

Title: Usability Patterns for Applications on the World Wide Web

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Introduction

The World Wide Web (WWW) has dramatically changed the look and feel of graphical user interfaces (GUI), sometimes for the better, sometimes to the user's detriment. There are solutions to the usability problems introduced by the web. This paper presents an initial collection of patterns that describe these solutions.

A leading usability expert, Jakob Nielsen, enjoys pointing out that there are millions of web sites and millions of web pages, and only thousands of usability engineers and user interface designers. [Nielsen99a] These patterns and others like them endeavor to establish helpful guidelines for developers to improve usability for their users. By satisfying users' expectations, productivity is improved and the users' enjoyment is enhanced.

These patterns document the human factors implications of frequently used interface elements for applications deployed over the web. Web applications differ from simple web sites in complexity. Web sites just require the user to submit information for navigation. The WWW pages of many newspapers are typical examples of web sites. Web applications require a much broader range of user input. For example, e-commerce sites, web-enabled mainframe applications and message boards are all examples of web applications. Some WWW pages combine the elements of both a web site and a web application, for example a collection of content pages combined with a registration function. The patterns in this paper focus on the context of web applications.

We believe patterns can be particularly valuable in this domain. Web application development often involves the collaboration of skilled information technology professionals with widely varying backgrounds and terminology. An example of the diversity can be found in vocabulary. For example the concept of *design* to a graphic artist is very different than the concept of *design* to a software engineer. Usability is a critical success factor for successful web applications. Patterns can provide a language for communicating usability concerns among these diverse participants in the development process without hindering the creative elements of web development.

Some work in patterns and usability has been published. For example, there are some patterns describing user interface issues for broad contexts that cover web development as part of a broader discussion. [Tidwell98] Some patterns address usability in the context of client-server development. [Bradac97][Tullis97] Others have described patterns on how to implement user interfaces. [Harrison97] [Coldeway98] However, there have only been a few efforts to date that focus on usability and the web with more emphasis on web site design rather than web applications. [Garrido97] [Lyardet98][Rossi99]¹ Casaday describes three kinds of usability patterns: Simple, Intrinsic, and Circumstantial. We believe that the patterns in this collection represent Circumstantial because of the external force of the web environment that constrains the solutions. [Casaday97] Mahemoff builds on Casaday's classification by proposing four classifications of usability patterns – task related user profile based, user interface elements, and system based. The user interface element patterns are a group of widgets that work synergistically to produce a clever solution. The system based patterns consist of a collection of patterns that interact and are grouped and labeled according to achieve the system's purpose. [Mahemoff98a] The successful applications of our patterns require the developer to have a specific task and user profile previously defined. Our patterns fall into the classification of either user interface widget (UI), or are system based (Sys.). The patterns describe

¹ Usability was a topic at ChiliPloP '99, but the results of the working group there were not available at the time this paper was written. [Brooks99]

solutions that improve usability attributes, i.e. is the web application– learnable, memorable, efficient, reliable, flexible, automated, understandable, and subjectively satisfying. [Nielsen 93]

The subject of web usability is quite large, and is worthy of an entire pattern language. While this paper only scratches the surface, we hope that the patterns it contains are a useful first step. The web represents not just new implementation technologies, but it is a new medium with its own social and economic dynamics. The first two patterns, **Carrot and a Stick** and **Policy Statement** address problems that arise from this new medium. They are System Patterns (Sys) in Mahemoff's parlance. The remaining three patterns in this collection, **Required Field Markers**, **What They See is All They Get**, and **Plan B**, address more tactical issues of page design, User Interface Widgets (UI) using Mahemoff's categorization.

In addition to the patterns in this paper, we have identified many other candidate patterns, which we believe would be part of a full pattern language. These patterns are briefly described at the end of the paper.

- **Client-Side Validation (Sys.)**
- **Server-Side Validation (Sys.)**
- **Three Clicks or You're Out (Sys.)**
- **Site Context (UI)**
- **Location, Location, Location (UI)**
- **You Are Here (UI)**
- **Flag Planting (Sys.)**
- **Universal Navigation (UI/Sys.)**
- **Searching the Web (Sys.)**
- **Web Registration Forms (UI)**
- **Links, Jumps and Suicide Leaps (UI/Sys.)**
- **Query Forms (UI)**
- **Data Entry Forms (UI)**

Pattern: Carrot and a Stick

Problem

How do you get end users to provide information that they are reluctant to share?

Context

You are a developer building a WWW application in which forms are used to gather user input. These forms contain certain fields that are required input from the user in order to advance and to get value from the application. Some of the fields are for submitting personal information.



Classification

- System Based

Forces

- Users may want to use a particular site if it has valuable content, good recommendations from peers or the media.
- The web is a place where information is free and users are reluctant to pay (i.e. exchange something of value) for free information. [Hoffman99]
- Users will search for an alternative source to get content without having to share any information
- Users are paranoid that “big brother” is watching and do not like to directly identify themselves and lose their anonymity if it is not necessary.
- Users on the Internet are reluctant to provide personal information about themselves because it is not always clear how information gathered over the web will be used. [Hoffman99]
- It is difficult to determine the most appropriate incentive from an anonymous group of users. Determining what anonymous users consider valuable enough to trade personal information for is difficult without basing it on demographic information.
- Users may try to subvert required fields with false information. [GATech98]
- In an effort to learn more about their end users and build email mailing lists, many web sites ask users for information about themselves.
- Web sites need as much information about their users as possible to generate user requirements, create mailing lists or justify the expense of site maintenance and enhancements.
- Web sites need proof that there are unique users rather than the same three users hitting the site hundreds of times a day.
- Web sites need to gather user data to compare or integrate with other data sources.

Solution

Determine what users consider to be a “valuable” carrot. Offer the end user a portion of that carrot before you request personal information. The content is withheld (“the stick”) until the requested information is provided. When the personal information is requested, explain exactly how the information will be used and to whom it will be distributed. Limit the amount of sensitive information gathered to the most useful. In many cases this will be the email address and zip code. After you have gathered the key information, then grant the user access to the rest of the carrot.

Rationale

If users perceive that they will receive something of value for their information, then they may be more willing to share. For many web applications, the carrot the site has to offer is information. However, unlike a traditional market place, it is difficult for the user to inspect information before deciding whether to exchange personal information for the site content. That is why it is important to offer something of value for free first to establish a foundation for information exchange and creating a relationship with the user. The user may determine whether such an exchange is advantageous based on the quality of the free content.

Resulting Context

If the site has collected appropriate information, then the site is able to personalize the site for the individual user, rather than any one of the millions of users on the web. Sites that collect address information can create mailing lists, which can be used for additional directed marketing campaigns via postal service or sold if permitted by the **Policy Statement**.

Even with incentives, if the information is not directly tied to the reward, users may not provide quality information. For example, a user sensitive to email solicitations may provide an incorrect email address. Other users may decide to opt out entirely in search of other sources that do not require personal information to be exchanged.

Example

The New York Times (www.nytimes.com) online allows you to read the first page for free. If you want to read any of the articles or sections, you have to register by providing basic demographic information.

ESPN's site (www.espn.com) implements another variation on this idea. Many articles don't require registration at all, but some columns require not just registration but also an annual fee. Some information, such as statistics on athletes, are free, but subscribed users get access to tools to select and sort this data many different ways, such as performance home versus away. The interesting part of this example is the way that the site is able to make content available for free to build trust and usage, and yet still have content of compelling value for which users will exchange not just personal information but also payment. In the case of the statistical data, the additional value is generated from the same information that is freely available.

Related Patterns

If an site uses both **Carrot and a Stick** with **Policy Statement**, then the **Policy Statement** will usually describe the terms and conditions of the **Carrot and a Stick**.

Pattern: Policy Statement

Problem

How do you establish sufficient trust with users so that they will provide personal information?

Context

You are a developer building a WWW application in which forms are used to gather user input. The application gathers information that the user might consider sensitive, such as email address, phone number, age, etc.

Classification

- System Based

Forces

- Users on the Internet are reluctant to provide personal information about themselves if they do not readily understand how information gathered over the web will be use. [Hoffman99]
- Users may choose to provide information only to sites that promise to restrict the information's use. For example, the site may promise not to share it with other firms, or the site may promise not to send certain kinds of email.
- Web sites that build trust with users are more likely to maintain and increase traffic volume.[Nielsen99b]
- Web users are accustomed to moving from one web page to another without hurdles.
- Web users assume web sites for a well-known brand are honest.
- Web sites with branding have to live up to their corporate identity and honor.
- Sites that violate their privacy promises may lose user trust and receive media scrutiny.
- Web sites need information about their users for marketing purposes as well as to generate user requirements and create policies that suit their target audience.
- Users agree in principle with the idea of sharing their own demographic data with web sites. [Hoffman99]

Solution

Provide a detailed statement of how the information you gather will be used. Write the policy statement so that it is consistent with your actual practices. For example, if you are able to ensure the confidentiality of submitted information, then make sure that is communicated in the policy statement. Place these statements in a prominent location on the forms.

What constitutes a good policy statement varies based on the context, but many give users the option to request that information not be shared with other firms or sites. Others give users the ability to control whether they received solicitations as a result of sharing their information. The Center for Democracy and Technology has published some guidelines for evaluating privacy policies. [CDT99]

Rationale

Users are sensitive about protecting their privacy online, and in particular they are concerned about data being collected by a site and being sold to third parties. [GATech98][Hoffman99] However, they also understand and appreciate that there are legitimate business reasons for web sites to collect demographic data about their users. According to one survey, over 72% of users said they would share demographic data with a site if only the site would provide a statement about how the information would be used. [Hoffman99] If a site provides a **Policy Statement** that addresses users concerns about protecting their privacy, then the site should be able to increase users willingness to share information.

Resulting Context

Users gain a comfort level (or discomfort level) from knowing how the information about them will be used. Users feel empowered to make an informed decision and not provide their information if they do not agree with how it will be used.

You may be more exposed if you have a security lapse if you promised to protect private data than if you had no policy at all. Alternatively, if your policy does not offer assurances of privacy, having a policy statement might dissuade users from using the site.

Example

In the area of content distribution, the New York Times (www.nytimes.com) web site has two links from the registration form to two policy statements for registered users, a Subscriber Agreement and a Privacy Policy.

Ebay (www.ebay.com), an online auction e-commerce site, states their policy at the top of their registration form.

“Please Note: To be eligible to register, you must be over 18 years of age and provide valid contact information, including a valid e-mail address. **eBay** will not use any registration information for marketing, nor will we disclose this information to any outside party.”

A policy statement that might dissuade users can be found on many DoD sites. For example, see the National Guard Security and Privacy notice at <http://www.ngb.dtic.mil>.

Related Patterns

Policy Statements should be in a prominent location, and so the **What They See is All They Get** pattern applies.

Pattern: Required Field Markers

Problem

How do you ensure that the end user provides information essential to the use of a web application?

Context

You are a developer building a WWW application in which forms are used to gather user input. These forms contain certain fields that are required input from the user in order to advance and to get value from the application, while other fields are optional.

Classification

- User Interface Widget

Forces

- When using an application, users often provide as little input as possible to continue using it as they explore the application.
- Users may try to avoid providing required information by providing false information in required fields. [GATech98]
- Omitting a required field prohibits the application from completing a task and can lead to an application error.
- Users who do not provide all the information the system requires are not using the application in the way it was intended and the user may be unaware of this.
- Adding icons and typographic variations adds to screen complexity.
 - Additional symbols may require an annotation to define their meaning.
 - Using font changes alone may be too subtle to be noticed.
 - Color changes may be too subtle or too distracting.
- Color changes may not be obvious to users with color perception difficulties.
- Requesting additional information from the user by returning an “error” page can be time consuming.
- “Error” pages or other indications of incorrect usage may reduce the users’ confidence and therefore reduce their satisfaction.
- Site owners often want to collect good data from the site to perform demographic studies, usage patterns, and other important market research.

Solution

Clearly label the information the users are required to provide to operate the site effectively. Make sure that all such fields are really necessary.

Required fields can be labeled using several approaches. A graphical icon, such as a bullet, asterisk or checkmark can mark the field, or you can use a verbal identifier, such as the word, “required.” Another way to convey this is to have all the required fields in a single section of the form. [Tullis97]

If there are a significant number of required fields, adding a graphical element may be the best option. The graphical element should not rely exclusively on color or on font family. Somewhere on the top of the page should be a key to explain the notation. If there is just one or a few such required fields, it may make sense to add the term “required” to the label. Grouping the required fields on one portion of the form makes sense only a logical grouping of the fields can be maintained.

Resulting Context

Error detection to find omitted fields and user feedback to communicate errors are still needed. However, users should experience the problem of missing field data less frequently. Because of that, the user saves time by avoiding the error recovery process. The user may also save time by filling out the form only with the required fields. The screen might be a little more complex with the required field notations. To avoid confusion, the notation scheme (asterisks, bold, etc) should not be used to communicate other information to the user. This pattern will not prevent the user from submitting spurious data to circumvent required field mechanisms.

Rationale

If users are aware that fields are required, then they can make sure that the information is completed before submitting the form. This can save the user time and potential rework. Since some users may have difficulty distinguishing between colors, it is not a good idea to rely solely on color. Similarly, there is not universal support for fonts across different browsers and environments, so relying on font family is not reliable. If a key is provided, it should be on the first screen of information, so the user can see it without scrolling.

Example

Ebay (www.ebay.com) presents its registration form with several elements for educating the user about what is required for registration to be complete. (Illustration 1) The form groups all of the required fields together in a table. It also labels the required fields with the word “required” to the right of the entry field. In addition, the field labels are green and a statement to explain what the green field labels indicate is at the top of the form. Unfortunately, green and red are poor colors to use to indicate status because the colors may be misinterpreted by users who are color blind. However, since the form indicates the required fields in several ways, this is a minor complaint.

Illustration 1: Screenshot of Ebay registration form indicating required fields.

Required entries are shown in green.

E-mail address e.g. username@aol.com	<input type="text"/> (required) <small>Note: AOL and WebTV Users: Please remove any spaces from your username and add the domain suffix (@aol.com or @webtv.net to your username). For example, if your username is joeool, your e-mail address would be joeool@aol.com</small>
Full name e.g. John H. Doe	<input type="text"/> (required) First M. Last
Company	<input type="text"/> (optional)
Address	<input type="text"/> (required)
City	<input type="text"/> (required)
State	Select State <input type="text"/> (required)
Zip Code	<input type="text"/> (required)
Primary phone # e.g. (408) 555-1234	(<input type="text"/>) <input type="text"/> - <input type="text"/> (required) <input type="text"/> (extension)
Secondary phone #	(<input type="text"/>) <input type="text"/> - <input type="text"/> (optional) <input type="text"/> (extension)
Fax #	(<input type="text"/>) <input type="text"/> - <input type="text"/> (optional)
Optional Info	
How did you first hear	<input type="text"/>

Related Patterns

Client-side Validation and **Server-side Validation** both present approaches for ensuring data quality of information submitted through WWW forms. Information communicated to the user through this pattern should be guided by other patterns such as **Behavioral Grouping** [Garrido97], **Behavioral Anticipation** [Garrido97], **What They See is All They Get**, and **PlanB**. Tullis also described this pattern in a traditional client-server context. [Tullis97]

Pattern: What They See is All They Get

Problem

How do you make sure an end user sees everything on a web form that the user needs to see?

Context

You are a developer building a WWW application in which forms are used to gather user input. These forms require input from the user in order to advance and to get value from the application. There are many fields on the forms.

Classification

- User Interface Widget

Forces

- Users on the web often do not scroll down long pages. [Nielsen96]
- Each user has a different screen allotment for the web browser window, the minimum screen resolution is 640 by 480, but each user can set the size of their browser according to their preference. However, this space is further constrained by menu bars, title bars and other desktop interface elements that take up space and cannot be hidden. The only guaranteed screen space is 535 pixels by 295 pixels. [Lynch 97].
- Users expect the web form to be like a Windows desktop interface with some error recovery features.
- Indications of incorrect usage (like error pages or heavy-handed prompts for information) may undermine the users' confidence, reduce their satisfaction, and therefore scare them away from the web application.
- Users may not locate the submit button if it is not displayed on the web page that comes up initially.
- Users may click on navigation links that have action names like Search and Register rather than scroll down and find the button that has the word Search or Register that is for submitting the form that searches or registers.
- Font size is dependent on the end users' default settings, and installed fonts.

Solution

Design the web page content to display the most critical page elements in the upper left area of the page. Critical page elements are the entry fields and push buttons the user is required to select to continue using the application. Visual clues that communicate when there is more information to the bottom or the right of the screen are also critical. Keep all important information within the 535 pixels wide and 295 pixels long parameters. If the form requires the user to scroll, provide visual clues that encourage the user to scroll down to a push button. Consistently present the forms throughout your site with the submit push button in the same place. Limit query forms to one screen. Allow data entry forms to scroll.

Limit the number of fields on the form to critical ones to prevent overwhelming the user.

Rationale

Web designers have learned to design for the minimum display of 640 by 480 pixels, but because some users may only have 535 by 295 visible pixels, key information may not be visible on the page.²

It is important to understand the purpose of each form. Forms that are queries or search interfaces need to be in one screen above the fold because the form is just one step toward finding the desired information. Forms that are data entry forms, like registration forms, can require scrolling because separating a registration form into separate pages gives the end user a false impression that they are done.

Resulting Context

The user is less likely to miskey information that was scrolled past the bottom of the page. For some sites, this may mean the site is broken up into more, but smaller pages. By communicating to the user when a

² Actually, many web developers now target 800 by 600 pixels.

page is more than a screenful, the user understands what is required by each page through consistent implementation.

Example

The Ebay (www.ebay.com) registration form is a good example of a registration form that leads the user. (Illustration 2) The top of the web page gives numbered instructions on the registration process. Further down the page, the form presents fields in sets organized in a table with borders and colored cells to provide visual cues to the user to scroll down for more. (Illustration 3)

Illustration 2: Screenshot of the first screen of the Ebay registration page 600 pixels by 295 pixels.



Illustration 3: Screenshot of the form section of the Ebay registration page 600 pixels by 295 pixels.

Please Note: To be eligible to register, you must be over 18 years of age and provide valid contact information, including a valid e-mail address. **eBay** will not use any registration information for marketing, nor will we disclose this information to any outside party.

If you would like to read a full explanation of our privacy policy, click on the TRUSTe button below:

reviewed by
TRUSTe
site privacy statement

Step 1 - eBay Initial Registration Form

Simply fill out the information below and click the **continue** button.
Required entries are shown in **green**.

E-mail address e.g. username@aol.com	<input type="text"/> (required) Note: AOL and WebTV Users: Please remove any spaces from your username and add the domain suffix (@aol.com or @webtv.net to your username). For example, if your username is joecool, your e-mail address would be
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Related Patterns

Similar challenges are addressed in the **Required Field Markers**, and **Form** [Bradac97] patterns.

Pattern: Plan B

Problem

How do you support users who are unable to perceive web page graphics?

Context

You are a developer building a WWW application and you plan to use graphics, icons, and typography to enhance the site.

Alias

A Picture Is Not Worth A Thousand Minutes (To Download)

Classification

- User Interface Widget

Forces

- Users expect visually appealing sites.
- Sites without visual appeal may be perceived to be less trustworthy or of lower quality.
- Graphics can add to the visual appeal of a site.
- Some users on low-bandwidth connections turn off their graphics
- Some users are visually impaired, e.g. blindness, color blindness, etc.
- Some users use alternative browsing technologies that render sites very differently than traditional browsers (e.g. Palm Pilots)

Solution

Whenever information is communicated graphically on a page, create an alternative to communicate the information without graphics. This solution can take many forms. For graphics, this can mean including the HTML tag ALT to specify a text equivalent. If information is communicated by font color, an icon can also be used to communicate the same information. In an extreme form, this solution can be implemented with a duplicate, graphics-free site.

Resulting Context

The site is accessible to a broader array of users. Depending on the specific instantiation of the solution, the site might be more cluttered with additional symbols. While some tools provide support for implementing these solutions, there may be some additional maintenance costs associated with keeping the second set of symbols in sync.

Rationale

The current trends in web design do not allow organizations to eliminate graphics completely from their sites, and for good reason. While graphics can increase the appeal of a site, they do introduce obstacles for many users. By providing an alternative mechanism to communicate the information of the site, you enable more users to visit the site without detracting from the overall visual appeal of the site. This principle is reflected in many coding standards and is expressed in the World Wide Web Consortium's draft Web Content Accessibility Guidelines. [W3C99]

Example

Amazon.com illustrates the use of ALT text for many of the graphics on their home page. They also have graphics without that additional text. The following illustration shows the difference when the graphics are turned off. (Illustration 4) Oracle.com's home page applies a different approach. The main navigation bar is rendered in graphics on the top of the page, and it is also displayed in text format at the bottom of the page. (Illustration 5) Symantec.com uses several approaches. Many of the graphics also have equivalent text links (Illustration 6) and even a graphics-free version of the site (Illustration 7).

Illustration 4: Screenshot of Amazon.com ALT tags instead of graphics.

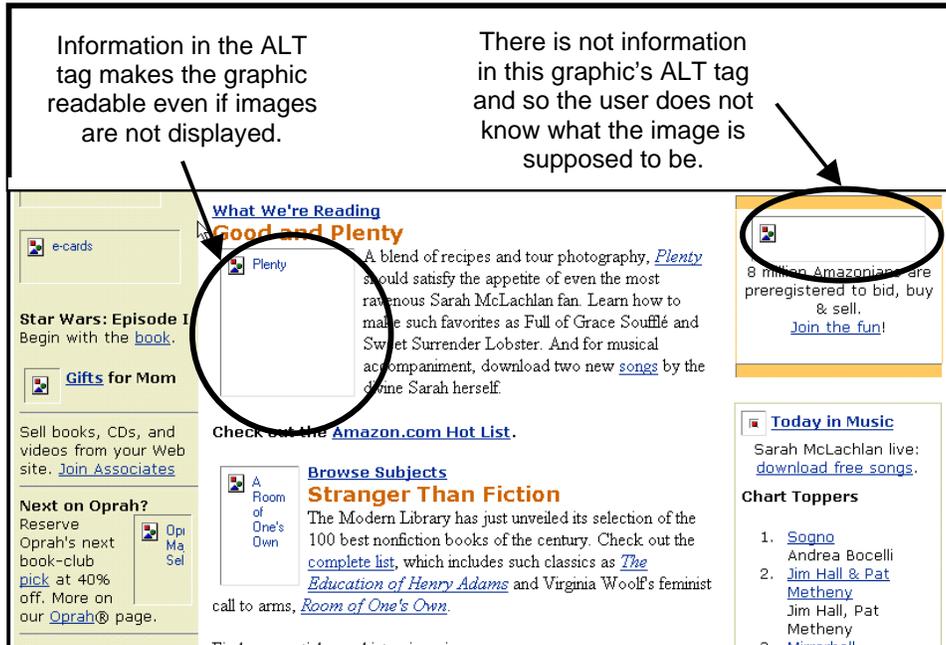


Illustration 5: Screenshot of Oracle.com which provide a text version of the main navigation.

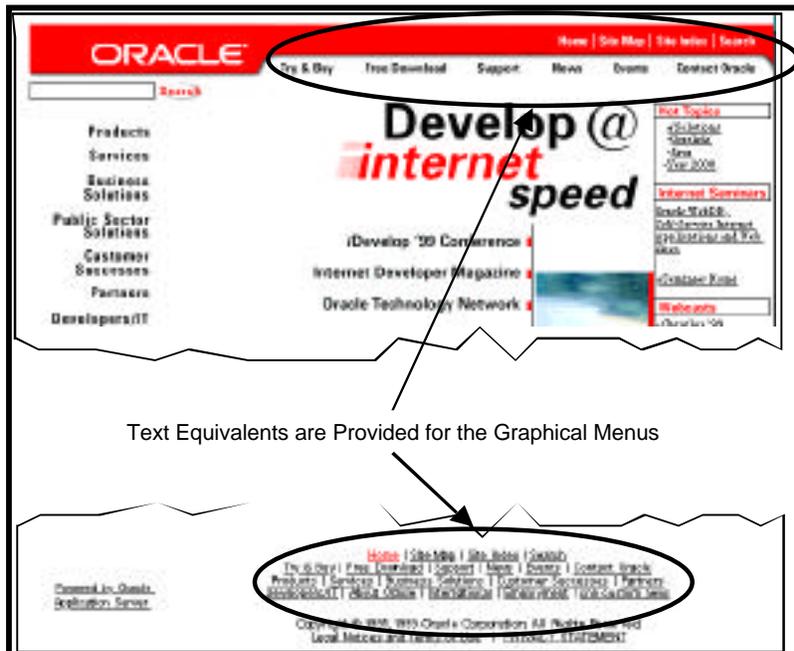


Illustration 6: Screenshot of Symantec.com provides a text link for graphical buttons.

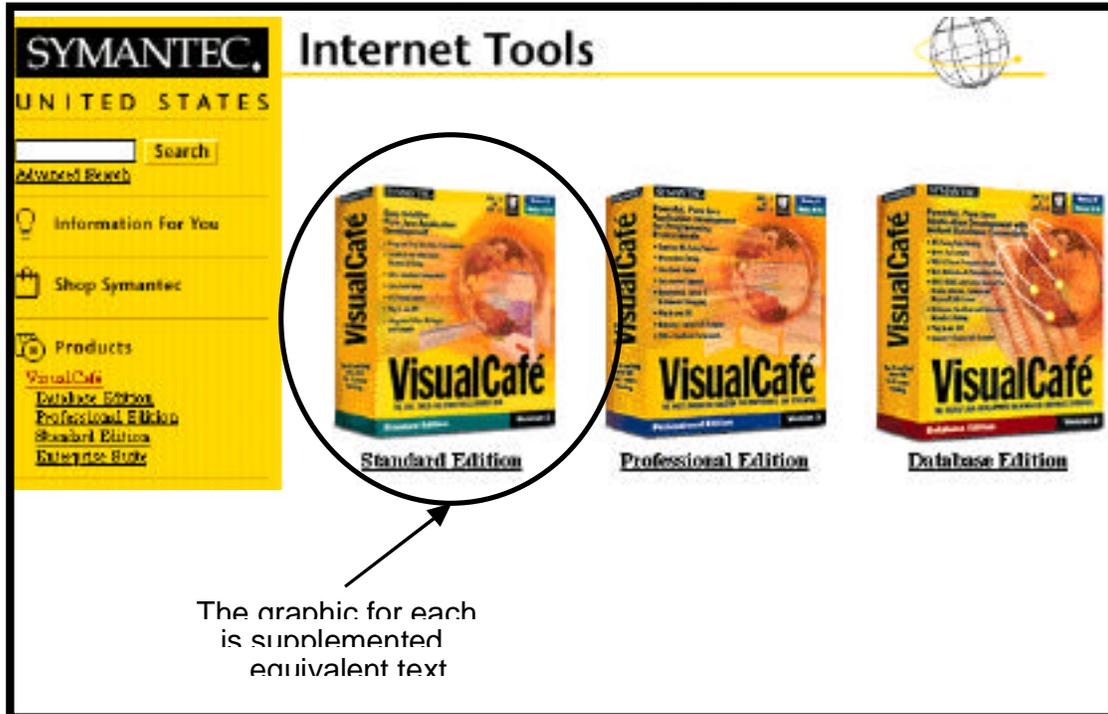
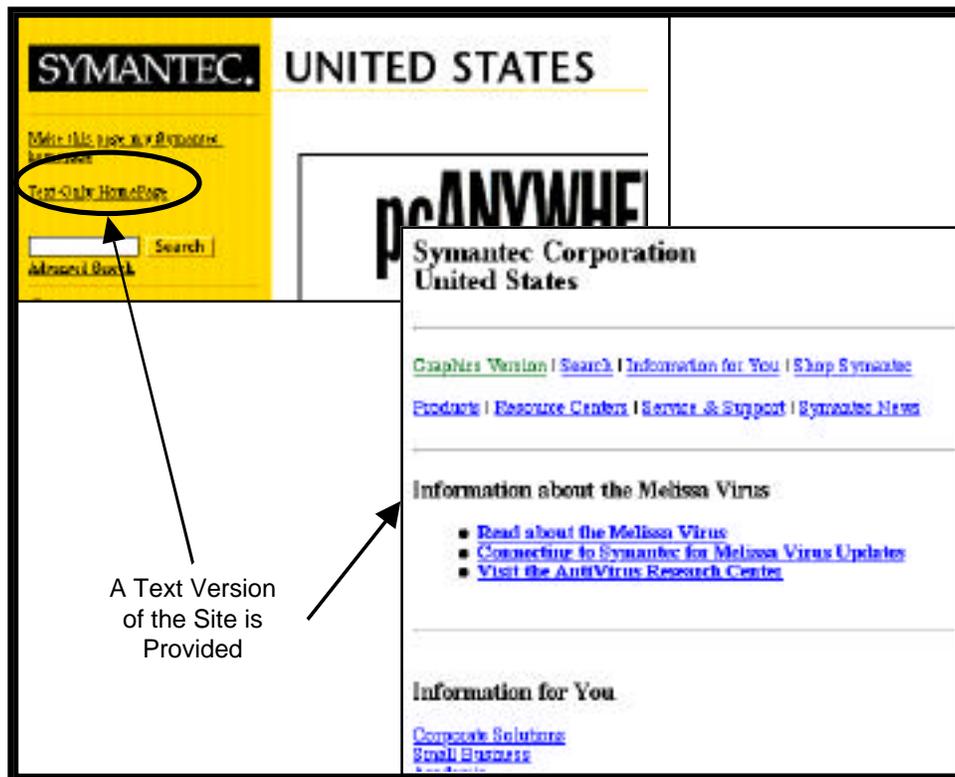


Illustration 7: Screenshot of Symantec.com provides a graphics-free version of the site.



Candidate Patterns

The following patterns are candidates that we have identified as part of the web usability pattern set. A short description is provided for them to indicate the direction of our thoughts. We are looking for write-ups of these patterns for the web, so that we can reference them, or we may write them up ourselves in future versions of this collection. There were other areas of web usability that we considered at length for mining patterns. For example the problems of creating human-readable URL's in web applications and maintaining bookmarkability. However, we were unsure how to partition the problem and solution space. We are confident that there are more patterns lurking in that subject area as well as in other aspects of web usability.

Pattern: Client-Side Validation

Abstract: Using a scripting language in the browser to perform field-validation before sending a request to the server.

Classification: System Based

Pattern: Server-Side Validation

Abstract: Sending a request to the web server in order to have the fields validation, and possibly processed.

Classification: System Based

Pattern: Three Clicks or You're Out

Abstract: The user of a web site should be able to find what they want within 3 clicks from the home page.

Classification: System Based

Pattern: Site Context

Abstract: Providing users feedback on where they are with regards to the rest of the site.

Classification: User Interface Widget

Pattern: Location, Location, Location

Abstract: Meeting user expectations that certain features are found on particular parts of the screen.

Classification: User Interface Widget

Pattern: You are Here

Abstract: Providing users with information about their current location and allowing them to leave a trail to be able to return to that place quickly.

Classification: User Interface Widget

Pattern: Flag Planting

Abstract: Bookmarking locations deep in a web site. However, bookmarking web forms is not always possible.

Classification: System Based

Pattern: Universal Navigation

Abstract: Providing users with navigation tools on every page

Classification: User Interface Widget • System Based

Pattern: Searching the Web

Abstract: This group of patterns addresses the user-acceptable way to present search and search results interfaces and their limitations.

Classification: System Based

Pattern: Web Application Registration Forms

Abstract: This group of patterns address the user-acceptable way to present to ask the user to register, inform the user what registration includes and entitles them to, and the order and fields that should be included.

Classification: User Interface Widget

Pattern: Links, Jumps, and Suicide Leaps

Abstract: A link should take the user to a web page in the same browser window. Links that open additional browser windows should be used when the user is required to view both web sites simultaneously.

Classification: User Interface Widget • System Based

Pattern: Query Forms

Abstract: Query forms are used to retrieve lists of information, and on the web have special characteristics based on existing query interfaces and user expectations.

Classification: User Interface Widget

Pattern: Data Entry Forms

Abstract: Data entry forms on the web are often treated like traditional data entry forms, but some different usability standards apply. Data entry forms have specific user expectations associated with them and should be designed to minimize the number of steps.

Classification: User Interface Widget

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