

# Website Navigation Tools – A Decade of Design Trends 2002 to 2011

Chris J Pilgrim

Centre for Computing and Engineering Software Systems, Faculty of ICT  
Swinburne University of Technology  
PO Box 218, Hawthorn, 3122, Victoria

cpilgrim@swin.edu.au

## Abstract

The World Wide Web Consortium describes the Web as “the universe of network-accessible information, the embodiment of human knowledge” (W3C, 2011). This vision of the Web is contingent on the ability of users to freely access and contribute to the overall system. The freedom of the Web threatens its own future due to the possibility of users being disoriented and cognitively fatigued when trying to locate desired information. Appropriate support for navigation is required if the Web is to achieve its vision.

One challenge confronting website designers is to provide effective navigational support at the local level. Supplemental navigation tools such as search, sitemap and index tools are frequently included on websites to support navigation. However, there is a lack of detailed guidelines for design of such tools. Instead changes in design appear to be by natural evolution with a ‘survival of the fittest’ approach.

This paper reports on a longitudinal survey of design of website navigation tools within commercial websites over the past decade. The survey exposes several trends in design practice, particularly in recent years. The intention of this survey is to provide a sounder basis for future research and development of website navigation tools by clarifying existing research and identifying important issues for future investigation.

**Keywords:** Website design, navigation tools, search, sitemaps, indexes.

## 1 Introduction

Web navigation is a two-stage process involving initially finding a website that relates to an area of interest, and then secondly, locating the information within the individual website. The initial stage of navigation generally uses global search tools (Nielsen 2000) that provide users with a list of candidate websites. The second stage of navigation involves users navigating through individual websites using a combination of both local search tools and page-to-page browsing (Katz and Byrne, 2003).

The navigation tools that are available to the user at the local level include the functions that are provided by

the browser software and those that are incorporated into the website by the developer of the site.

Web browsers generally only include limited navigation tools such as back and forward buttons, history lists, bookmarks, colour coding indicating visited/unvisited links, the home button and the URL field. These methods present navigational choices to the user, utilising the self as the frame of reference. This ‘inside-out’ view of the information space is a result of the Web being a ‘page-oriented’ hypertext-based system. Browsers typically provide no feedback about the context of the currently displayed page within the total information space, nor do they provide any alternative views of the site being visited. Users, when lost, will attempt to find their way back to a previously visited page, resulting in inappropriate use of the Back button (Cockburn et al., 2003) and reluctance to explore further (Ayers & Stasko, 1995). Browser software does not provide the facilities to visualise the inter-relationships between pages, preventing users from answering questions such as ‘Where am I?’, ‘Where can I go from here?’ or ‘Which pages point to this page?’ (Bieber et al., 1997). This lack of knowledge of the overall structure of the site can result in confusion and cognitive overload when users jump from one location to another in the Web (Mukherjea and Foley, 1995), or encounter multiple paths to the same or different endpoints (Hedberg and Harper, 1992). The lack of location information can result in a condition that Jul and Furnas (1998) describe as “desert fog”, where a navigator is in a situation where the immediate environment is totally devoid of navigational clues that might be useful to the traveller.

Website navigation tools are included in websites by developers to assist users in achieving orientation and moving in a website towards a desired target. The three most common website navigation tools are search tools, sitemaps and indexes.

Website search tools allow users to search the current site for those pages that match to a desired search string. These tools generally provide users with a ranked list of page that match the search criteria.

Sitemaps are a visual representation of the architecture of a website providing users with either an overview of the major headings of the content or a view of the physical structure of the site. Sitemaps may be considered similar to the table-of-contents of a book by providing a list of the major categories of information (i.e. chapters) and their subsections. Sitemaps improve spatial context, reduce disorientation and support users when they are attempting to initially orient themselves in a website (Shneiderman, 1997).

Whilst sitemaps may be considered similar to a table-of-contents provided at the front of a book, it may be presumed that an index of a website would be presented as an alphabetical list of the contents of the site.

Usability problems relating to the lack of a global navigation structure and inadequate locational feedback from browsers are compounded by the desire for flexibility of access and control and the vast size of the Web. As a consequence of these factors, users are prone to suffer from disorientation and cognitive overhead whilst navigating the Web.

Disorientation within websites is a problem that may never be solved but it may be alleviated through the provision of aids and tools that minimise the cognitive load of the task of navigating. Interfaces and tools that support the navigation through websites need to be designed with due consideration to the nature of the navigational problems, and supported with a strong theoretical and empirical background. It is only through a considered design process that appropriate navigation aids will be developed which are sensitive to the context of the site, reducing cognitive overhead and disorientation in users (Ahuja and Webster, 2001). This paper reviews design guidelines for website navigation tools and then reports on a survey of design practices over the past decade in order to identify emerging trends and patterns. The identification of any trends in design practice will provide a sounder basis for future research and development to improve website navigation tools.

## 2 Website Navigation Tool Design Guidelines

Design guidelines provide a framework that guide designers towards making sound decisions (Preece et al., 1994) and hence are essential to designers and developers who under the pressure of budgets and timelines cannot afford to empirically test every design feature that they implement. Design guidelines are particularly important in the development of websites since the nature of the Web means that it can be difficult to access a target user group for usability tests.

Since the inception of the Web there has evolved a range of website navigation tools with a variety of visual properties and functional abilities. Xu et al. (2001) reports that “although there are many visualisation and web navigation tools, design guidelines for such navigation visualisation systems are rarely reported”.

There are two kinds of guidelines: high-level guiding principles and low-level detailed rules. A common criticism of user interface design guidelines is that the advice that is provided is either too general so that it is difficult to apply to a specific case, or too specific and cannot be widely applied (Beier and Vaughan, 2003). Current web design guidelines appear to either lack any reference to or only provide limited high-level advice regarding the design of navigation tools such as search, sitemaps and indexes.

For example, the “Web Style Guide” (Lynch and Horton, 2009) is a well known set of Web design guidelines. The third edition of these guidelines has some advice regarding the design of site search tools however the guidelines do not appear to mention sitemaps or indexes at all. The previous second edition of these guidelines did provide some limited advice regarding

the design of table-of-contents pages and sitemaps tools however these sections have been removed in the most recent edition.

The “Web Design and Usability Guidelines” (HHS, 2006) also provide reasonable advice regarding the design of search tools however the advice regarding sitemaps is limited to the following: “Use site maps for Websites that have many pages. Site maps provide an overview of the Website. They may display the hierarchy of the Website, may be designed to resemble a traditional table of contents, or may be a simple index.”

The UsabilityNet (UsabilityNet, 2006) guidelines contain little more than the following statements regarding search and sitemap tools: “On larger sites consider providing a search facility - many users habitually use search rather than exploring a site” and “Provide a sitemap or overview - this helps users understand the scope of the site.”

The Australian Government Information Management Office (AGIMO, 2011) provide a range of “Better Practice Checklists” to inform Web design practice for Australian Government websites. The checklist for Website Navigation includes the following advice regarding provision of options for finding information: “Because users approach information on a website differently, agencies should provide users with a variety of ways to get to information. Examples include: embedded links, a sitemap giving an overall view of the site, A-Z indexes and a search facility” (AGIMO, 2011). The AGIMO site also contains a description of the most common navigation tool types, including “supplemental navigation which comprises additional navigation tools such as sitemaps, indexes and guides.” Apart from this general advice, there are no specific guidelines or advice regarding the design or development of each type of tool.

This lack of specific advice regarding the design of website navigation tools has left design practice open to evolutionary change possibly with a survival of the fittest approach. This intention of the longitudinal survey of website navigation tools is to provide a comprehensive overview of the current design practices of website navigation tools.

## 3 Survey Methodology

A longitudinal survey has been conducted to examine the trends in the design and implementation of website navigation tools in the websites of large commercial companies over the past decade. An initial survey was conducted in 2002 extending an approach utilised by Russell (2002). The survey was repeated in October 2006 and again most recently in July 2011. The survey methodology examined the websites of the top 300 companies in the Fortune top companies list. The 2002 survey reported on 299 websites as one site was not available during the survey period. The 2006 survey examined the exact same sites as those surveyed in 2002 and reported on 297 websites with three sites having closed down since 2002. The most recent 2011 survey again examined the same set of websites and reported on 266 websites. In the 2011 survey there were 31 websites that had either closed down or had been taken over by a different company since the 2006 survey. It is assumed that the recent global financial crisis may have

been responsible for many of these closures or take-overs as many of the sites that had become unavailable related to financial institutions.

The survey method used a taxonomy checklist reported on previously that systematically evaluated the presence and general design features of each type of navigation tool (search, sitemap, index). The results of the surveys are presented in Tables 1, 2 and 3.

## 4 Results

### 4.1 Search Tools

Table 1 shows a steady increase in the provision of site search tools into the surveyed websites over the past decade. In the 2011 study there were 83.8% of the sites surveyed that provided a search tool. Between 2006 and 2011 there were 41 companies that added a search tool to their website and 11 companies which removed a search tool indicating some decision making regarding the value of a search tool. One significant change that has occurred over the survey period is the method of providing a search tool. In 2002, 32% of the sites provided a 'Search' link which had to be clicked in order to display a page containing a text entry box. In 2011 only 8.1% of the sites provided a link with the overwhelming majority providing a text entry box as part of the general website template avoiding the need for users to open a dedicated 'search' page.

|                                 | 2002<br>N<br>(%) | 2006<br>N<br>(%) | 2011<br>N<br>(%) |
|---------------------------------|------------------|------------------|------------------|
| Number of sites                 | 299              | 297              | 266              |
| Search tool is present          | 206<br>(68.9)    | 226<br>(76.1)    | 223<br>(83.8)    |
| Link to search (not search box) | 66<br>(32.0)     | 40<br>(17.7)     | 18<br>(8.1)      |

**Table 1 Search Tools**

### 4.2 Sitemap Tools

The survey results for 2011 as shown in Table 2 show a considerable increase in the number of websites in the sample group that provided a sitemap tool (65.6%). The number of websites in the sample group providing a sitemap had previously been stable with survey showing 51.2% in 2006 and 52.8% in 2002 and Russell (2002) reporting 54% in 1999. It was noted that between 2006 and 2011 there were 65 companies that added a sitemap tool to their website and 38 companies which removed their sitemap indicating some decision making regarding the value of a sitemap tool.

All sitemaps in the 2011 survey were found to use a categorical approach to organising the various entries in the sitemap. There was only one website that provided an option to change the categorical display into an alphabetic list of topics. The general structure of all websites in the 2011 survey was hierarchical with no websites using network-based structures. One website did implement a graphical approach to displaying levels in the hierarchy (General Design Type D) with lines providing a visual

connection between the various levels. There has been a decline in the use of graphical/network based formats with Russell (2002) reported that 11% of sitemaps that were surveyed in 1999 displayed a graphical depiction of the site.

There now appears to be more of an even divide between those sitemaps that visually distinguish the levels in the hierarchy through the use of indenting (51.7% General Design Type A) compared with those that use a table-of-contents style to set up hierarchical levels (47.7% General Design Type B).

|                      |                                                                                             | 2002<br>N<br>(%)                                                                                                                                                                                            | 2006<br>N<br>(%) | 2011<br>N<br>(%) |
|----------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| Number of sites      |                                                                                             | 299                                                                                                                                                                                                         | 297              | 266              |
| Sitemap available    |                                                                                             | 158<br>(52.8)                                                                                                                                                                                               | 152<br>(51.2)    | 172<br>(65.6)    |
| Organisation         | Alpha                                                                                       | 0<br>(0)                                                                                                                                                                                                    | 4<br>(0.03)      | 0<br>(0)         |
|                      | Categories                                                                                  | 158<br>(100)                                                                                                                                                                                                | 148<br>(97.3)    | 172<br>(100)     |
| Structure            | Hierarchy                                                                                   | 158<br>(100)                                                                                                                                                                                                | 148<br>(97.3)    | 172<br>(100)     |
|                      | Network                                                                                     | 0<br>(0)                                                                                                                                                                                                    | 4<br>(0.03)      | 0<br>(0)         |
| Levels               |                                                                                             | Number of initial levels (% of sites)<br>2002: 1L = 16%, 2L = 47%,<br>3L = 33%, 4L = 3%, 6L = 1%<br>2006: 1L = 2%, 2L = 38%,<br>3L = 53%, 4L = 6%, 6L = 1%<br>2011: 1L = 5%, 2L = 47%,<br>3L = 42%, 4L = 6% |                  |                  |
| Interactive features |                                                                                             | 2<br>(1.2)                                                                                                                                                                                                  | 5<br>(3.3)       | 10<br>(5.8)      |
| Size                 | Scrolling required                                                                          | 114<br>(72.2)                                                                                                                                                                                               | 132<br>(86.8)    | 117<br>(68.0)    |
| General Design       | A:<br> | 61<br>(38.6)                                                                                                                                                                                                | 95<br>(62.5)     | 89<br>(51.7)     |
|                      | B:<br> | 91<br>(57.6)                                                                                                                                                                                                | 55<br>(37.5)     | 82<br>(47.7)     |
|                      | C:<br> | 4<br>(0.3)                                                                                                                                                                                                  | 0<br>(0)         | 0<br>(0)         |
|                      | D:<br> | 2<br>(0.1)                                                                                                                                                                                                  | 0<br>(0)         | 1<br>(0.06)      |

**Table 2 Sitemaps**

The results suggest that the sitemaps in 2011 have become more complex and crowded. The number of sitemaps that can be viewed on a standard resolution

screen (1024x768) has increased to 32% up from 13.2% in 2006 whilst the number of levels in the hierarchy has remained approximately the same. This change may be perceived to be beneficial to the users since a requirement to scrolling to view a single view can cause the user to perform sub-optimally (Beard and Walker, 1990).

One of the most interesting trends that has been observed over the period of the survey is the increased use of interactive controls in sitemaps. Interactive controls generally provide the ability for the user to expand and contract sections of the sitemap in order to control the extent of detail within the current view. In 2002 there were only two websites that provided interactive controls. This increased to 5 websites in 2006 and a total of 10 websites in 2011.

An additional trend that has developed in the most recent 2011 survey is the inclusion of a sitemap style navigation bar located on the bottom of the general website template. This display is generally available on every page within the website. In 2011 there were 25 websites (9.4%) in the sample which had adopted this practice.

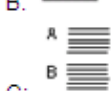
|                         |                                                                                           | 2002<br>N<br>(%) | 2006<br>N<br>(%) | 2011<br>N<br>(%) |
|-------------------------|-------------------------------------------------------------------------------------------|------------------|------------------|------------------|
| Number of sites         |                                                                                           | 299              | 297              | 266              |
| Site Index is available |                                                                                           | 22<br>(7.3)      | 17<br>(5.7)      | 6<br>(2.2)       |
| Organisa-<br>tion       | Alpha                                                                                     | 3<br>(13.6)      | 5<br>(29.4)      | 0<br>(0)         |
|                         | Categories                                                                                | 19<br>(86.4)     | 12<br>(7.1)      | 6<br>(100)       |
| Interactive features    |                                                                                           | 0<br>(0)         | 0<br>(0)         | 0<br>(0)         |
| Size                    | Scrolling<br>required                                                                     | 18<br>(81.8)     | 15<br>(88.2)     | 4<br>(66.6)      |
| General<br>Design:      | A:<br> | 2<br>(9.0)       | 4<br>(23.5)      | 0<br>(0)         |
|                         | B:<br> | 1<br>(4.5)       | 1<br>(5.9)       | 0<br>(0)         |
|                         | C:<br> | 1<br>(4.5)       | 1<br>(5.9)       | 0<br>(0)         |
|                         | D:<br> | 18<br>(82.0)     | 11<br>(64.7)     | 6<br>(100)       |

Table 3 Site Indexes

### 4.3 Index Tools

The provision of a link entitled 'Site Index' or 'Index' on the surveyed websites has reduced substantially over the survey period. In 2002 a total of 22 websites provided a site index tool reducing to 17 websites in 2006 and finally only 6 websites in 2011. Between 2006 and 2011 there were 15 companies that removed an index tool from their website whilst only one company added an index tool. In

the previous surveys some of the site index tools actually presented the index as an alphabetical list of the site contents. In 2011 all of the available index tools presented a categorical list which was structured similar to a standard sitemap (General Design Type D). No site provided links to both a sitemap and a site index.

## 5 Discussion

The finding that there has been an increase in the inclusion of site search tools into major commercial websites over the past decade is not surprising. There has been strong advice in various design guidelines which recommend that site search tools be available on every page within a website. It is also reported that users have a strong preference for a text entry box rather than a link to search (Nielsen, 2001).

The survey found that not only had the use of index tools reduced substantially over the survey period, but all remaining index pages use a categorical structure rather than the expected alphabetical list of contents. The decline in the use of index tools appears to have been countered by an increase in sitemap tools.

The surveys have established that there has been a surge in the past five years in the number of websites in the sample group that now provide a sitemap tool. There also appears to be more consistency in the general design of sitemap tools with the vast majority of sitemaps being organised as a hierarchical list of the categories of content in the website either using indenting or columns to identify the sections and/or levels in the hierarchy.

The surveys have highlighted several trends in the design of sitemaps in major commercial websites.

### 5.1 Trend One: Textual Formats for Sitemaps

The first trend relates to the adoption of textual forms of sitemaps with a rejection of graphical structures.

Early sitemaps inherited their design influences from navigational tools developed for pre-web hypertext systems. The non-linearity of hypertext systems resulted in some new usability problems particularly in relation to disorientation and cognitive overhead (Conklin, 1987). Several novel navigational aids were developed to overcome the 'Lost in Hyperspace' challenges of hypertext structures. One innovation was the development of the 'Overview Diagram' which provided a graphical representation of the system topology. Conklin (1987) claimed that overviews provided "important measures of contextual and spatial cues to supplement the user's model of the nodes he is viewing, and how they are related to each other and their neighbours in the graph". Cockburn and Jones (1997) suggest that disorientation is alleviated through the provision of graphical overviews as they not only help users maintain a sense of context within an information space, but also reduce cognitive overhead by providing an external representation of the user's memory of their navigation session.

The design of sitemaps in the early years of the World Wide Web adopted the graphical formats found in previous hypertext systems. Rosenfeld and Merville (1998) defined sitemaps as a "graphical representation of the architecture of a website" and maintained that a sitemap should provide a view of the site in a way that

goes beyond textual representation. One of the most classical examples of an early graphical sitemap is the Apple sitemap in the mid 1990s (Figure 1) which has been replaced by various textual versions over the past decade.



**Figure 1: Graphical Sitemap (mid 1990s)**

Whilst graphical or metaphorical styles of sitemap designs may have aesthetic appeal, there is the risk that users will find these designs difficult to immediately comprehend if they are overly large or complex (Bieber et al., 1997).

The survey has established that there is a clear trend away from previous graphical designs towards textual formats. Whilst there has been some pre-Web research into textual versus graphical formats for hypertext overview maps McDonald and Stevenson (1997), the current trend in the design of website sitemaps appears to lack a research basis and may simply be a result of natural evolution with a ‘survival of the fittest’ approach. One explanation is that textual formats provide users with a familiar ‘table-of-contents’ structure from our experience with books (Hoffman, 1996).

## 5.2 Trend Two: Interactive Controls

A second emerging trend relates to the moderate increase in the number of websites in the survey group that now incorporate a sitemap with some interactive controls.

Maps of physical space do not attempt to display every feature of the area being mapped true to scale, as this would result in maps that are impossible to read (Davidson, 2003). Hence, mapping is a process of the application of symbols and abstractions in order to control the complexity of the view presented to the user. Mapping virtual spaces such as websites draws on this experience, and visualisation techniques are commonly applied in order to provide an integrated view of the context and detail in a single view.

Designers of sitemaps must decide on the level of detail to be provided, with a trade-off between providing a complete view of the entire site contents with the risk that users will get lost in the detail, or providing a narrow view which may limit the opportunity for users to gain detailed information (Danielson, 2002).

Visualisation techniques may be used to control the complexity of the view presented to the user but still allowing exploration of lower levels. There are various techniques that may be applied including global and local views, zooming controls and fish-eye views to provide varying levels of detail.

The balance between presenting local detail and global structure in maps of information spaces has been a major theme in visualisation research. Hornbæk and Frøkjær (2001), in an experiment comparing three types of interfaces, found that an ‘overview+detail’ interface supported navigation and helped users to gain an overview of the structure of the document space. Shneiderman (1997) proposed a Visual Information Seeking strategy which involved three steps: overview first, zoom and filter, then details-on-demand. Sifer and Liechti (1999) stated that context can be maintained by providing a distortion or ‘focus plus context’ view. In an empirical study Pirelli et al. (2001) found that an integrated focus-plus-context view of an information space increased search speeds claiming that the overview provided cues that improved the probability that users would search in the right part of the space.



**Figure 2: Interactive Sitemap Using Expand/Contract Controls (from 2011 survey)**

The 2011 survey found two general approaches to providing interactive controls to allow the user to manage the extent of the detail within the sitemap. Four sites implemented an approach similar to that in Figure 2 which allowed the user to expand or contract sections of the sitemap.



**Figure 3: Interactive Sitemap Using Filter Links (from 2011 survey)**

Six websites in the 2011 survey contained sitemaps such as that shown in Figure 3 that included several section headings at the top of the sitemap that could be selected by the user to control the current sitemap view effectively acting as a filter.

## 5.3 Trend 3: A Sitemap on Every Page

The final trend relates to the increasing number of websites in the sample group that have implemented a general page template that includes a sitemap styled tool at the bottom of every page on the website. For example, the tabular display at the bottom of the website in Figure

4 provides users with a hierarchical view of the major categories of content on the website. This display is available on every page within the website effectively providing users with a constantly visible sitemap.

Danielson (2002) investigated the effects on user behaviour of having a constantly visible sitemap implemented as a text-based contents list in a separate frame in the window. An analysis of click-stream behaviour of subjects, including number of pages visited, revisits, back actions and distal jumps, found that the availability of a constantly visible sitemap resulted in users abandoning fewer information seeking tasks, less use of the browser's Back button, and frequent navigational movements across the site hierarchy.

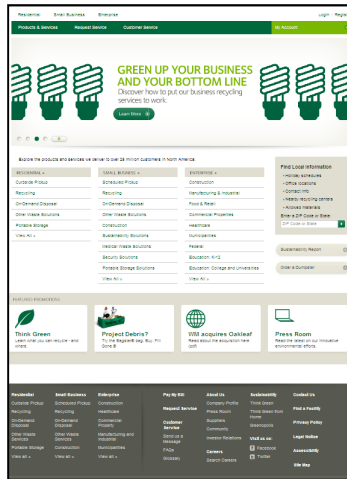


**Figure 4: Constantly Visible Sitemaps (from 2011 survey)**

Yip (2004) examined five different sitemap conditions which varied on constancy of visibility, incorporation of hyperlinks and a no-sitemap condition. Measures of task success, completion times and numbers of nodes visited provided results that suggested that constantly visible sitemaps increased performance especially for large websites.

## 6 Conclusion

The results of the longitudinal survey expose several trends in design practices for website navigation tools over the past decade. Emerging trends include the increasing use of textual formats and interactivity in sitemaps and the provision of sitemaps on every page of the website. Such trends don't appear to be supported by published empirical research or design guidelines but rather may be examples of evolutionary design by 'natural selection'.

This paper provides website developers with an understanding of the critical design factors and recent trends regarding the design of website navigational tools. Further research is required to examine whether there is an empirical justification for the recent design trends in order to provide developers with more confidence in their selection of website usability guidelines.

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