Accessibility Issues in E-Government

Eleanor Leist and Dan Smith

University of East Anglia, Norwich, NR4 7TJ, UK
{e.leist,dan.smith}@uea.ac.uk
http://www.uea.ac.uk/computing

Abstract. Government services are almost always monopoly services, and as a result, it is important to maximize inclusion. However, substantial numbers of people are unable or unwilling to use internet services. Usability and accessibility issues are a major deterrent to internet use and are important in users' perceptions of websites. These are particularly important for older people, many of whom have reduced visual acuity, loss of fine motor control and other disabilities that make it more difficult to deal with poorly designed websites. We undertook two sets of experiments, the first involving an assessment of the accessibility and standards compliance of local and national e-government sites in the UK. The second focuses on sites in several other European countries. Results show significant differences between different levels of government and between standards compliance and accessibility.

Keywords: e-government, accessibility, standards, exclusion.

1 Introduction

As we conduct more of our daily activities online, e-government becomes more essential to citizens and to businesses. Governments are sole providers of many services, for example, registering a birth, booking a driving test or paying taxes. Making these services available online gives most people quicker and more convenient access, as well as creating substantial savings [20]. However, the presence of groups of people who are unable or unwilling to use online services makes the change more problematic, the 'actively disengaged' and the 'willing but unable'; the main characteristics of e-government non-users are related to age, education and income [28] [1].

Since many public services are natural monopolies usability and accessibility issues have a disenfranchising effect which is likely to exclude the groups of citizens who are least well equipped to participate in a digital society. Web accessibility guidelines are well developed, but many organisations do not implement them and previous studies have shown a widespread lack of compliance with accessibility guidelines on e-government websites. A related issue is the extent to which e-government sites are using standards-compliant HTML. Standards-compliant HTML is less likely to have accessibility and usability problems and can be rendered appropriately on a wider range of devices, including adaptive technologies and mobile platforms.

We describe two sets of experiments, using a set of common e-government tasks in a range of European countries, to test the accessibility of a sample of national and local e-government websites using the WCAG guidelines [29] and to test their compliance with HTML standards.

The structure of this paper is as follows. Section 2 discusses e-government usability issues and some results of previous work in this area. Section 3 describes the methodology used to measure e-government accessibility and section 4 presents the results of the experiments.

2   Service Usability

For e-government services to be successful, they must be usable and easily accessible to consumers. Government sites, in common with the rest of the Web have become more usable over time [21], with the better use of features by designers, better user understanding of conventions and changes in technology. This trend is being helped by the move to standards-based websites, since the standards incorporate many features that aid usability. However, most government (and other) web pages are not compliant with the standards they claim to be written to [14].

Usability measures used for e-government service evaluations may not measure the features normally associated with usability; for example [28], whose usability component comprises a score for help facilities and for user feedback or comment mechanisms. Work on Jordanian government sites [4] included a set of questions about user customisation of the sites, some of which (e.g. font size) are clear usability and accessibility issues, but others do not seem appropriate for e-government sites (e.g. changing the colour scheme).

The satisfaction ratings for e-government services are generally lower than for commercial services (e.g. internet banking); the satisfaction rating was highest for 'declaring income tax' and lowest were for 'becoming unemployed' and other services which might result in a claim for benefits [28]. Of the EU services users, only 47% had their information or transactional needs met in full. Work on US federal e-government shows similar trends; there is low satisfaction (66%) with e-government services compared with commercial services in all sectors surveyed – only ISPs scored lower [2]. There is considerable variation in satisfaction between services, ranging from 75% to 58%; transactional services generally have lower scores than informational services. However, even for poorly-rated services, the satisfaction with the online service is considerably greater than for the paper-based service.

A widely recognised issue in e-government is the difficulty that many users have in finding information (e.g. [9]), which is organised by department, rather than by function. The restructuring of the e-government landscape to facilitate users' tasks is a significant motivation in the UK for both central and local government adoption of cloud-based services.

Extensive research has been carried out on older peoples' use of the internet. It is apparent that the digital divide is a problem for the level of e-government

use, with the majority of adults who have never accessed the internet being over the age of 65 [20]. Factors such as ethnicity, education level, income and disabilities can also have a significant effect on usage of the internet [7]. The main barrier to internet use is frustration [12], with causes including failing to remember instructions, inability to use the mouse and preferring words to images [26].

Older users are more inclined to use services which they perceive to be useful and easy to use [24] but they are less likely to use financial services due to a perceived lack of online safety. The lack of trust in online services by older people has been widely reported and there has been work on metrics to identify the aspects of sites that influence older peoples' perception of trustworthiness [15]. Projects such as WAI AGE [3] have investigated improving accessibility using first-hand guidance from older people and guidelines for e-government forms have been developed [22]. Attempts to automatically identify usability problems by adaptively enlarging error sites (e.g. misplaced clicks) show comparable results to one-on-one observations of the users [27].

A survey of e-government sites from Europe and Latin America tested usability with the Neilsen heuristics [14], finding that consistency and standards were the main issues. Work on the usability of online government forms for older people has identified major issues with the web paradigm (i.e. many older users do not have an adequate model of the web to be able to search and navigate sites effectively), the lack online help and real-time assistance, form design, the use of technical or legal language, and trust [22]. The needs of some groups of users (e.g. visually impaired) are not adequately covered by WCAG guidelines [8], as their model of processing is substantially different from the majority [5]. Similar lists of critical page-level issues have been identified in other studies (e.g. for US state websites [6], UK local government [19]).

Many e-government sites require high levels of literacy, making them inaccessible to large segments of the population [10]. Kuzma [18] studied the compliance with UK disability law and WCAG of sites of UK members of parliament and found that only 7% of the sites did not have accessibility problems, with the majority of errors caused by missing `alt` tags, by insufficient emphasis on important information, and by complex language.

The results of a survey of US local government portals showed that only a small minority of sites met usability standards and passed an accessibility check [30]. Other studies in Malaysia [16] and Dubai [17] found consistent results. Automatic accessibility checkers were used in both studies to measure levels of compliance with WCAG. The Dubai study also found a weak correlation between the accessibility of a website and its evaluation score, measured using a local scale with human assessments of features.

The case for making routine use of usability evaluations for e-government is strong, as successful services are intimately dependent on their users [25]. The issues of poor service usability and the improvement of heuristic usability approaches for e-government are discussed in a case study three Spanish language sites [14], using the g-Quality approach [11]. Text mining of survey results, using

a topic model shows similar issues [23]. The major common issues relate to navigation difficulties, missing or hidden information, design consistency and standards compliance.

3   Methodology

The first part of this research was to measure the accessibility of national and local e-government websites, by measuring the accessibility and standards-compliance of pages visited when completing a set of 12 common e-government tasks, which are relevant to a large number of users, covering both local and national government activities. The national level pages are the responsibility of the UK government and the local governments tested are a sample from a range of authorities, covering rural areas, large and small cities, with a mix of reasonably affluent and deprived areas. The second part of the research was to compare the accessibility and standardisation of a wider sample of European countries: France, Germany, the Netherlands and Romania. Seven tasks, applicable across most countries, were used for this experiment and results were gathered using the same methodology; Table 1 shows the tasks.

The tasks used for testing UK sites contain a mix of tasks carried out on national sites (e.g. registering a death and finding e-government statistics) and local sites (e.g. searching for a library book and paying a parking fine). Some tasks can be carried out at both a national and local level, for example, applying for a disabled person's parking permit and reporting a change of address. We have based our choice of national tasks on those listed as most common in European surveys and UK data. For local government tasks we have not had comparable sources of data, so we have identified some from surveys and others by discussion with colleagues.

A number of the chosen tasks are not carried out in the same way across different European countries. For example, parking tickets issued in France have a national number, so fines are paid using a national e-government service, as opposed to a local service in the UK. These differences mean it can be difficult to draw definitive comparisons based on individual tasks. It is also difficult to discover which services are most common on local government sites as, unlike with national government, there are very few statistics available.

We measured standards compliance and accessibility. Firstly, the source code of the website was run through the W3C Validator mark-up checker[1] to assess the level of compliance with standards and to discover the version of markup language being used. Secondly, the page was checked using the AChecker accessibility checker [13], using the WCAG 2.0 AA guidelines.

4   Results and Discussion

The results of the survey show that the national government pages had substantially fewer errors and accessibility issues compared to the majority of local

---

[1] http://validator.w3.org

Table 1. Tasks used to test e-government sites

	All countries		UK only
1	Pay parking or speeding fine	8	Search for a library book
2	Register a death	9	Search for an adult education course
3	Send message to an elected representative	10	Apply for a disabled parking permit
4	Report a change of address	11	Report a problem with a road
5	Pay income (or other) tax	12	Find e-government statistics
6	Add child to school/nursery waiting list		
7	Find information on pension entitlement		

government pages in all cases where we could compare them. The various government organisations almost all require their pages to be declared to a standard, which varies from HTML 3.2, through the XHTML standards, to HTML5, and may change between sections of a site; few organisations seem to look for compliance to their chosen standard(s). For each page visited for a task we recorded the number of HTML errors and WCAG accessibility issues reported, then averaging them. Where a task required a login or citizen identification we stopped the task at that page.

For our 12 UK tasks, we found that the national government portal pages (rooted at https://www.gov.uk) use HTML5 and very few HTML errors were found, most of which were low severity. The number of accessibility problems on these pages is also low, and are mostly due to missing alt text on logos. The majority of problems found on these national pages would be simple to fix. We also sampled some of the less frequently used UK national government services[2] and found much greater variation, particularly with older sites that have not been updated for several years.

In general, local government sites performed worse than the national government pages in terms of both HTML errors and accessibility issues. However, pages from larger authorities (Norfolk, Cambridgeshire and North Yorkshire county councils) were generally found to perform better than those of smaller organisations, possibly due to their being able to recruit and retain staff with higher levels of expertise. The London boroughs performed particularly poorly, with little standardisation; this may be a reflection of the longstanding difficulties that London boroughs have in recruiting and retaining professional staff. There appears to be a correlation between the economic status of the area and the numbers of HTML errors and accessibility problems. Less prosperous areas (e.g. Barking & Dagenham and King's Lynn & West Norfolk) had higher levels of HTML errors or accessibility problems whereas more affluent areas which are seen as desirable places to live (e.g.Cambridge) fared better. However, the small sample size does not allow firm conclusions to be drawn.

---

[2] For 2013, 766 UK national e-government services are listed, but data for many is incomplete; see `https://www.gov.uk/performance/transactions-explorer/all-services/by-transactions-per-year/descending`

Some results are skewed due to outliers. Pages created by a third party (e.g. capitadiscovery.co.uk for library searches and eadmissions.org.uk for school admissions) had very high numbers of errors or accessibility issues, increasing the average for those tasks.

As with the national government, most of the errors occurring at a local level are low in severity and would require only minimal changes to fix. One authority in our sample is still using HTML 3.2 – superseded in 1999 – as its main standard. The results from our sample show that most local authorities are not consistent in the standards they use, and that the use of obsolete HTML standards is likely to increase the number of accessibility issues found.

Using a chi-squared test, the degree of difference in the number of errors and accessibility problems of local and national pages is found to be highly significant (alpha=0.01). There is also found to be good correlation between the number of HTML errors and accessibility problems observed across all pages tested (R=0.56, alpha=0.01).

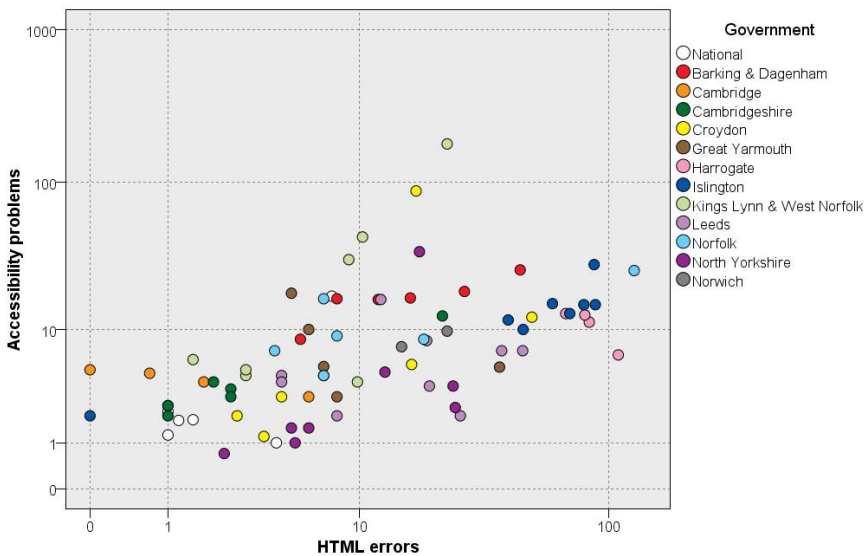The results for the UK tasks are shown in figure 1 and summarised in Appendix A.

Fig. 1. UK results: mean HTML and WCAG errors (log scales)

Differences between e-government services in the UK and elsewhere restricted the number of tasks we could attempt (see results in table 2). In France, six of the seven tasks could be completed. Results were very similar to those from the UK, with national pages consistently having lower numbers of accessibility problems. The high average number of errors in the table for national pages is
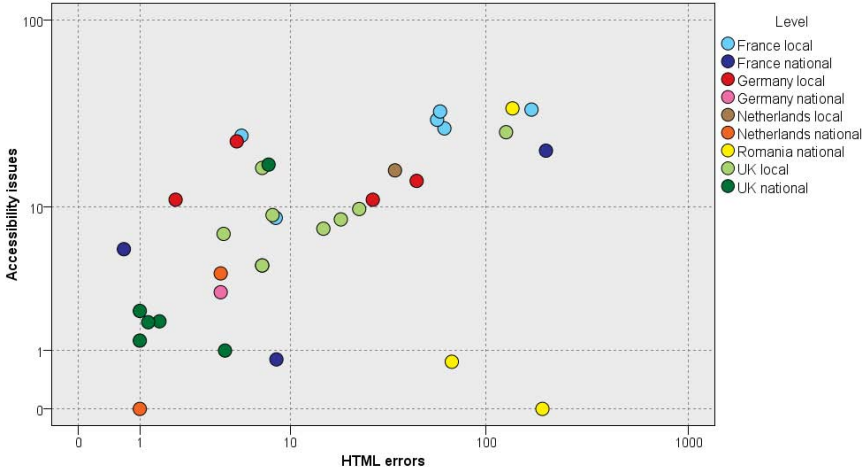
Fig. 2. Europe: mean HTML and WCAG errors (log scales)

Table 2. Results for France, Germany, Romania and the Netherlands

Country	Level	Mean HTML errors	Mean accessibility errors
France	Local	60	26
	National	69	9
The Netherlands	Local	35	16
	National	3	2
Germany	Local	20	15
	National	4	3
Romania	Local	-	-
	National	131	12

due to a single outlier (on impots.gouv.fr). To test the consistency of our local government results, we tried several of the tasks on multiple local government sites in the Rhône-Alpes region. The results suggest that large urban centres (e.g. Grenoble) are likely to have fewest issues, followed by local government authorities, their travel-to-work regions and then by smaller and more isolated authorities.

From the three tasks that we could carry out for Dutch e-government, the local pages had far more issues, whereas the national sites were relatively accessible. Many tasks could not be tested as a login, only available to Dutch residents, is required to access most services.

Most tasks we tested in Germany took place on local sites, all of which had more accessibility problems than national pages. Again, relatively few services were available online, with many pages giving information about how to complete the task by phone or in person. No results were obtained for Romanian local sites as the country is in the early days of e-government provision. Online content

is mostly informational, as opposed to transactional. From the sample tested, the accessibility seems considerably better in Romania, with many of the pages having no problems. However, high numbers of HTML errors were present, most of which were repeated.

Overall, we have found a significant relationship between HTML errors and accessibility issues, and a significant difference in the accessibility and standards compliance of local and national e-government websites.

5   Conclusions and Future Work

We have conducted a task-driven survey of a range of national and local government sites in the UK and other European countries, looking at accessibility and standards compliance. With most citizen-facing sites, it is clear that some effort has been put towards standardisation, with a consistent and current HTML version being used on pages across each level of government.

The results show consistent and significant differences in the performance of local and national sites. Similar patterns of HTML errors and accessibility problems were observed in the French sites, although there were more issues in total. In Germany and the Netherlands, the national pages that we could access without a login had relatively few issues, whereas local pages had many more. The Romanian sites had relatively few accessibility problems.; this may be a result of our sampling or may indicate a latecomer benefit, starting e-government development with a better awareness of accessibility issues.

The diversity in government structures between countries make it more difficult to undertake detailed comparisons and to draw consistent conclusions across all countries tested. Many of the services were either not consistently available online, or were provided in a different way, for example, paying a speeding fine or parking ticket at a national level in France and a local level in the UK.

Currently, the issues discovered are likely to be hindering internet use for older people and those with disabilities, increasing exclusion from e-government services. Despite the large numbers of issues, many of them would be easy to correct. Small but vital steps, such as reducing simple errors in HTML and ensuring `alt` tags are included would increase accessibility and would require little effort. It is clear that the use of a mark-up language validator and accessibility checker for all e-government sites could substantially improve their accessibility for a very modest effort. We also note that the characteristics of websites that aid accessibility also – with few exceptions – improve the experience of mobile versions of sites.

It is clear that many government authorities are not using standard tools for checking the accessibility of their websites, making it unnecessarily difficult for a substantial minority of users, many of whom are likely to be reluctant or lacking in confidence in using e-government services.

We are planning further work to look in more detail at selecting suitable e-government tasks that are relevant across a wide range of countries, investigating the relationship between users' usability experiences and reported issues, and

undertaking larger surveys to establish the range of variation and relationships to other geographical, economic and social factors that may influence governments' migration to online services.

References

1. Digital landscape research (2012), `https://www.gov.uk/government/publications/digital-landscape-research/digital-landscape-research`
2. Acsi federal government report 2013 (2014), `http://www.theacsi.org/news-and-resources/customer-satisfaction-reports/customer-satisfaction-reports-2013/acsi-federal-government-report-2013`
3. Abou-Zahra, S., Brewer, J., Arch, A.: Towards bridging the accessibility needs of people with disabilities and the ageing community. In: Proceedings of the 2008 International Cross-Disciplinary Conference on Web Accessibility (W4A), pp. 83–86. ACM (2008)
4. AlFawwaz, B.M.: Evaluation of egovernment websites usability in Jordan (2012)
5. AlJarallah, K., Chen, R.C.C., AlShathry, O.: Cognitive-based approach for assessing accessibility of e-government websites. In: Stephanidis, C., Antona, M. (eds.) UAHCI 2013, Part II. LNCS, vol. 8010, pp. 547–554. Springer, Heidelberg (2013)
6. Becker, S.A.: E-government usability for older adults. Communications of the ACM 48(2), 102–104 (2005)
7. Bélanger, F., Carter, L.: The impact of the digital divide on e-government use. Communications of the ACM 52(4), 132–135 (2009)
8. Caldwell, B., Chisholm, W., Slatin, J., Vanderheiden, G., White, J.: Web content accessibility guidelines 2.0. W3C working draft 27 (2006)
9. Choudrie, J., Ghinea, G., Songonuga, V.N.: Silver surfers, e-government and the digital divide: An exploratory study of UK local authority websites and older citizens. Interacting with Computers 25(6), 417–442 (2013)
10. Davey, B., Parker, K.R., Lukaitis, A.: e-government and the elderly: A two country comparison. e-Government 8, 6–2011(2011)
11. Garcia, A.C.B., Maciel, C., Pinto, F.B.: A quality inspection method to evaluate E-government sites. In: Wimmer, M.A., Traunmüller, R., Grönlund, Å., Andersen, K.V. (eds.) EGOV 2005. LNCS, vol. 3591, pp. 198–209. Springer, Heidelberg (2005)
12. Gatto, S.L., Tak, S.H.: Computer, internet, and e-mail use among older adults: Benefits and barriers. Educational Gerontology 34(9), 800–811 (2008)
13. Gay, G., Li, C.Q.: AChecker: Open, interactive, customizable, web accessibility checking. In: Proc. Int.Cross Disciplinary Conf. Web Accessibility, W4A 2010, pp. 23:1–23:2. ACM, New York (2010), `http://doi.acm.org/10.1145/1805986.1806019`
14. Granizo, C.J., Yanez, P.L., Ramirez, D.P., Machado, P.C.: Usability in e-government sites. In: 2011 Eighth International Conference on Information Technology: New Generations (ITNG), pp. 453–458. IEEE (2011)

15. Holzinger, A., Searle, G., Kleinberger, T., Seffah, A., Javahery, H.: Investigating usability metrics for the design and development of applications for the elderly. In: Miesenberger, K., Klaus, J., Zagler, W.L., Karshmer, A.I. (eds.) ICCHP 2008. LNCS, vol. 5105, pp. 98–105. Springer, Heidelberg (2008)

16. Isa, W.A.M., Suhami, M.R., Safie, N.I., Semsudin, S.S.: Assessing the usability and accessibility of Malaysia e-government website. American Journal of Economics and Business Administration 3(1), 40 (2011)

17. Kamoun, F., Almourad, M.B.: Accessibility as an integral factor in e-government website evaluation: the case of Dubai e-government. Information Technology & People 27(2), 5 (2014)

18. Kuzma, J.M.: Accessibility design issues with UK e-government sites. Government Information Quarterly 27(2), 141–146 (2010)

19. Lines, L., Ikechi, O., Hone, K.S.: Accessing e-government services: Design requirements for the older user. In: Stephanidis, C. (ed.) Universal Access in HCI, Part III, HCII 2007. LNCS, vol. 4556, pp. 932–940. Springer, Heidelberg (2007)

20. PricewaterhouseCoopers LLP: for digital inclusion: The economic case for digital inclusion (2009),
http://www.parliamentandinternet.org.uk/uploads/Final_report.pdf

21. Loranger, H., Nielsen, J.: Prioritizing Web Usability. New Riders (2006) ISBN-10: 0-321-35031-6

22. Money, A.G., Lines, L., Fernando, S., Elliman, A.D.: e-government online forms: design guidelines for older adults in Europe. Universal Access in the Information Society 10(1), 1–16 (2011)

23. Nariman, D.: Analyzing text-based user feedback in e-government services using topic models. In: IEEE CISIS, pp. 720–725. IEEE Computer Society, Washington, DC (2013), http://dx.doi.org/10.1109/CISIS.2013.129

24. Phang, C.W., Sutanto, J., Kankanhalli, A., Li, Y., Tan, B.C., Teo, H.H.: Senior citizens' acceptance of information systems: A study in the context of e-government services. IEEE Transactions on Engineering Management 53(4), 555–569 (2006)

25. de Róiste, M.: Bringing in the users: The role for usability evaluation in egovernment. Government Information Quarterly 30(4), 441–449 (2013)

26. Sayago, S., Blat, J.: About the relevance of accessibility barriers in the everyday interactions of older people with the web. In: Proceedings of the 2009 International Cross-Disciplinary Conference on Web Accessibililty (W4A), pp. 104–113. ACM (2009)

27. Taylor Sr., A., Miller, L., Nilakanta, S., Sander, J., Mitra, S., Sharda, A., Chama, B.: An error detection strategy for improving web accessibility for older adults. International Journal on Advances in Intelligent Systems 6(3 and 4), 376–393 (2013)

28. Tinholt, D., Colclough, G., Oudmaijer, S., Carrara, W., Tol, T., Schouten, M., van der Linden, N., Cattaneo, G., Aguzzi, S., Jacquet, L., Kerschot, H., van Gompel, R., Steyaert, J., Millard, J., Schindler, R.: Public services online: Digital by default or by detour (2013), doi:10.2759/13072

29. W3C: Web content accessibility guidelines (wcag) 2.0 (2008),
http://www.w3.org/TR/WCAG20/

30. Youngblood, N.E., Youngblood, S.A.: User experience and accessibility: An analysis of county web portals. Journal of Usability Studies 9(1), 25–41 (2013)

Appendix A: Results for the UK Tasks across a Number of Government Authorities

Government	Standards observed	Mean HTML errors	Mean accessibility errors
National	HTML5, HTML 4.01 Transitional, HTML 4.01 Strict	3.01	4.69
Norfolk	XHTML 1.0 Transitional, HTML 4.01 Transitional	25.35	10.82
Norwich	XHTML 1.0 Transitional	19	8.63
Great Yarmouth	HTML 5, XHTML 1.0 Transitional, HTML 4.01 Transitional	12.65	8.31
King's Lynn & West Norfolk	HTML 5, XHTML 1.0 Transitional, HTML 4.01 Transitional, HTML 3.2	8.51	38.9
Cambridge	HTML 5, XHTML 1.0 Transitional, HTML 4.01 Transitional	2.11	4.18
Cambridgeshire	HTML 5, XHTML 1.0 Transitional, XHTML 1.0 Strict	4.57	4.29
Leeds	HTML 5, XHTML 1.0 Transitional, XHTML 1.0 Strict	19.76	6.09
Harrogate	XHTML 1.0 Transitional, XHTML 1.0 Strict, HTML 4.01 Transitional	85.43	10.88
North Yorkshire	XHTML 1.1, HTML 5, XHTML 1.0 Strict, HTML 4.01 Strict, XHTML 1.0 Transitional	12.27	6.26
Islington	HTML 5, XHTML 1.0 Strict, XHTML 1.0 Transitional	59.21	13.78
Barking & Dagenham	XHTML 1.0 Transitional	18.97	17.08
Croydon	XHTML 1.0 Strict, XHTML 1.0 Transitional, HTML 4.01 Transitional	15.77	18.59