



Ajax Usability Benefits and Best Practices

A White Paper from JackBe Corporation

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About This Document

Purpose of this Document

While Ajax technology has recently received a lot of attention, there is uncertainty about benefits, best practice, and risks. This white paper addresses these questions, primarily from a usability perspective.

Who is this document for?

This document is intended for:

- Developers who need to learn more about Ajax applications and best practice.
- Executives who need to make business decisions about adopting Ajax technology.
- Analysts who need background on the developing Ajax market.

Executive Summary

Ajax (Asynchronous JavaScript and XML) refers to using a combination of pre-existing software technologies to create interactive Web applications. The sudden emergence of Ajax (or Ajax) as a term, first introduced in February 2005 by Jesse James Garrett,¹ reflects the rapidly growing market awareness of the benefits Ajax can provide.

The primary strength of Ajax is allowing Web applications to have the interactivity of familiar desktop tools. Ajax can be thought of as a set of enabling technologies for the Web 2.0² transition from a static to an interactive Web environment.

Key Ajax benefits for Ajax-enabled Web applications include:

- *Less waiting.* Ajax supports updating parts of a Web page on an as-needed basis, rather than the traditional approach of updating an entire Web page at once. This allows for faster turn-around.
- *Faster user task performance.* Ajax provides numerous usability benefits, which (with good design) allow users to do what they need to do more quickly.
- *Familiar user interfaces.* Ajax interactivity support allows Web applications to look more like traditional desktop applications.
- *Lower bandwidth requirements.* Ajax reduces bandwidth requirements in two ways: by removing the need to resend an entire page to update part of it; and by a more efficient encoding of complex Web pages.

The goal of user interface design is to improve usability³ and the overall user experience.⁴ Ajax simplifies achieving this goal.

¹ <http://adaptivepath.com/publications/essays/archives/000385.php>

² http://en.wikipedia.org/wiki/Web_2

³ <http://www.useit.com/alertbox/20030825.html>

Ajax Technology Summary

Ajax extends beyond the JavaScript⁵ and Extensible Markup Language (XML)⁶ technologies that are the basis for its name: Ajax also includes Cascading Style Sheets (CSS),⁷ Dynamic Hypertext Markup Language (DHTML)⁸ and XMLHttpRequest (XHR).⁹

Ajax streamlines Web interactivity by enabling smarter communication between client and server. Instead of each change to a Web page requiring a complete page refresh, Ajax makes it possible to only update the altered parts of a page. The result is faster updates.

There are other technologies¹⁰ that can achieve benefits similar to Ajax. However, Ajax has the advantages of being platform independent, useful now for many developers with their existing skill sets, and of already having critical mass.

Summary of Ajax Applications, Benefits & Pitfalls

When technology evolves people do not just do the old things better, they think of new things to do. That is why predicting the implication of technology development is so difficult.

There are not many quantitative case studies available that compare Ajax to traditional solutions. However, one small study¹¹ found that Ajax reduced task completion time by 32%, bytes transferred by 73%, and transmission time by 68%.

The core value provided by Ajax is increased responsiveness over the Web. Table 1 on the following page summarizes where this responsiveness is most useful.^{12 13 14 15 16 17 18 19}

⁴ <http://www.nngroup.com/about/userexperience.html>

⁵ <http://en.wikipedia.org/wiki/JavaScript>

⁶ <http://en.wikipedia.org/wiki/XML>

⁷ http://en.wikipedia.org/wiki/Cascading_Style_Sheets

⁸ <http://en.wikipedia.org/wiki/DHTML>

⁹ <http://en.wikipedia.org/wiki/xhr>

¹⁰ <http://www.ajaxinfo.com/default-viewart-8.htm>

¹¹ <http://www.developer.com/java/other/article.php/3554271>

¹² <http://swik.net/Ajax/Places+To+Use+Ajax>

¹³ http://www.sourcelabs.com/blogs/ajb/2005/12/10_places_you_must_use_ajax.html

¹⁴ http://blogs.pathf.com/agileajax/2006/05/direct_manipula.html

¹⁵ <http://blogs.pathf.com/agileajax/2006/05/index.html>

¹⁶ <http://adaptivepath.com/publications/essays/archives/000385.php>

¹⁷ <http://www.ue.com/events/uiconf/articles/ajax/>

¹⁸ http://Weblog.infoworld.com/realworldsoa/archives/2006/05/the_benefits_of.html

¹⁹ <http://blogs.ebusiness-apps.com/andre/files/april%2018%20-%20business%20case%20for%20Ajax2.pdf>

Table 1: Ajax Application Areas

Application Area	Overview	Examples
Navigation & control	Easier movement within or between Websites	<ul style="list-style-type: none"> • <i>Deep hierarchical navigation.</i> Navigation can be sped up by using Ajax to only load the requested data; for instance, only retrieving a particular entry in a discussion thread, rather than an entire page. • <i>Contextual control.</i> Tailor the controls to the content. For instance, initially provide high-level controls, with more detailed controls appearing for more detailed tasks. • <i>Managing multiple tasks.</i> Make it easier to track different threads of activity.²⁰ This is related to the idea of a locus of control.²¹ • <i>Mode Management.</i> Facilitate smoothly switching between modes, for instance between data entry and error recovery, without requiring a new Web page and a complete switch of context • <i>Application-level undo.</i> Provide the ability to restore an earlier state of an application, not just return to a previous page. • <i>Manipulation of spatial data.</i> For instance, scrolling or zooming a map, or dragging the nodes in a graph.
Searching	Improved search engine capabilities	<ul style="list-style-type: none"> • <i>Filtering.</i> Dynamic control of search parameters, for instance using slider bars to indicate a price range.
Communication	Aids for human-to-human and human-to-computer interaction	<ul style="list-style-type: none"> • <i>Interface standardization.</i> Ajax allows applications to have a look-and-feel similar to familiar desktop applications. • <i>Rapid user-to-user communication.</i> In message posting applications, immediate display of messages without having to do a page refresh. • <i>Dynamic error management.</i> Notification of errors as they occur. • <i>Voting, yes/no boxes, rating submissions, etc.</i> Streamlined submission of simple information. • <i>Long-running tasks.</i> Indicate time to completion, e.g. with a progress bar or clock. • <i>Data entry.</i> Data can be processed and results displayed without the delay of a complete page refresh. • <i>Auto-completion.</i> Provide option of selecting most-likely completions when doing text entry. • <i>Hints.</i> Provide additional information during task performance.

²⁰ <http://blogs.pathf.com/agileajax/2006/05/index.html>
(see discussion of Zeigarnik Effect)

²¹ <http://www.cs.utexas.edu/users/almstrum/cs370/elvisino/rules.html>

Application Area	Overview	Examples
Web services	Ajax is useful for supporting Service-Oriented Architectures (SOAs). ²²	<ul style="list-style-type: none"> • <i>Mashups</i> Ajax simplifies the process of combining Web services.
System tasks	Background tasks not directly apparent to the user	<ul style="list-style-type: none"> • <i>Autosave</i>. Automatically saving data as it is entered. • <i>Computationally-expensive tasks</i>. Complex tasks can be routed to more powerful servers. • <i>Server bandwidth savings</i>. By only sending required data, the load on the server can be reduced dramatically.

Some examples of current Ajax applications^{23 24} include

- *Map and route-finding tools*, such as Google Maps,²⁵ an interactive map of Switzerland,²⁶ and a London route finder²⁷
- *Search tools*, such as Zillow,²⁸ Google Suggest,²⁹ Zuggest,³⁰ and Amazon's Diamond Search³¹
- *Stock tracking tools*, such as Google Finance³²
- *Word processing tools*, such as Writely³³ and Primal Grasp spellchecker³⁴
- *Web development tools*, such as Real-time HTML Editor³⁵
- *Webfeed tools*, such as Backbase RSS Reader³⁶
- *Data management and shared data space tools*, such as del.icio.us,³⁷ flickr,³⁸ Filemobile,³⁹ Protopage⁴⁰ and Ta-da Lists⁴¹
- *Educational tools*, such as the Periodic Table⁴²
- *Enterprise collaboration tools*, such as Zimbra⁴³

²² http://en.wikipedia.org/wiki/Service-oriented_architecture

²³ http://ajaxpatterns.org/Ajax_Examples

²⁴ <http://www.aventureforth.com/2005/09/06/top-10-ajax-applications/>

²⁵ <http://maps.google.com/>

²⁶ <http://map.search.ch/index.en.html>

²⁷ <http://public.ok2life.com/tube/routes>

²⁸ <http://www.zillow.com>

²⁹ <http://www.google.com/Webhp?complete=1&hl=en>

³⁰ <http://www.francisshanahan.com/zuggest.aspx>

³¹ <http://www.amazon.com/gp/gsl/search/finder/103-0607765-1595809?ie=UTF8&productGroupID=loose%5Fdiamonds>

³² <http://finance.google.com/finance>

³³ <http://www.writely.com/>

³⁴ http://demo.primalgrasp.com/spell/edit_text

³⁵ <http://www.squarefree.com/htmledit/>

³⁶ [http://www.backbase.com/demos/RSS/#aid=901\[1\]](http://www.backbase.com/demos/RSS/#aid=901[1])

³⁷ <http://del.icio.us/about/>

³⁸ <http://flickr.com/>

³⁹ <http://filemobile.com>

⁴⁰ <http://www.protopage.com/v2>

⁴¹ <http://www.tadalist.com/>

⁴² <http://code.jalenack.com/periodic/>

- *Organizational tools*, such as Backpack⁴⁴
- *E-Mail tools*, such as Google Gmail
- Comparison shopping tools, such as Pepperjam⁴⁵
- Calendars and time-tracking tools, such as Kiko⁴⁶ and TimeTracker⁴⁷

Ajax is most suited to situations that require fine-grained interactivity and/or asynchronous data exchange. Where this is not required Ajax may be inappropriate, particularly since Ajax imposes extra development and maintainability costs.

Situations where it may be best not to use Ajax include:⁴⁸

Table 2: When *Not* To Use Ajax

Don't Use Ajax For	Overview	Examples
Simple navigation & control	Simple navigation and control problems do not benefit from Ajax	<ul style="list-style-type: none"> • <i>Simple forms</i> • <i>Basic navigation</i>
Simple search tasks	Some search problems do not benefit from Ajax interactivity support	<ul style="list-style-type: none"> • <i>Small search spaces</i>
Non-synchronizable system tasks	Ajax is not be a benefit for "batch mode" tasks	<ul style="list-style-type: none"> • <i>Saving large amounts of text.</i> If most of a Web page has to be saved, using Ajax to save it asynchronously is not a benefit: in fact, the Ajax overhead may slow the process down.

General concerns associated with Ajax include:

- *Accessibility.* Ajax makes possible new Web capabilities; it is important to make sure that these capabilities do not make it harder for people who use assistive technologies to access the Web.⁴⁹ Aside from good Web citizenship, supporting assistive technologies is a business and in many cases regulatory requirement.⁵⁰ Fortunately, Ajax accessibility issues have received considerable attention.⁵¹
- *Breaking the back button and bookmarks.* The browser back button is a crucial Web navigational tool for returning back to a previous state.⁵² Bookmarks, similarly, are a way of storing state. However, these tools were introduced when the Web consisted of static Web pages: retrieving state is more difficult in the Ajax environment where each Web page can change dramatically over time. Solutions to this problem are currently being

⁴³ <http://www.zimbra.com/>

⁴⁴ <http://www.backpackit.com/>

⁴⁵ <http://www.pepperjam.com/>

⁴⁶ <http://www.kiko.com/>

⁴⁷ <http://www.formassembly.com/time-tracker/>

⁴⁸ <http://swik.net/Ajax/Places+To+Use+Ajax>

⁴⁹ <http://www.abilityhub.com/>

⁵⁰ For instance, anyone doing IT business with the U.S. federal government needs to comply with Section 508 of the Rehabilitation Act: <http://www.section508.gov/>

⁵¹ http://www.maxkiesler.com/index.php/Weblog/comments/how_to_make_your_ajax_applications_accessible/

⁵² <http://Webdesign.about.com/od/usability/a/aa051506.htm>

discussed.^{53 54} On the positive side, we may be seeing the evolution of the back button into a more general “undo” capability.

- *Page weight.* Ajax involves embedding JavaScript code into Web pages in order to enable greater interactivity. In some cases, the embedded code may reduce page data sizes by allowing for a more compact representation that can be expanded into full HTML. But there are certainly situations where the embedded code increases Web page data sizes. This has to be considered as an Ajax risk factor.
- *Maintainability.* Ajax increases the amount of code associated with a Website: it may therefore increase the upkeep burden. It is important to consider ahead of time whether the benefits will outweigh the costs.
- *Unsuitable functionality.* Every tool can be misused, and Ajax is no exception. Ajax should be used to improve the user experience, not in ways that distract while providing no real benefit.
- *Security.* Since Ajax makes use of existing technologies, it does not inherently introduce new security holes.^{55 56} However, the asynchronous and highly interactive nature of Ajax can create vulnerabilities and complicate security testing if developers are not careful.

User Interface Design With Ajax

Ajax brings to the Web the kind of interactivity that has long been available for desktop applications. Consequently, principles which have been developed and tested for the desktop environment are generally applicable to Ajax. However, since Ajax exists in the Web environment it also faces distinct challenges, particularly controlling for bandwidth.^{57 58}

It is worth looking at Ajax interface design from four perspectives.

- *General principles.* Universal guidance applicable to the design of almost any type of user interface
- *Interaction styles.* Organizing themes for supporting user tasks
- *Specific guidelines.* Narrowly-defined rules on what to do and not to do
- *Design patterns.* Distilled experience on the best ways to address particular design problems

⁵³ <http://www.onjava.com/pub/a/onjava/2005/10/26/ajax-handling-bookmarks-and-back-button.html>

⁵⁴ <http://dev2dev.bea.com/pub/a/2006/01/ajax-back-button.html>

⁵⁵ <http://www.securityfocus.com/infocus/1868>

⁵⁶ <http://www.techworld.com/security/news/index.cfm?newsID=6243&pagtype=samechan>

⁵⁷ <http://siteexperts.spaces.msn.com/blog/cns!CE6C50D25BF AAA73!4852.entry>

<http://blogs.zdnet.com/Burnette/index.php?p=84>

⁵⁸ <http://blogs.zdnet.com/Burnette/index.php?p=84>

General Principles of Interface Design

General principles provide useful design guidance, although they require interpretation before they can be applied to specific problems. Two established sets of principles are outlined below.

Shneiderman's Eight Golden Rules

Summarizing two decades of experience and research, Ben Shneiderman⁵⁹ crystallized his "eight golden rules of interface design."^{60 61}

- 1) *Strive for consistency.* Similar user actions should be supported in similar situations, and there should be a similarity of system presentation and responses.
- 2) *Cater to universal usability.* Create systems that can be used by many classes of users, for instance novices and experts, different ages, persons with disabilities, etc.
- 3) *Offer informative feedback.* For every user action, provide informative system feedback.
- 4) *Design dialogs to yield closure.* Organize sequences of actions into groups with a beginning, middle and end.
- 5) *Prevent errors.* Design systems as much as possible to prevent users from making errors.
- 6) *Permit easy reversal of actions.* Providing simple and effective "undo" operations to reduce the impact of errors, encourage exploration and reduce anxiety.
- 7) *Support internal locus of control.* Design the interface so that the user is able to initiate actions and feels in control.
- 8) *Reduce short-term memory load.* Minimize the number of things and length of time that people have to remember.

Norman's Four Principles of Good Design

Don Norman⁶² defined four principles of good interface design:

- 1) *The state and action alternatives should be visible.*
- 2) *Provide a good conceptual model with a consistent system image.*
- 3) *Reveal the relationships between stages.*
- 4) *Provide the user with continuous feedback.*

⁵⁹ <http://www.cs.umd.edu/~ben/>

⁶⁰ B. Shneiderman, C. Plaisant (2005). *Designing the user interface*. Addison Wesley:Boston.

⁶¹ <http://www.cs.utexas.edu/users/almstrum/cs370/elvisino/rules.html>

⁶² <http://www.jnd.org/>

Interaction Styles

“Interaction style” refers to the means of structuring communication. Shneiderman & Plaisant⁶³ defines five human-computer interaction styles: *direct manipulation*, *menu selection*, *form filling*, *command language*, and *natural language*.

From an Ajax perspective, the most interesting of these is direct manipulation.⁶⁴ In fact, a key usability benefit of Ajax is precisely that it supports direct manipulation for Web applications.

Direct manipulation allows the user to feel that they are directly controlling objects on the screen.⁶⁵ It is characterized by continuous representation of objects of interest and rapid, reversible, incremental actions and feedback. Direct manipulation interfaces tend to be relatively easy and pleasant to learn and to use.

A “real world” example of direct manipulation is the steering wheel of a car.

Partly due to Ajax, on-line direct manipulation interfaces are now becoming common, particularly for search tasks in which the user manipulates query parameters with widgets such as slider bars (see the examples in Section 3).

Specific Guidelines

Useful interface design guidance at the level of building dialog boxes, menus, etc. has been developed by Apple for their Aqua interface.⁶⁶ These guidelines translate well into addressing interactive Web application design problems.

Ajax Design Patterns

A “design pattern” is “a general repeatable solution to a commonly-occurring problem.”⁶⁷ Essentially, patterns are distilled experience on how to handle particular types of problems. Fortunately, interface designers using Ajax can benefit from extensive pre-Ajax experience.

Many interface design patterns have been cataloged online.^{68 69 70 71 72 73 74} While these patterns reflect the experience and judgment of particular interface designers, they are not backed by published human factors experiments.

⁶³ B. Shneiderman, C. Plaisant (2005). *Designing the user interface*. Addison Wesley:Boston.

⁶⁴ http://en.wikipedia.org/wiki/Direct_manipulation_interface

⁶⁵ <http://developer.apple.com/documentation/mac/HIGuidelines/HIGuidelines-18.html>

⁶⁶ <http://developer.apple.com/documentation/UserExperience/Conceptual/OSXHIGuidelines/>

⁶⁷ [http://en.wikipedia.org/wiki/Design_pattern_\(computer_science\)](http://en.wikipedia.org/wiki/Design_pattern_(computer_science))

⁶⁸ <http://ajaxpatterns.org/>

⁶⁹ <http://developer.yahoo.com/ypatterns/index.php>

⁷⁰ <http://www.cs.helsinki.fi/u/salaakso/patterns/>

⁷¹ <http://www.hcipatterns.org/tiki-index.php>

⁷² <http://blogs.ebusiness-apps.com/andre/files/april%2018%20-%20business%20case%20for%20Ajax2.pdf>

⁷³ <http://www.visi.com/~snowfall/InteractionPatterns.html>

⁷⁴ <http://softwareas.com/ajax-patterns>

The tables below provide descriptions of patterns available online and where to find them. The tables cover:

- 5) *Communication*. Patterns for facilitating human-human or human-computer interaction.
- 1) *Data views*. Patterns for viewing data files.
- 2) *Editing*. Patterns for editing text or other information.
- 3) *Hierarchies, sets and navigation*. Patterns for displaying and traversing hierarchical information.
- 4) *Layout*. Patterns for structuring the presentation of information.
- 5) *Notifications*. Patterns for informing users of new or important information.
- 6) *Object display, selection & manipulation*. Patterns for managing objects.
- 7) *Save & undo*. Patterns for preserving or retrieving information and state.
- 8) *Search*. Patterns for supporting queries.
- 9) *Time*. Patterns for dealing with time-related information, such as calendars.
- 10) *Widgets*. Low-level interface tools for supporting user tasks.

Table 3: Communication Design Patterns

Pattern Name	Description	Reference
Architecture of a Review	A product or Website needs to present ratings and reviews with a variety of informational elements.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=architectureofreview
Direct Login	Simplify the login process.	http://ajaxpatterns.org/Direct_Login
Lazy Registration	Accumulate information about a user during interaction, to simplify formal registration later.	http://ajaxpatterns.org/Lazy_Registration
Microlinks	Open new content on the same page.	http://ajaxpatterns.org/Microlink
Popups	Provide quick information in notes that appear on the current page.	http://ajaxpatterns.org/Popup
Portlet	Isolated blocks of content with independent conversational state.	http://ajaxpatterns.org/Portlet
Progress Indicator	Indicate that progress is occurring.	http://ajaxpatterns.org/Progress_Indicator
Rating an Object	A user wants to quickly leave their opinion on an object, with minimal interruption to any other task flow they are involved in.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=ratinganobject
Sprite	Augment the display with small, flexible, icon-like blocks of content. These provide content that can be updated quickly without having to do a complete page update, for instance to provide markers on a map.	http://ajaxpatterns.org/Sprite
Status Area	Provide a read-only area to report on past and current activity.	http://ajaxpatterns.org/Status_Area
Timeout	Terminate session after inactivity.	http://ajaxpatterns.org/Timeout

Pattern Name	Description	Reference
Unique URL	Provide unique URLs for significant application states, to facilitate bookmarking.	http://ajaxpatterns.org/Unique_URLs
Writing a Review	User wants to share her opinion with others about an object (place, person, thing) in greater detail than a simple rating.	http://developer.yahoo.com/ypatterns/atoz.php

Table 4: Data View Design Patterns

Pattern Name	Description	Reference
Data Grid	Sorting, filtering and editing data tables.	http://ajaxpatterns.org/Data_Grid
Expand in Context	Bring details into the immediate context of the selected object.	http://www.cs.helsinki.fi/u/salaa_kso/patterns/Expand-in-Context.html
Fisheye	Show all details in context by distorting the view	http://www.cs.helsinki.fi/u/salaa_kso/patterns/Fisheye.html
Item Pagination	The user needs to view data items from a potentially large set of sorted data that will not be easy to display within a single page.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=itempagination
Overview Beside Detail	Show detail in context by splitting the visible area into an overview and a detail view.	http://www.cs.helsinki.fi/u/salaa_kso/patterns/Overview-beside-Detail.html
Virtual Workspace	Cache a browser-side view of parts of a large server-side data space, to reduce bandwidth requirements.	http://ajaxpatterns.org/Virtual_Workspace

Table 5: Editing Design Patterns

Pattern Name	Description	Reference
Auto Complete (Also called "Suggestion")	The user needs to enter an item into a text box which could be ambiguous or hard to remember and therefore has the potential to be typed incorrectly.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=autocomplete http://ajaxpatterns.org/Suggestion
Editable Table	Table in which entries can be edited and rows can be sorted continuously.	http://www.cs.helsinki.fi/u/salaa_kso/patterns/Editable-Table.html
Text Editing	Edit large blocks of text.	http://ajaxpatterns.org/Rich_Text_Editor
Live Form	Similar to an Editable Table, a Live Form supports continuous update of elements of a form.	http://ajaxpatterns.org/Live_Form
Malleable Content	Structure Web pages in terms of small, individually editable chunks.	http://ajaxpatterns.org/Microcontent

Table 6: Hierarchies, Sets & Navigation Design Patterns

Pattern Name	Description	Reference
Breadcrumbs	User needs to navigate potentially large quantities of information efficiently, without becoming lost.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=breadcrumbs
Drilldown Menu	Guides users through a menu hierarchy by presenting menu and submenu items next to each other.	http://ajaxpatterns.org/Drilldown
Groups & Items	Handle two sets with many-to-many connections	http://www.cs.helsinki.fi/u/salaa kso/patterns/Groups-and-Items.html
Module Tabs	The user needs to navigate through one or more stacked panes of content without refreshing the page.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=module tabs
Navigation Tabs	The user needs to navigate through a site to locate content and features and have clear indication of their current location in the site.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=navigation tabs
Tree	A visualization of a hierarchy.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Tree.html

Table 7: Layout Design Patterns

Pattern Name	Description	Reference
Page Grids	Web sites have a need for consistency amongst common page elements, page width, division of space, ad usage and code base.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=grid
Page Rearrangement	Alter page layout to reflect user tasks.	http://ajaxpatterns.org/Page_Rearrangement

Table 8: Object Display, Selection & Manipulation

Pattern Name	Description	Reference
Animate Transition	Designer needs to communicate that an object is changing its spatial relationship within the page.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=animate http://ajaxpatterns.org/One-Second_Motion
Brighten Transition	Designer wants to make a previously dimmed object a point of focus by making the object bright again.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=brighten http://ajaxpatterns.org/One-Second_Spotlight http://ajaxpatterns.org/Highlight
Collapse Transition	The designer needs to communicate that an object is no longer of primary importance, yet wants to keep it available in a smaller form.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=collapse
Cross Fade Transition	Designer wants to communicate that a new view of an object is replacing the previous view of the object.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=crossfade

Pattern Name	Description	Reference
Cursor Invitation	Designer needs to cue the user that an object can be interacted with.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=cursorinvitation
Dim Transition	Designer needs to communicate that an object is of secondary importance.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=dim
Display Morphing	Dynamically update display elements based on context.	http://ajaxpatterns.org/Display_Morphing
Mutate	The general case of more specialized patterns in this table, such as Collapse Transition, Cross Fade Transition, etc.	http://ajaxpatterns.org/One-Second_Mutation
Double List	Select items from one list, move them to another.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Double-List.html
Drag & Drop	The user needs to re-arrange the layout of modules on a Web page directly with the mouse.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=dragdropmodules http://ajaxpatterns.org/Drag-And-Drop
Drop Invitation	Designer needs to indicate valid candidate drop sites during a drag and drop operation.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=dropinvitation
Expand Transition	Designer needs to show the detail of an object in its context or reveal a previously collapsed object.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=expand
Fade In Transition	Designer needs to communicate that an object is being added to the page or application.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=fadein
Fade Out Transition	Designer needs to communicate that an object is going away.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=fadeout
Hover Invitation	Designer needs to cue the user about what will happen when the mouse is clicked on the hovered object.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=hoverinvitation
Master and Instances	Some changes should affect all instances of a kind of object, other changes should affect only a particular instance.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Master-and-Instances.html
Pile of Items	Create an item by pulling it from a pile.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Pile-of-Items.html
Slide Transition	The designer wants to bring new content into the page and would like to communicate the additional content's relationship with other items on the page.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=slide http://ajaxpatterns.org/One-Second_Motion
Spotlight Transition	Designer needs to call attention to where a data value or content has changed within the interface.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=spotlight
Tool Tip Invitation	Designer needs to cue the user about what will happen if they click the mouse on the hovered object.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=tooltipinvitation

Table 9: Save & Undo Design Patterns

Pattern Name	Description	Reference
Auto Save	The system automatically saves data	http://www.cs.helsinki.fi/u/salaa kso/patterns/Autosave.html
Deleted Data Storage	Retrievable storage of deleted data	http://www.cs.helsinki.fi/u/salaa kso/patterns/Deleted-Data-Storage.html
Global Undo	Reverse user actions wherever they occurred in the system	http://www.cs.helsinki.fi/u/salaa kso/patterns/Global-Undo.html
Object Undo	Reverse user actions with respect to the selected object only	http://www.cs.helsinki.fi/u/salaa kso/patterns/Object-Specific-Undo.html
Placeholder	Save a short-cut (bookmark)	http://www.cs.helsinki.fi/u/salaa kso/patterns/Placeholder.html
Temporary Storage	Save data temporarily (e.g., a on a clipboard)	http://www.cs.helsinki.fi/u/salaa kso/patterns/Temporary-Storage.html

Table 10: Search Design Patterns

Pattern Name	Description	Reference
Continuous Filter (Also called "Live Command-Line"; the "Live Search" pattern referenced here is very similar.)	Search in which results are updated and displayed continuously. Non-matching items are filtered out.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Continuous-Filter.html http://ajaxpatterns.org/Live_Command-Line http://ajaxpatterns.org/Live_Search
Data Storage	Save results of search.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Data-Storage.html
Continuous Highlight	Search in which results are updated and displayed continuously. Matching items are highlighted, non-matching items are present for context.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Continuous-Highlight.html
Search Pagination	The user needs to view a set of search results ranked by relevance that is too large to easily display within a single page.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=search_pagination
Rule Storage	Save search criteria	http://www.cs.helsinki.fi/u/salaa kso/patterns/Rule-Storage.html

Table 11: Time Design Patterns

Pattern Name	Description	Reference
Calendar Strip	A continuous calendar for operating with dates.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Calendar-Strip.html
Schedule	A calendar visualization for possibly overlapping events.	http://www.cs.helsinki.fi/u/salaa kso/patterns/Schedule.html
Self-Healing Transition	Designer wants to show that an object has been removed from a list of objects.	http://developer.yahoo.com/ypatterns/pattern.php?pattern=selfhealing

Table 12: Widget Design Patterns

Pattern Name	Description	Reference
Slider	Support choosing values in a range (e.g., for search or rating tasks).	http://ajaxpatterns.org/Slider

Glossary

Common Web and Ajax-related acronyms and terms include:

- **Ajax (or Ajax):** Asynchronous JavaScript and XML
- **DOM:** Document Object Model.
- **CSS:** Cascading Style Sheets
- **DHTML:** Dynamic HTML
- **HTML:** HyperText Markup Language
- **RIA:** Rich Internet Application
- **URL:** Universal Resource Locator
- **XHR:** XMLHttpRequest
- **XML:** Extensible Markup Language

About JackBe / For Further Information

JackBe Corporation is a pioneer and industry leader at the center of the Ajax/SOA market. Founded in 2001 and headquartered in Chevy Chase, Maryland, JackBe's goal from the outset was to enable the next generation of browser-based applications.

JackBe is the first to integrate the desktop-like interactivity of Ajax with the flexibility and reusability of SOA to deliver complete Rich Enterprise Applications (REA). Just as the client/server paradigm enabled a leap beyond monolithic mainframe applications, JackBe's REA solutions deliver dramatic new opportunities for creating and delivering powerful business applications over the Web.

JackBe already counts among our satisfied clients more than 35 industry leaders worldwide supporting more than four million end users. Our deployments and deep expertise span the financial and information services, government, online commerce and telecommunications sectors.

Visit our website at <http://www.jackbe.com> to learn more about our Ajax/SOA solutions. Then give us a call at 240.744.7620 to talk about your specific needs and goals for your Web applications—and let us put our proven products, services, and expertise to work for you!