Askalex", "Kelly's Web" and "ThomWeb" were also searched.[xvi]

107   Many of these directories are still present in the archives; some of them were part of

108   international search engines, such as "Yahoo.com", or "Yell.co.uk", the online version

109   of the Yellow Pages. Other directories were category-specific, such as the one

110   provided by ABPI, the Association of British Pharmaceutical Industry,[xvii] or the list of

111   barristers and solicitors' websites provided by the personal website of Delia Venables,

112   a computer consultant for lawyers.[xviii] The most cited British directory at the time

113   seems to be "The UK directory", a list of 8600 URLs that claimed to collect "all the

114   WWW sites in the UK"[xix] divided by category. Other directories were created as part

115   of the services offered to its users by a specific website. For example, the largest

116   directory found was created by "Waternet", a company specialised in delivering water

117   supplies to offices. In 1999, they published a list of 15,834 URLs which they claimed

118   to be the complete list of UK companies' websites with a ".co.uk" domain.[xx]

119   Interestingly, one of the aforementioned studies reports that in August 1998 the

120   "Yahoo! Regional Business Directory", the most complete directory available,

121   comprised about 14,000 companies.[xxi]

122   Not all directories retrieved were useful for the purpose of this study.[xxii] Many

123   simply provided a list of companies registered in the UK, without any reference to

124   possible online presence. Others were displayed as search engines, without the

125   possibility to access the list of links that composed the database; as archived web

126   pages, the search engine is no longer operative and therefore useless for the purpose of

127   this study [see Picture 1]. Of the directories whose database was accessible and that

128   listed actual companies' websites, a selection of four was made, based on their size

129   and on the number of crawled instances within the Wayback Machine. The analysed

130   directories were the aforementioned "Waternet", "The UK Directory" and "Yell", plus

131   "DMOZ", a user-edited directory project [see Picture 2]. The directories appeared on

132   the Internet Archive between 1996 and 1999 [see Figure 2].

133   The content and structure of the directories were collected into a database through a

134   process of web scraping. Thanks to this collection, it was possible to enquire WHOIS

135   current data and the Internet Archive, thus creating a dataset of information associated

136   to each link. This system, though not as exhaustive as if it were possible to access

137   historical data on domain registration, still allowed to analyse the links to actual

138   archived websites, reconstructing the UK companies' web space as it was organised at

139   the time by the directories taken into account.

140   Two different scraping processes were implemented. The first step used a Google

141   Chrome plugin simply called "Web Scraper":[xxiii] a custom profile was created for each

142   of the directories, matching the specific hypertext structure. The plugin crawled each

143   of the directories collecting category information as well as links, titles and

144   descriptions as and where available. The data were then exported into CSV files and

145   cleaned in a spreadsheet programme. Through this system, a total of 23,739 individual

146   links were collected; a number that is coherent with the figures on the size of the UK

147   business companies given by the aforementioned studies.[xxiv]

148   After mapping the directories, the second step was to gather information on how the

149   unique links collected by the directories were archived by the Wayback Machine. A

150   custom script was written in Javascript and executed in Node.js in order to read the

151   collected CSV data and run queries to the Wayback Machine. The script is available

152   under an open source licence on Github.[xxv] The script retrieved the URL to the

153   Wayback Machine instance as well as the date of the first and latest crawl and the total

154   number of scans occurred.

155   Finally, the same script was used to gather current WHOIS data for the domains.

156   WHOIS data is openly available, however in order to limit abuse most servers

157   providing WHOIS databases for free restrict the number of requests that can be run by

158   the same computer in a specified time. To circumvent this limitation, an inexpensive

159   bulk research service was purchased;[xxvi] this service was provided though an API

160   (Application Programming Interface). With this method, for each link gathered it was

161   possible to retrieve the date of registration, the date of the last update, information on

162   the registrar and registrant (name, address, contacts, website),[xxvii] and the current date

163   of contract expiration.[xxviii] Three types of data were gathered for each of the 23,739

164   links:

165

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

167   - business category

168   - business name

169   - business description

170   - original URL

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172   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.

187

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

198   different data and each of them was organised according to its own guidelines. For

199   example, some companies could be listed as UK companies even though they were not

200   based in Britain; other directories could have listed domains that were not companies'

201   websites, but websites offering services to companies, such as chamber of commerce,

202   universities, etc. It is important to keep in mind that these collections were the results

203   of a selection made by the curators, sometimes with a contribution on part of the users.

204   Furthermore, the data are skewed by the way in which the Internet Archive and the

205   directories operate.

206   These limitations particularly affect the two most interesting data available: the

207   business category and the creation date. As neither the directories nor the Companies

208   House dataset provide information on the companies' size, understanding which types

209   of businesses went online in the Nineties can be only attempted through information

210   regarding the business category; this will be analysed in the next session.

211   The creation date would theoretically allow to understand the evolution of the UK

212   business web space over time and which type of companies created this space, but it is

213   an extremely problematic datum. First of all, knowing exactly when a website was put

214   online is next to impossible; WHOIS provides the year of the domain registration, the

215   Internet Archive the year of the first crawl [Figure 3]. The data tell us that the largest

216   amount of companies' domains was registered in 1996, with a second smaller peak in

217   1999. These data go against the general trend of companies' websites as given by the

218   literature, which show a large constant increase between 1996 and 1999 (from 20,000

219   to 364,000 to 500,000 websites).[xxix] This could mean that most of UK companies

220   registered their domain very early, in 1996; however, there is no evidence to support

221   this possibility. The data could show a gap in the dataset, further complexity in what

222   WHOIS records as "registration date", or a combination of the two. Furthermore,

223   almost 20% of the domains appear to have been registered after the website was first

224   listed in the directory. All websites analysed should have been registered no later than

225   February 2001, the date of the most recent directory instance analysed. This could

226   mean a passage of ownership, or the migration to a different server and registrant; in

227   any case there is no guarantee that the website currently registered on WHOIS is the

228   same as the one listed by the directories at the time.

229   If the claims made by Waternet were true (with the partial confirmation from the

230   information we have on the "Yahoo! Regional Business Directory"), we can consider

231   the dataset an exhaustive, if not complete, list of UK companies' websites in the

232   period taken into account. However, it is very difficult to understand how this web

233   space evolved between 1996 and 2001 in terms of size. The analysis of the business

234   categories, though also incurring important limitations, gives a better picture of which

235   type of companies created this web space, and why.

236

237

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

239

240   This session provides an examination of the dataset based on the information

241   regarding business categories. At first, a comparison between the registered businesses

242   and relative websites divided by category was attempted, in order to give a glimpse of

243   the relations between the number of companies registered in the UK and the number of

244   companies' websites created in the 1996-2001 period.

245   In second instance, and more successfully, the analysis has focussed on the

246   categorisation provided by the directories for the web space. This not only helps to

247   understand which businesses were more attracted by the Internet, but it also allows to

248   reflect on the taxonomies created by the directories, and therefore on the ways in

249   which users searched for companies' websites.

250

251   **2.1 COMPARING COMPANIES HOUSE AND THE DOMAINS DATASET**

252

253   The first step in the analysis of the domain dataset was a comparison with the list of

254   UK registered companies provided by Companies House [Annex III]. If there were

255   23,739 UK business web domains and 655,645 British companies active between 1996

256   and 2001, this means that the percentage of UK companies that opened a website in

257   this timeframe is around 3.62%.

258   Unfortunately, a further comparison between the websites' categories (as indexed

259   by the directories) and the overall number of companies per category (as indexed by

260   Companies House) was largely inconclusive. The lack of standardisation provided by

261   each dataset made the data completely aleatory and useless to compare. To begin with,

262   DMOZ listed more than 300 categories, the UK Directory only 7. Waternet, the largest

263   directory available, did not provide a description, a category, or even the name of a

264   company: the links were simply listed in alphabetical order, without any detail. Yell,

265   the online version of the Yellow Pages, listed the websites both by company's name,

266   in alphabetical version, and by category. For what concerns the categories, the web

267   pages were organised with 25 links on each page. The Wayback Machine only crawled

268   the first page for each category, and therefore each category appears to have 25 links.

269   This is the reason why the Yell directory as it was retrieved is only composed of 475

270   websites: 25 links times 19 categories.

271   Furthermore, the data are not uniform between the different categories, WHOIS and

272   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[xxx] all had full operating websites, that are all preserved in the

296   Internet Archive.[xxxi] With regards to the primary sector, the UK directory also listed 81

297   websites as "Agriculture Companies"; the names suggest mostly farms and

298 agricultural service manufacturers and providers. It was not possible to run a

299 comparison with Companies House's primary sector companies because they were

300 categorised in a too scattered manner. The other interesting information obtainable is

301 the large quantity of Employment-dedicated websites, 488 on a total of 3456

302 registered companies. In a sector strongly based on the exchange of information

303 between parties, employers and job seekers, it is not surprising that the migration to

304 online databases that could be updated and consulted in real time represented a real

305 game changer for the business.

306   However, this is too little information to come to definite conclusions on what were

307 the most proactive categories on the web compared to the overall number of

308 companies for the same sector. The category aggregation and comparison is too vague

309 and too many categories are left out to be able to reach valuable results. Concentrating

310 on the categories through which the directories organised the business web space was

311 more meaningful to have a glimpse of which type of companies were online.

312

313   **2.2 CATEGORISING THE BUSINESS WEB SPACE**

314

315 Looking at the 300 categories provided by the three directories taken into

316 consideration, a clear macro division is immediately apparent between "national"

317 businesses, in which only the business category is indicated, and "local" businesses, in

318 which the catchment area of a website is specified alongside (or in the place of) the

319 type of business. Categories such as "Scotland – Motoring" or "England – East

320 Sussex" are by far the most popular way of indexing companies' websites: 2279

321 companies in total were listed under "England" (1343), "Scotland" (468), "Wales"

322 (350) and "Northern Ireland" (118).

323   When reading the business description provided by the directories, the companies

324   defined as "local" seem to be offering mostly business-related or general services, and

325   many of them are industrial of financial sectors, so not necessarily small businesses;

326   however, they are qualified *in primis* according to their location. This showed the need

327   to provide a geographical space to the UK companies that opened a website, like print

328   directories would do, and before interactive maps allowed for a different type of

329   territorial research.

330   Leisure activities and services such as restaurants, cinemas, hotels and beauty

331   centres are mostly missing from the categories list. This could be because the

332   directories catalogued these companies under "Entertainment" or "Leisure" rather than

333   "Business"; however, it is probable that most of these business websites were

334   categorised simply under "Local activities", meaning that the directories were mostly

335   concerned in offering to the users a list of the various services offered in the area

336   rather than then listing the websites/webpages available for a business.

337   On the contrary, "Shopping" escape this "localisation". The category, one of the

338   most popular, is mostly composed of shops, with taxonomies such as "Shopping –

339   clothing" or "Shopping – pets". It included retail sectors such as music shops and

340   jewellery, auctions and furniture, items for children and bookshops.[xxxii] A quick look

341   into the items that are available in the archive shows that large chains such as

342   Debenhams and Costcutter are represented as much as small local businesses selling

343   specialised items. In particular, antiques and memorabilia were the most represented

344   sub-category. It seems clear that the web promoted already in the Nineties the

345   delocalisation of shopping in favour of one single virtual market, not just for large

346   retailers but also for the smallest activities.

347   After local businesses, the most represented categories are International Business

348   and Trade services, Motoring Dealers, Legal and Financial Services, Shopping, Real

349   Estate, Recruitment. Unsurprisingly, as already mentioned with regards to

350   Recruitment, business that had the most to gain from faster interaction possibilities

351   between buyers and sellers seem to have gone online early. For example, from a

352   sample analysed it seems that many Motoring and Computer websites offered the

353   possibility to post ads of people selling used items.

354   It is also extremely interesting to notice that one of the most popular category is

355   "Directory", and that other categories often have sub-sections like "Shopping –

356   directory", "Legal services - directory", "International Business and Trade –

357   directory". Section 2.3 will be dedicated to this particular category of companies'

358   websites.

359   Finally, the data collected through the methodology outlined were compared with

360   the information provided by the business literature of the time. C. Greaves et al.

361   reported in 1999 the companies' web classification as given by the Yahoo! Business

362   directory, [xxxiii] comparing UK's companies websites to the overall number of

363   companies' websites [see Figure 5]. According to the "Yahoo! Business Category",

364   which is now lost, the most popular UK companies' websites were Computer-related

365   businesses (19%), Transport (10%), Entertainment (10%), Engineering (10%),

366   Financial Services (6.2%) and Real Estate (6.2%). The "Miscellaneous" category was

367   still the most popular. These data tend to confirm what written with regards to which

368   business companies took an early interest in the web; the differences in percentages

369   could be given by the different way of categorising the websites: for example, the lack

370   of the categories Recruitment/Employment is probably due to the fact that "Yahoo!"

371   put these companies under the specific sector that they served (for example,

372   Engineering Recruitment under Engineering).

373   The comparison with the general trend of business websites outside Britain, though

374   referred to the previous year, is also very interesting in showing that UK companies

375   were following the same trend of other nations (at this stage, namely the U.S.), in

376   building their web space.

377

378   **2.3 THE "DIRECTORY" CATEGORY**

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380   As explained in section 1.1, this study analysed a sample of directories that where not

381   category-specific and that allowed to access the list of domains they included. This

382   analysis suggests that the directories available on the web were many more than the 20

383   found through the keyword research with AADDA and Shine [see Annex I], and also

384   that most directories linked not only to unique websites, but to lists of other

385   directories. In the dataset created from the scraping of the four directories selected,

386   more than 400 websites were categorised as "Directories". Of these, 112 were general

387   directories that offered different types of websites; 177 were business-related

388   directories, where to find chambers of commerce and trade companies; 72 were

389   "Property Directories", search engines to find retail estate managers according to be

390   type of property sought (for this reason, it would not be wrong to consider them under

391   the "Real Estate" category, as websites created by real estate companies); 54 were

392   shopping directories, which listed a mix of online retail and local shops.

393   Here again, a regional dimension to the World Wide Web emerges, because many

394   directories aimed to collect lists of websites of interest to a local area, from local shops

395   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.[xxxiv]

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.[xxxv] 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".[xxxvi] 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

420   full catalogue, especially without a recall for spelling mistakes, was a serious

421   shortcoming compared to the analogue versions available.

422   Indeed, by the early noughties, most of these directories had been cancelled, or they

423   were not updated anymore. Sophisticated and automated search engines had changed

424   by then the way in which people accessed the web, the costs of creating a website had

425   dropped, and user-generated platforms were about to make service suggestion lists

426   redundant. In 2001 directories were still indicated as an important digital space for

427   companies; however, early experts in digital markets warned that "the WWW is the

428   ultimate self-publishing environment", and that the most effective way to gain from an

429   online presence was to open a full corporate website.[xxxvii] Nowadays, directories have

430   been substituted by independent websites, retrieved through the main search engines,

431   social networks, interactive maps, globalised user-generated content websites. Of the

432   general directories analysed that are still available online, Yell and the UK Directory

433   now offer mostly digital marketing services to companies;[xxxviii] DMOZ still exists as

434   an ongoing experiment to build a human-edited directory of the web, but it should be

435   considered an exception.[xxxix]

436   However, in the period analysed these directories were not just a mean to organise

437   and make accessible the business space, but they were a specific form of uploading

438   content online – a place for businesses to advertise and promote themselves which

439   represented an intermediate passage from the traditional printed resources to the more

440   sophisticated search engines that changed the way in which we retrieve information

441   online.

442

443

444   **3. THE RATIONALE BEHIND BRITISH COMPANIES' WEBSITES**

445

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.[xl] 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);[xli]

453   furthermore, Internet users were strong spenders, with higher incomes than average,

454   especially in the earliest years (1996-1997).[xlii] 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.[xliii] 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.[xliv]

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[xlv] 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

470   new website. The price did not include the creation of animation (£150 each), special

471   graphics and logos (£50 each), or the on-line research for a hypertext 'links' page (from

472   £25 per hour). Weekly e-mail promotion of the site started at £75 per year.[xlvi] Global

473   Internet, an Internet service provider based in London, offered up to 5MB of space on

474   servers for £99 as annual rental, £79 for each additional 5MB.[xlvii]

475   This quick estimate gives an interesting overview of what Internet services

476   providers offered to companies. The aforementioned studies conducted in the Nineties

477   outlined that the reasons for a company to go online were the usage of email, not only

478   as office tools but to communicate with the clients; collaboration with other companies

479   or remote offices through shared workstations, research and development through

480   shared information. However, the web in particular allowed two fundamental

481   innovations that were indicated as the main reasons for companies to open a website:

482   universal visibility and online sales.

483

484   **3.1 VISIBILITY**

485

486   Like with any other means of communication, companies aimed to use the web for

487   promoting their services and products. Being linked from other websites and

488   directories was fundamental to gain online visibility. In fact, it is important to

489   remember that advertising on the Internet caused several protests. Before the

490   development of the web, Internet was mostly about chats, newsletters, discussion

491   groups and emails: private or semi-private means of communication in which

492   advertisement was perceived as breach of privacy. Furthermore, connections were paid

493   for by the minute and by the megabyte, a scarcity system in which users were annoyed

494   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"[xlviii] - a term that started to circulate in that

497 period and that derives from a Monty Python sketch.[xlix]

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.[l]

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.[li]

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. [lii] 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.[liii] "In the Web, content really *is* king - wrote in 2001 marketing

517 expert Steven Armstrong – users have nearly complete control when surfing". [liv] 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

520   presentations rather than pure advertising were, and still are, two of the main features

521   of companies' website. More than marketing hype, websites were filled with corporate

522   material, including annual reports and technical financial details, important for press

523   offices to communicate with journalists. Furthermore, especially in the case of small

524   and medium-size enterprises (SMEs), websites were filled with information on the

525   business sector where the company operated, content that people interested in a

526   specific business might want to see. For example, a make-up artist from London had a

527   website full of beauty tips and hair-styling suggestions: content that promoted loyalty

528   building to the website by providing free information [see Picture 4].[lv]

529   It is interesting to notice that from a small sample of 300 websites analysed, most of

530   them were organised to mimic either shops or indexes. In the first case, the home page

531   corresponded to an entrance door, often accompanied by animation and sounds,

532   followed by an "enter" button that allowed to come into the virtual boutique.

533   Alternatively, the homepage was composed of a table of content that asked, like a

534   virtual clerk, which type of information did the customer need. In many cases the

535   homepage also provided technical information about which software should be used to

536   better navigate on the website and which type of bandwidth did the website require.

537   Sometimes viewers could choose between different versions of the website according

538   to the characteristics of their connection.

539

540   **3.2 ONLINE SALES**

541

542   Apart from visibility, the other main reason for companies to go online was,

543   unsurprisingly, the possibility of online sales. Already in 1994, a study described the

544   "virtual mall" possibilities given by the multi-media capabilities of the web.[lvi] "A good

545   virtual shop should make the customer feel as if they might actually be out shopping in

546   the real world"[lvii] wrote a study in 1996. In the UK, online sales took off more slowly

547   than in the United States, mostly because of doubts about the security systems of

548   online payments.[lviii] However, by October 1999 the Financial Times reported that

549   shoppers had spent £2 billion in the past twelve months, with a tenfold increase

550   compared to the previous year.[lix] The UK directory for secure online stores listed 178

551   stores in February 1999[lx] and already 252 three months later,[lxi] ranging from auctions

552   to travel agencies to toys and baking services.[lxii] According to the directories analysed,

553   175 websites provided online sales between 1996 and 2001, together with 54 shopping

554   directories. In total, 1342 companies were indexed on Companies House as retailers

555   through e-mail or the web.

556   Tesco and Sainsbury's were the first large retail chains to offer online sales

557   services.[lxiii] In May 1998, Sainsbury's was offering an online shopping service via

558   credit card, home delivery included. In order to activate the account it was necessary

559   to visit a local store and create a personal catalogue of specific brands and goods from

560   which to choose: not all products were sold online, and not all areas were served.

561   However, the system allowed to create different shopping lists to order a whole set of

562   products in one click.[lxiv] Full online shopping without pre-registering in a store seems

563   to be available from the year 2000.[lxv] In January 1998, Tesco developed a special

564   software called Tesco Home Shopper, which allowed to browse more than 20,000

565   products offline, connecting to the Internet only to send orders and check prices

566   updates. However, only the Greater London area and Leeds were served.[lxvi] Again by

567   2000, online shopping had become more similar to what it is today, not bounded by

568   special software or geographical areas.[lxvii]

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,[lxviii] or the "Japanese

573   Centre", a London-based consultancy agency for Japanese students in London.[lxix]

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 where 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.[lxx] 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), one of the largest online British bookstores at the time.[lxxi]

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.[lxxii]

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

594   interactions allowed with potential clients, which was particularly important in the

595   case of niche retailers, such as memorabilia, or in the case of user information-based

596   businesses like Recruitment. Initially, these functions passed mostly through the

597   usage of online directories for visibility and of the email for communication; from the

598   early noughties however, opening an independent website was considered the most

599   effective investment.

600   The main difference compared to previous available media was in the type of

601   information provided: not simple blasting, but notions on the products, on the

602   company, and on anything that would please visitors that wanted more information.

603   Throughout the years, it seems that webpages within specialised directories tended

604   to diminish in parallel to the expansion of the web, search engines, and the constant

605   decrease in the costs of opening a full website. At the same time, despite an increase in

606   multimedia features, the type of content remained centred on giving information on

607   products and services rather than simple advertisement.

608

609

610   **CONCLUSIONS**

611

612   The creation of companies' websites mark the general evolution of the Internet from a

613   private or semi-private mean of communication, almost an extension of the telephone

614   and the fax, to a public space, in which the business sphere had a predominant role. A

615   comparison between the overall number of websites as reconstructed by Netcraft [see

616   Figure 1] and the data offered by the aforementioned studies from the Nineties on the

617   live business web space, shows that companies' websites alone represented 7.78% of

618   the total web sphere in 1996, 15.1% in 1998 and 15.7% in 1999.[lxxiii] 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

644   web. For companies that wanted to be present online, webpages within larger

645   directories were an intermediary passage before opening an independent website – an

646   evolution that seems to have accompanied the development of search engines and the

647   obsolescence of web directories, and that would require further studies.

648   The second objective of the paper was to compare the quantitative data gathered

649   with the general context in which companies' websites went online in the UK, in order

650   to reflect on what drew businesses to the web it its early years of existence. Even

651   though with severe limitations, the reflections generated by the study of the web space

652   as mapped through the business directories found confirmation in the studies of the

653   time and in the reconstruction of the debate around companies and the web. This

654   analysis gives back a picture of the World Wide Web as an ideal place for businesses

655   of all sizes, a new medium in which British companies immediately took interest,

656   attracted by the possibilities for interaction, online sales, network building with their

657   customers and clients. In particular, businesses could retain their geographical

658   delimitation and catchment areas while opening to the possibility of building a remote

659   and potentially worldwide clientele.

660   Overall, the present results only draw some tentative conclusions on the actual

661   composition of the UK business web space in its early years; however, with a more

662   exhaustive enquiry of the available directories and with more powerful means of

663   analysis for the comparison of the data provided by the directories and by the WHOIS

664   protocol, it will be possible to further investigate these and other aspects of the

665   development of business websites and their influences on the larger web sphere. In this

666   sense, this paper hopes to offer a useful set of tools and to serve as a starting point for

667   further research on the history of the business web sphere.

668

669 **ANNEX I:**
670 Musso M. and Merletti F., *Annex 01_list of directories* [xlsx]. Available at <
671 http://fm.to.it/uk-web-annex1>
672
673
674
675 **ANNEX II:**
676 Musso M. and Merletti F., *Annex 02_domain dataset* [xlsx]. Available at <
677 http://fm.to.it/uk-web-annex2>
678
679
680
681 **ANNEX III:**
682 Musso M. and Merletti F., *Annex 03_UK Companies active between 1994 and 2001* [xlsx].
683 Available at <http://fm.to.it/uk-web-annex3>
684
685

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

687

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

Number of websites (Netcraft)
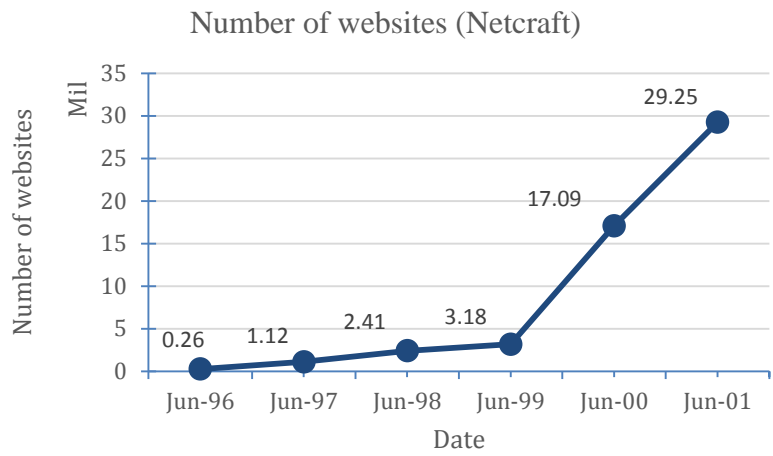
688

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

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

691

692

693   **FIGURE 2: DIRECTORIES ANALYSED**

694

695

696

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

697

698   Sources: Annex I and Annex II

699

700

701

702   **FIGURE 3: REGISTRATION YEAR AND CATEGORIES**

703

704

Year of first capture vs year of WHOIS registration

Captured: DMOZ 24 Jan 2001   UKDirectory 20 Jan 1997   Waternet 19 Feb 1999   WHOIS
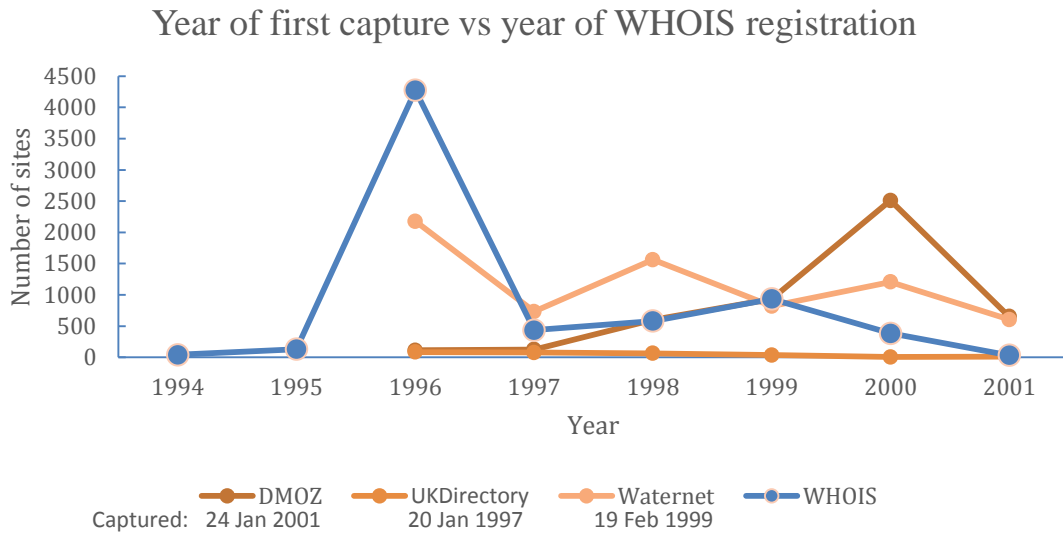
705

706

707   Source: Annex II

708

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

710 **CATEGORY**

711

712

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

713

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

715

716 **FIGURE 5: COMPANIES' WEBSITE ACCORDING TO SIC CATEGORIES**

717 **IN THE UK AND IN GENERAL**

718

719

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

720

721

722 Source: Greaves, Kipling and Wilson (1999) Business Use of the World-Wide Web,

723 with particular reference to UK companies, *International Journal of Information*

724 *Management,* Vol. 19: 449-470

725

726

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

728

729

730

731 **Kelly's Web**

732

733
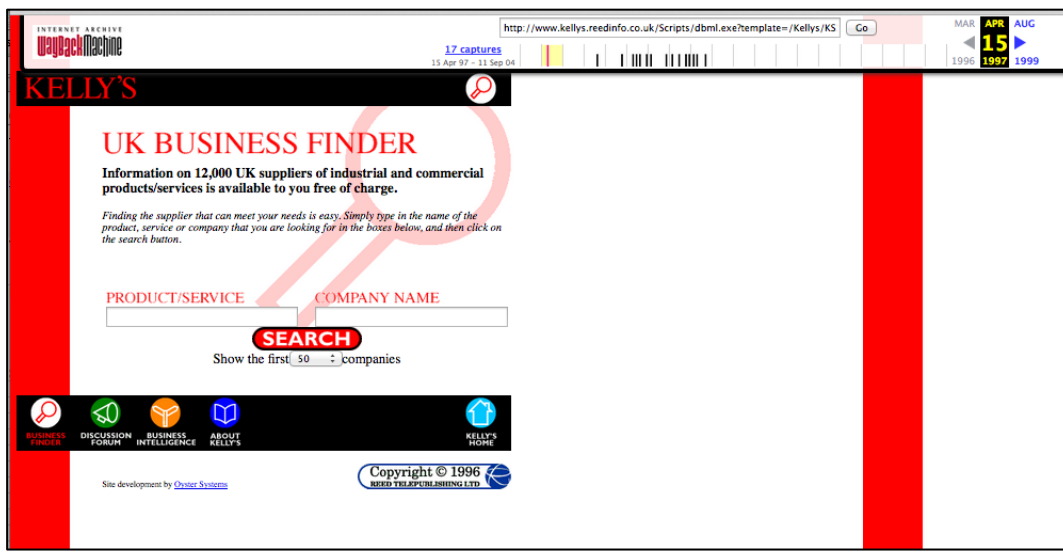
734

735

736 Source: Kelly's UK Business Finder,
737 <http://web.archive.org/web/19970415015024/http://www.kellys.reedinfo.co.uk/Script
738 s/dbml.exe?template=/Kellys/KS1.dbm> [Internet Archive, site captured 15 Apr.
739 1997]
740

741 **Delia Venables**

742

743

744

745

746 Source: Delia Venables, English Firms of Solicitors on the Web,
747 <http://web.archive.org/web/19981202064024/http://www.venables.co.uk/legal/firms.
748 htm> [Internet Archive, site captured 2 Dec. 1998]
749

750

751 **PICTURE 2: DIRECTORIES ANALYSED**

752

753

754

755 **Waternet**

756

757
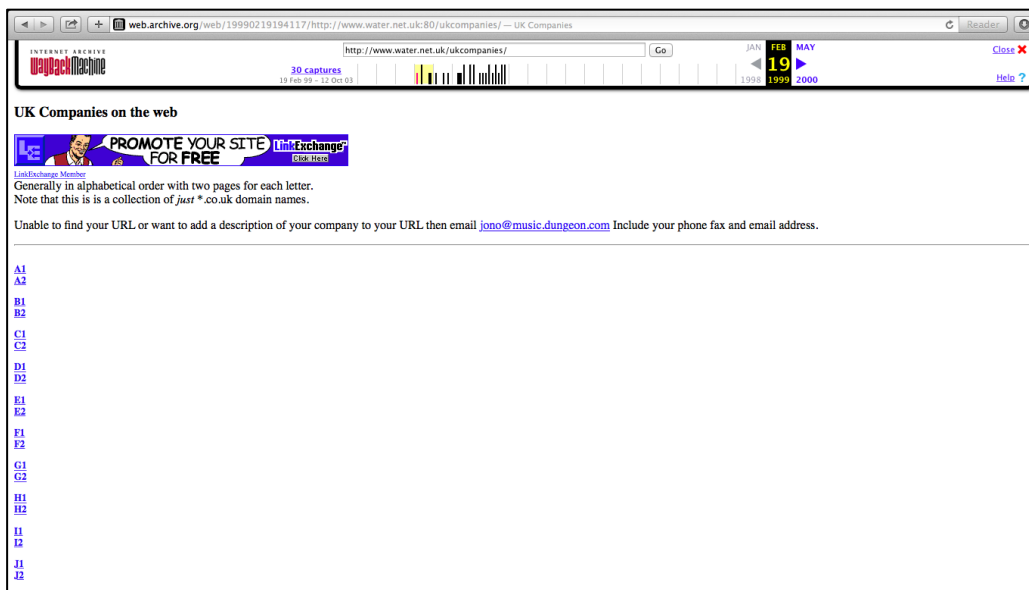
758

759

760 Source: Waternet, UK Companies on the web,
761 <http://web.archive.org/web/19990219194117/http://www.water.net.uk:80/ukcompani
762 es/> [Internet Archive, site captured 19 Feb. 1999]
763

764

765

766 **Yell**

767

768

769

770

771 Source: UK Yellow Web,
772 <http://web.archive.org/web/19970616081900/http://www.yell.co.uk/yell/web/compan
773 yaz.html> [Internet Archive, site captured 16 Jun. 1997]
774

775

776   **DMOZ**

777

778
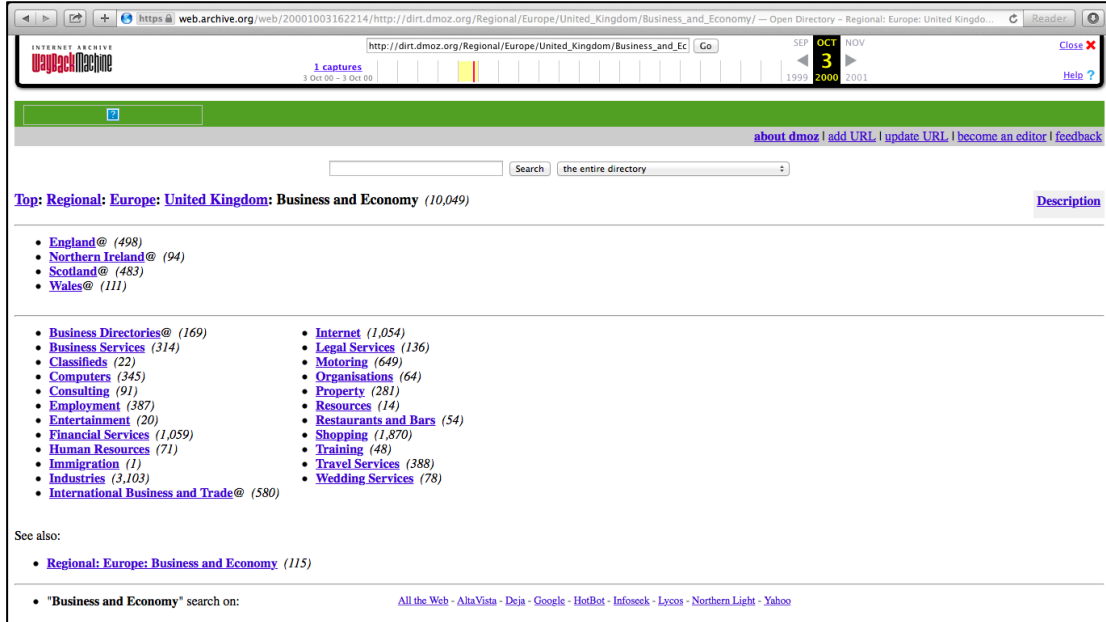
779

780

781   Source: DMOZ,
782   <https://web.archive.org/web/20001003162214/http://dirt.dmoz.org/Regional/Europe/
783   United_Kingdom/Business_and_Economy/> [Internet Archive, site captured 03 Oct.
784   2000]
785

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787

788

789 **UK Directory**

790

791

792

793

794 Source: UK Directory,
795 <http://web.archive.org/web/19961219105803/http://www.ukdirectory.com/> [Internet
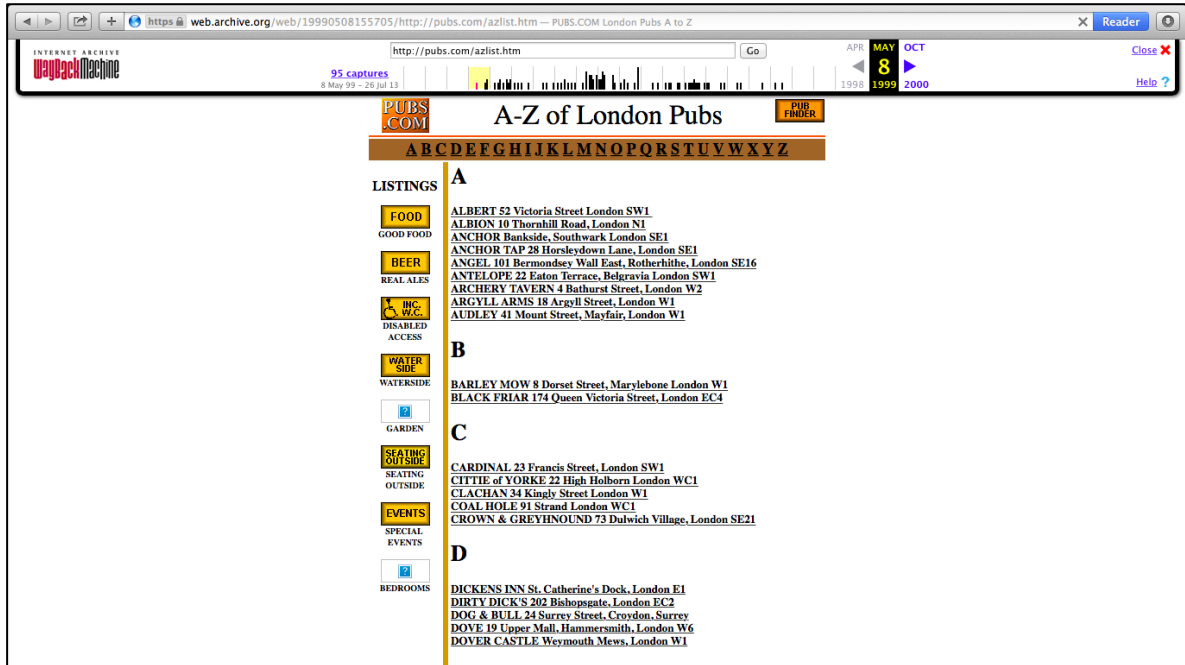796 Archive, site captured 19 Dec. 1996]
797

798   **FIGURE 3: PUB.COM DIRECTORY**

799

800

801

802

803   Source: Pubs.com,
804   <https://web.archive.org/web/19990508155705/http://pubs.com/azlist.htm> [Internet
805   Archive, site captured 8 May 1999]
806

807

808
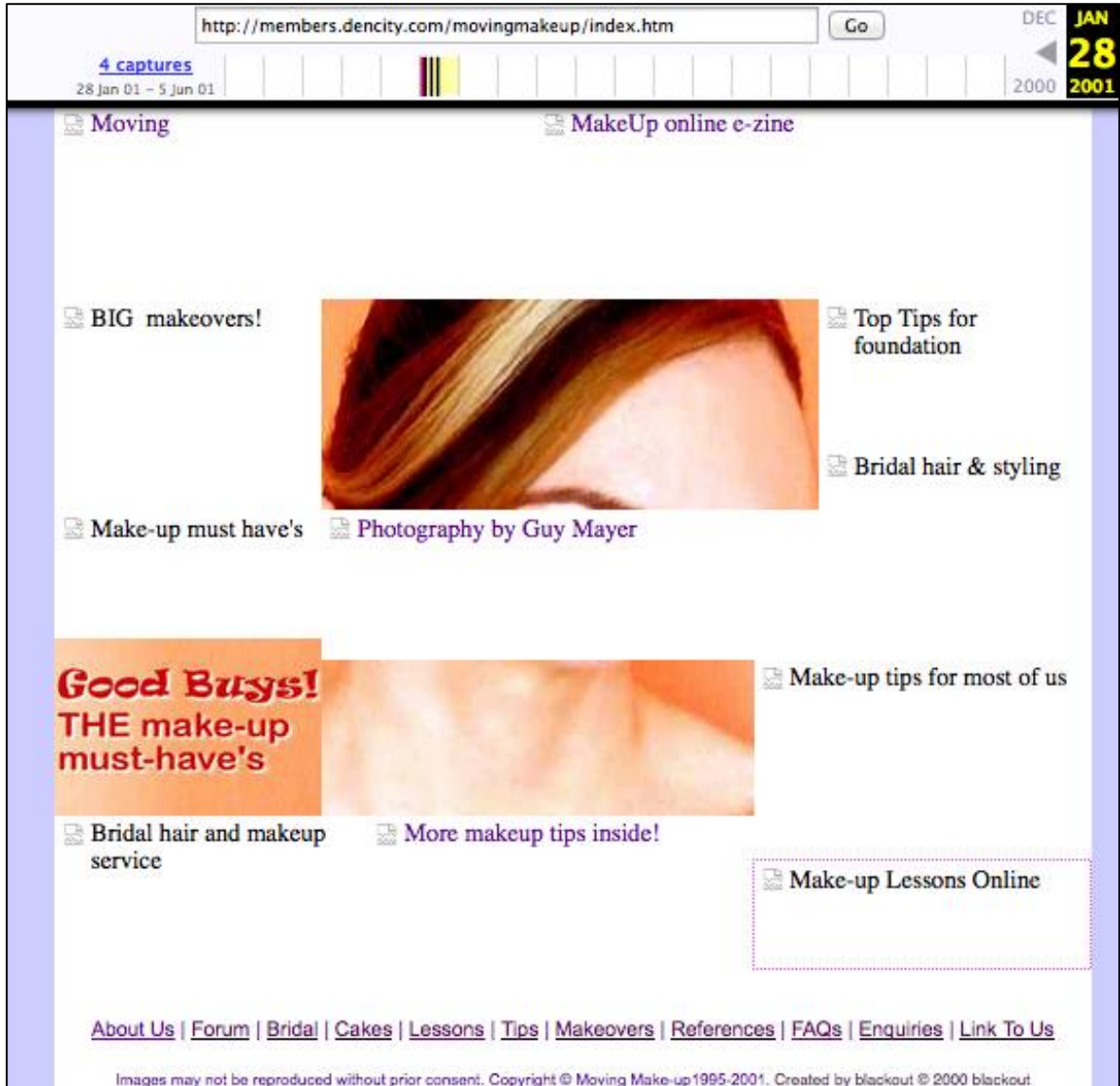
809

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

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

817

818

819

820   Source: Moving Make-up,
821   <https://web.archive.org/web/20010128101100/http://members.dencity.com/movingm
822   akeup/index.htm> [Internet Archive, site captured 28 Jan. 2001]
823

[i] 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

[ii] 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=14235937344640907915650146318> [Accessed 3 November 2014].

[iii] 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

[iv] Netcraft, March 2015 Web Server Survey. Available at: <http://news.netcraft.com/archives/category/web-server-survey/> [Accessed 12 April 2015].

[v] Internet Archive, Wayback Machine. Available at: <http://archive.org/web/>.

[vi] Companies House, Free Company Data Product. Available at: <http://download.companieshouse.gov.uk/en_output.html> [Accessed 1 February 2015].

[vii] Google will appear for the first time in 1998

[viii] Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of Information Management* Vol. 16: 83—102

[ix] 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

[x] 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

[xi] Big UK Domain Data for the Arts and Humanities. Available at: <http://buddah.projects.history.ac.uk/> [Accessed 22 May 2015].

[xii] UK Web Archive, AADDA - Analytical Access to the Dark Domain Archive (1996-2010). Available at: <http://www.webarchive.org.uk/aadda-discovery/search>

[xiii] UK Web Archive, Shine Application. Available at: <http://www.webarchive.org.uk/shine>

[xiv] Internet Archive, Wayback Machine. Available at: <http://archive.org/web/>

[xv] For the full list of item searched, please refer to Annex I

[xvi] 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

[xvii] 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].

[xviii] 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].

[xix] UK directory, <http://web.archive.org/web/19961219105803/http://www.ukdirectory.com/> [Internet Archive, site captured 19 Dec. 1996]

[xx] 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]

[xxi] 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

[xxii] For a full list, see Annex I

[xxiii] Web Scraper. Available at: <http://webscraper.io>

[xxiv] 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

[xxv] Francesco Merletti, *UK-companies-scraper*. Available at Github, < https://github.com/mjs2020/uk-companies-scraper>

[xxvi] Bulk Whois Api. Available at: <https://bulk-whois-api.com>

[xxvii] 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.

[xxviii] See Annex II

[xxix] 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

xxx 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].

xxxi Previous research on UK companies' website by Marta Musso

xxxii For a complete list, see Annex II

xxxiii 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

xxxiv see Annex II

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

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

xxxvii Armstrong, S. *Advertising on the Internet: how to get your message across on the World Wide Web*. London: Kogan Page 2001, pp.15-30

xxxviii 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]

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

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

xli 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]

xlii 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]

xliii Baxter (1996) Strategies for the net, Financial Times, 11 Dec

xliv Armstrong, S. *Advertising on the Internet: how to get your message across on the World Wide Web*. London: Kogan Page 2001, pp.15-30

xlv Corresponding to £450 ca. today This is money, 2015. Price and inflator calculator. [online] Available at: < http://www.thisismoney.co.uk/money/bills/article-1633409/Historic-inflation-calculator-value-money-changed-1900.html> [Accessed 15 February 2015].

xlvi Abracadabra Internet Publishing, <http://web.archive.org/web/19961222185552/http://www.netlink.co.uk/users/abracad/prices.html> [Internet Archive, site captured 22 Dec. 1996].

xlvii Global Internet, <https://web.archive.org/web/19961105105311/http://bilbo.globalnet.co.uk/web.htm> [Internet Archive, site captured 5 Nov. 1996].

xlviii Selling on the Internet, <http://web.archive.org/web/19980523214839/http://www.u-net.com/ukcom/sell/selling.htm> [Internet Archive, site captured 23 May 1998]. See also Beginners guide to: Good Manners, <http://web.archive.org/web/19961215145816/http://www.ukindex.co.uk/begin8.html> [Internet Archive, site captured 15 Dec 1996].

xlix Brunton, F. *Spam: a shadow history of the internet*, Cambridge (MA): The MIT Press 2013. In the book, Brunton defines spam as "the use of information technology infrastructure to exploit existing aggregations oh human attention"

[l] Selling on the Internet,
<http://web.archive.org/web/19961219025822/http://www.u-net.com/ukcom/sell/selling.htm> [Internet Archive, site captured 19 Dec 1996]

[li] Selling on the Internet,
<http://web.archive.org/web/19961219025822/http://www.u-net.com/ukcom/sell/selling.htm> [Internet Archive, site captured 19 Dec 1996]

[lii] Selling on the Internet,
<http://web.archive.org/web/19961219025822/http://www.u-net.com/ukcom/sell/selling.htm> [Internet Archive, site captured 19 Dec 1996]

[liii] Selling on the Internet,
<http://web.archive.org/web/19961219025822/http://www.u-net.com/ukcom/sell/selling.htm> [Internet Archive, site captured 19 Dec 1996]

[liv] Armstrong, S. *Advertising on the Internet: how to get your message across on the World Wide Web*. London: Kogan Page 2001, p.32

[lv] Moving make-up,
<https://web.archive.org/web/20010128101100/http://members.dencity.com/movingmakeup/index.htm> [Internet Archive, site captured 23 January 2001]. See also Picture 4

[lvi] Minio, R (1994) Businesses and the Internet, some interesting experiments, *Management and Technology*, vol 2 (1): 11-13. In Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of Information Management* Vol. 16: 83—102

[lvii] Cockburn and Wilson (1996) Business Use of the World-Wide Web. *International Journal of Information Management* Vol. 16: 83—102

[lviii] Denton, Nick, Financial Times [London (UK)] 13 Dec 1996: 09. Accesses through: Cambridge University Library website <http://search.proquest.com/docview/248333844?accountid=9851> [Accessed 3 November 2014].

[lix] Price, Christopher, Financial Times [London (UK)] 02 Oct 1999: 03. Accesses through: Cambridge University Library website <http://search.proquest.com/docview/248886545?accountid=9851> [Accessed 3 November 2014].

[lx] Welcome to the UK's fastest growing directory of SECURE online stores,
<http://web.archive.org/web/19990202161526/http://www.internetics.co.uk/shop/> [Internet Archive, site captured 2 Feb 1999]

[lxi] Welcome to the UK's fastest growing directory of SECURE online stores,
<http://web.archive.org/web/19990508182154/http://www.internetics.co.uk/shop/> [Internet Archive, site captured 8 May 1999]

[lxii] However, as the categories are not further crawled, it is impossible to verify whether these online shops correspond to UK companies and/or if they have guaranteed delivery services in the UK

[lxiii] Hollinger, Peggy, Financial Times [London (UK)] 28 Dec 1996. Accesses through: Cambridge University Library website <http://search.proquest.com/docview/248305200?accountid=9851> [Accessed 3 November 2014]

[lxiv] Sainsbury's orderline,
<http://web.archive.org/web/19980514215905/http://sainsburys.co.uk/orderline/index.html> [Internet Archive, site captured 14 May 1998]

[lxv] Sainsbury's orderline,
<http://web.archive.org/web/20000303221747/http://orderline.sainsburys.co.uk/> [Internet Archive, site captured 3 Mar 2000]

[lxvi] The Tesco Homeshopper,
<http://web.archive.org/web/19980115092120/http://www.tesco.co.uk/homeshop/> [Internet Archive, site captured 15 Jan 1998]

[lxvii] Tesco Home,
<http://web.archive.org/web/20001018041843/http://www.tesco.com/> [Internet Archive, site captured 18 Oct 2000] Unfortunately crawls for 1999 are only partial and do not allow to gather information on the online shopping system for that period.

[lxviii] Janet Granger Designs,
<http://web.archive.org/web/20000517144539/http://www.janetgranger.co.uk/> [Internet Archive, site captured 17 May 2000]

[lxix] Japan Centre Plaza,
<http://web.archive.org/web/20010301224257/http://www.centreproperties.co.uk/> [Internet Archive, site captured 5 Mar 2001]

[lxx] Stuart & Mary Manley, Barter Books Ltd. *Questionnaire on British Companies and the Internet*, 30 October 2014

[lxxi] This is money, 2015. Price and inflator calculator. [online] Available at: <http://www.thisismoney.co.uk/money/bills/article-1633409/Historic-inflation-calculator-value-money-changed-1900.html> [Accessed 1 December 2014].

[lxxii] The Boston Consulting Group, October 2010. *The connected kingdom – how the internet is transforming the UK economy*. [pdf] The Boston Consulting Group. Available at: <https://www.bcg.com/documents/file62983.pdf> [Accessed 24 April 2014].

[lxxiii] 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