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Designing Effective Websites: Lending Structure to a Chaotic Process

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Abstract

This paper explores some of the issues in the design and development of websites. The term website is used to refer to a family of web pages devoted to a common theme, typically hosted on a single server. It outlines the major issues that demand attention in the assembly of effective websites. While the emphasis of this paper is in macro-level design, it is important to realize that significant attention is necessary for the micro-level design of pages that comprise a website. However, given the vast amount of material on this subject, this aspect of website design will be downplayed in this paper.

Introduction

The World Wide Web has fundamentally altered the way in which information is disseminated both at individual and organization levels. It has been the driving force for the spread of Internet technologies, and is growing at a phenomenal rate, with thousands of new sites springing up every day. While most early offerings were of the billboard variety, i.e. geared to provide some basic information about an individual or an organization, many websites are now relatively sophisticated, and provide an alternative vehicle for day-to-day transactions. While there are formal methods for developing hypertext applications [2], the vast majority of websites fail to effectively use these principles. Given the pressures to develop usable websites quickly, it is not surprising that formal approaches are not adopted. Nonetheless, for these sites to be effective, some thought about the design is necessary. This paper seeks to provide the beginnings of a usable approach for developing websites. It adopts a macro-level design focus. The micro-level design issues are shaped primarily by advancing technology, and will perennially be subject to constant revision and update.

Key Macro Design Parameters

As with any information system, the design of a website should center on the audience (users), the task, and the technology [1]. While this may appear obvious, it is surprising how little attention is paid to these in the assembly of most websites. The design needs to address several dimensions, including structure, layout, and access. These in turn will have implications for web page construction, validation, and maintenance, as illustrated in Figure 1.

Unlike traditional information systems, which assume a known user, support a well-defined task, and employ a set of familiar technology, web-based information systems may involve an entire universe of users, may seek to provide support for several tasks, and frequently employ a mix of technologies – some controlled (at the server side) and others unspecified (at the client side). This adds significant complexity to the design of effective websites, and given the lack of formal methods in the area, rendering them prone to problematic design. Nonetheless, some guidelines can be developed, thereby lending structure to the process.

User Considerations

Principle I: Know the User

Every website has a universe of potential users – anyone equipped with a browser. The availability of sophisticated search engines and cataloging services only serves to widen the net of potential users. Good websites, however, will have a well-defined target audience.

Commercial sites target existing and potential customers, educational sites may support potential and current students and faculty/staff, etc. Without a well-defined set of users, a website is likely to be ineffective in its goal – providing limited information and functionality, and thereby frustrating its users. Identifying the set of target users is critical for successful websites, an extension of standard usability principles [6]. Characteristics of interest about the user that are relevant to design include Internet literacy, access to Internet services, and native language, among others. As a general rule, each class of user will be characterized by significant variance on each dimension. While there is may be a preference to accommodate all potential users, the use of a lowest common denominator approach will inevitably frustrate more sophisticated users, as well as restrict
functionality considerably. Instead a middle ground approach that accommodates most users is advocated. Thus, Internet banking, though desirable may not be appropriate for all customers of a bank.

Frequently, a website may cater to multiple classes of users, e.g. existing and potential customers. In some cases, there may be little overlap between the support for each user class – potential and existing students at a University serve as a good example. The former are interested in application processes, costs, program content, etc., while the latter are more concerned with schedules, activities, and the like. Partitioning the website to cater to each user class may be appropriate, with suitable cross-links where necessary. In other cases, there is considerable overlap between the support that is to be provided to each user class, e.g. websites for computer products for new and existing customers. In this case, structuring the website around the task may be more appropriate.

**Task Considerations**

*Principle II: Know Their Needs*

While there is an understandable tendency to throw everything including the kitchen sink on a website, since the apparent cost is minimal, this approach has some serious repercussions. First, it makes structuring and hence navigation much more difficult. Second, it complicates the maintenance and overhaul process considerably. With a well-defined set of users, it becomes considerably easier to determine the types of user tasks that will be supported via the website. As in most requirements definition exercises, there may be a hierarchy of needs, some more pressing than others. Unlike traditional information systems, adding task functionality to a website is generally a simpler process. Functionality can be grown over time, in a planned and organized manner.

The task set selected will have considerable implications for the structure of the website. While a hierarchical strategy is generally preferred to facilitate navigation, large websites with hundreds of pages may frustrate users, particularly if access is slow or expensive. Alternative navigation feature, including local search capabilities may need to be incorporated. Static information dissemination tasks have implications only for website structure and layout. Dynamic information dissemination, e.g. checking up bank balances, or looking up weekly schedules, involve additional technological design considerations, including interfaces to a database, as well as considerations about privacy of the information being relayed. Transaction processing tasks may require the use of secure sessions, in addition.

**Technology Considerations**

*Principle III: Know Their Limitations*

Despite the increasing sophistication of desktop computers, the threshold to access and use the Internet is relatively low. A connection to an Internet service provider and a text interface represent the minimal requirements. However, the range of capabilities at the client end vary considerably. These include the browser used (ranging from text-based systems to sophisticated programs with multimedia capabilities), the desktop processing capability, and the bandwidth of the connection.

As with the case of the user dimension, the designer has several choices to accommodate this range. While it is possible to design at the lowest common denominator level, this will most surely rob the website of some of its appeal and functionality. Instead, website designers should consider multiple versions as alternatives for users with different technological capabilities. While browser wars currently rage and will continue to do so for a while, it is clearly desirable to accommodate as many users through the avoidance of browser specific capabilities [3]. The use of sophisticated plug-ins also serves as a deterrent, particularly if the effort on the part of the user to properly utilize this feature is substantial. Bandwidth considerations should also guide the design, particularly in terms of creation of long pages, large graphics, or attachments. Technological choices at the server end will also have an impact on bandwidth. The operational performance of a website with the available technology needs to be carefully assessed, for possible inclusion or removal of specific task functionality.

**Micro Design Issues**

These focus primarily on the design of individual web pages at a website. There are a number of good design tips available in this area [4, 5, 7]. These cover issues such as page size (a judicious balance between few very long pages and too many tiny pages), layout, content, navigation (other than browser controls), and the use of special features. The gamut of special features include imagemaps (which could be slow for server side implementations), tables (for aesthetic formatting or display of tabular data), frames (which appear to have little consistency across browsers), plug-ins (another area of inconsistent support), and Java applets (which may not be supported at the client end), among others. The use of standards for HTML [8], as well as style sheets [9] will facilitate the accessibility and usability of individual web pages.

**Follow-Up Issues**

Construction, validation, and maintenance represent a major effort in website implementation. Several tools are currently available to create individual web pages and entire websites. In addition, most desktop application packages permit export in HTML format, albeit in fairly rudimentary form in many cases. Nonetheless, the effort required for creative page construction
cannot be understated. It appears convenient to simply reuse creations from other web pages (with or without permission or due credit). However, custom images, multiple color schemes, all demand sizeable investment in time and effort.

Validation of individual web pages remains an issue that is rarely addressed in many cases. It requires some effort, and may not always be viewed as productive use of developer resources. At the implementation level, pages need to be checked for HTML syntax, correct (and live) links, and comparability of results across different browsers. In addition, pages need to be validated for content, including accuracy, currency, spelling errors, grammatical errors, and poor formatting. A growing set of tools and services is available for validation of web pages, and though they reduce the validation effort considerably, their adoption and sustained use is still not readily apparent.

Maintenance represents one of the more insidious problems with websites. Unlike traditional information systems that need to change in response to different user needs or external mandates, the dynamic nature of information on websites demands continual attention to ensuring currency of its content. Growth of the website should be planned for in its design structure. Additionally, there will be periodic overhauls of the entire website design, reflecting changes in the three macro-design dimensions, coupled with the need to accommodate newer capabilities afforded by browsers and related web technologies.

**Conclusion**

This paper has sought to provide some structure to the design of effective websites – outlining issues at both macro and micro levels. The vast majority of websites often fail to measure up in terms of overall accessibility and utility. Ironically, some of the best examples of successful websites are embodied by the money-making ventures on the Internet – they have identified a specific user, provide services commensurate to their needs, and have generally employed technology that best delivers the services advertised, as evidenced by their popularity.

**References**


Note: All web references are subject to change.