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Information Architecture

Wei Ding
Xia Lin

Synthesis Lectures on Information Concepts, Retrieval, and Services

Gary Marchionini, *Series Editor*

Information Architecture

The Design and Integration of Information Spaces

Information Architecture: The Design and Integration of Information Spaces

Wei Ding and Xia Lin

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Information Architecture

The Design and Integration of Information Spaces

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ABSTRACT

Information Architecture is about organizing and simplifying information, designing and integrating information spaces/systems, and creating ways for people to find and interact with information content. Its goal is to help people understand and manage information and make right decisions accordingly. In the ever-changing social, organizational and technological contexts, Information Architects not only design individual information spaces (e.g., individual websites, software applications, and mobile devices), but also tackle strategic aggregation and integration of multiple information spaces across websites, channels, modalities, and platforms. Not only they create predetermined navigation pathways, but also provide tools and rules for people to organize information on their own and get connected with others.

Information Architects work with multi-disciplinary teams to determine the user experience strategy based on user needs and business goals, and make sure the strategy gets carried out by following the user-centered design (UCD) process via close collaboration with others.

Drawing on the author(s) extensive experience as HCI researchers, User Experience Design practitioner, and Information Architecture instructors, this book provides a balanced view of the IA discipline by applying the IA theories, design principles and guidelines to the IA and UX practices. It also covers advanced topics such as Enterprise IA, Global IA, and Mobile IA.

In addition to new and experienced IA practitioners, this book is written for undergraduate and graduate level students in Information Architecture, Information Sciences, Human Computer Interaction, Information Systems and related disciplines.

KEYWORDS

information architecture, user experience design, content management, user-centered design methodology, interaction design, usability, global IA, mobile IA, navigation design, design for persuasion and engagement, search interface design, enterprise IA

Wei's Dedication:
to her grandmother Peiying Sun,
who always lives in her heart.

Xia's Dedication:
to his parents, Lin Yue-sheng and Wang Zhu-rong.

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The reviewers, who remain anonymous, provided candid and insightful feedback to us, which have been incorporated into the book.

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Wei Ding and Xia Lin
October 2009

Preface

The term Information Architecture (IA) was coined by a brick and mortar architect Richard Wurman in the early 1970s as a profession of "gathering, organizing, and presenting information". The rising of the World Wide Web accelerated the information explosion and created the real needs for the profession to help more people find and manage useful information online. However, the debate on Little IA vs. Big IA never seems to have settled. Some people argue the Information Architects (aka little IAs) are only associated with taxonomy, metadata, thesaurus and other "information findability" related tasks. Meanwhile, others believe that IAs (aka big IAs) are responsible for synthesizing all data and information from the business and users, and crafting user experience vision and design solutions. This book holds the "Big IA" view and sees "Little IAs" being one of the IA specialties.

The authors believe that the continuous evolution of the Web makes it possible to support more sophisticated interactions and user activities, the level of depth and breadth of the corresponding information architectural work has been increasing accordingly. At the same time, it brings the convergence of multiple disciplines as User Experience (UX) Design, including usability/human factors, interaction design, graphical design, information architecture and many more.

The convergence calls for higher level of seamless collaboration among all the disciplines, but it does not eliminate the needs for IA work. Instead, information architecture work spreads from traditional Web design to digital devices, applications, and many other places. Information Architects are part of the TEAM determining the user experience strategy based on user needs and business goals, and make sure the strategy gets carried out via the collaboration of multiple disciplines by following the user-centered design (UCD) process.

Drawing on the authors' extensive experience as User Experience Design practitioner, HCI researchers, and Information Architecture instructors, this book outlines a balanced view of the IA discipline by connecting practitioner's real world experience and IA/UX practices to human information behavioral theories, design principles and guidelines. In addition to demonstrating the conventional IA deliverables, techniques and tools, this book emphasizes that information architecture is about the design and integration of information spaces (both digital and physical) that are bigger than and beyond the Web.

Uses of the Book

This book is a result of our teaching of a graduate level course on Information Architecture at Drexel University for a number of years. The content has been constantly updated to incorporate the latest developments in the field. The objective of the course is to introduce fundamental IA concepts, theories, processes and techniques, in the context of user-centered design, to graduate

students majored in Library and Information Science as well as in Information Systems. We cannot stress more that the essential point of learning for this course is by practicing via group projects and individual assignments. As the book was originally written as lecture notes, we believe it is most suitable to be used as textbook for similar courses in other schools. The key features of the book include concise discussions structured around each topic and the balanced coverage of theoretical and practical issues. As Drexel's courses are quarter courses typically include 10 lecture weeks. We have conveniently structured the book in 10 chapters, one for each week. The content for each week can be easily expanded when used for a semester course, however.

User experience practitioners should also find this book useful and inspiring. We hope this book can help bridge the gap between the community of practice and of the academia.

Structure of the Book

The book covers the following topics:

- Information Architecture: Past, Current and Future

Chapter 1 discusses the definition of Information Architecture in the context of the Web evolution and its impact on the way people interact with information, which leads to the convergence of multiple disciplines overlaying with IA. Chapter 2 takes a historical perspective to examine the evolution of the Web and identifies new challenges and opportunities for the IA discipline in the context of Web 2.0 and post-Web 2.0.

- IA Process and Methodology

Chapter 3 introduces IA steps and workfolks in the context of the User-Centered Design methodology, which is the prerequisite for conducting any information architecture practices.

- IA Foundations and Design Principles

As the core of the book, Chapters 4, 5 and 6 are dedicated to the IA key concepts and foundations including information organization and navigation; human information behavior and the corresponding design implications, as well as interaction design principles and best practices. These chapters incorporate the latest development in the field and reflect the current state of knowledge for usability researchers and user experience design professionals.

- Enterprise IA and IA in Practice

Via a set of longitudinal case studies a large financial company, we discuss our real life experience about how to create and execute enterprise Intranet strategies and how to establish online workspace integration solutions for different institutions.

The IA practice section provides practical guidance and advice on how to position the IA and UX teams in organizations to create business values by focusing on user needs.

- Advanced IA Topics

Advanced IA topics include global IA (Chapter 8) and mobile IA (Chapter 9). Chapter 8 discusses implications of user experience design in multiple languages and different cultures, and provides insights and solutions for internationalization and localization of Web design.

Chapter 9 starts with characteristics of mobile devices and the corresponding design challenges. We then discuss usability best practices based on today's mobile technologies and introduce a vision of the future mobile user experience, which creates seamless integration between the physical and digital spaces.

- The Future of Information Architecture

Chapter 10 identifies IA trends and future directions, urges IA researchers and practitioners to work together to continue to promote and grow the discipline. The chapter ends with a revisit of the IA definition used throughout the book.

Wei Ding and Xia Lin
October 2009

CHAPTER 1

Information Architecture Concepts

In this chapter, we are going to cover the following topics:

- The Definition of Information Architecture.
- Evolution of the Web and Web Design.
- User Experience Design: The convergence of IA and Related Disciplines.

1.1 THE DEFINITION OF INFORMATION ARCHITECTURE

Not surprisingly, like many other emerging disciplines, there exists many definitions of Information Architecture. Here are a few examples:

1.1.1 WURMAN'S DEFINITION OF INFORMATION ARCHITECT

One cannot talk about Information Architecture without mentioning Richard Saul Wurman, who coined the term "Information Architecture" or, at least, brought it to wide attention in the 1970s. Wurman was trained as an architect and skilled at graphical design, but "making information understandable" has been "the singular passion of his life." He sees the problems of gathering, organizing, and presenting information as closely analogous to the problems an architect faces in designing a building that will serve the needs of its occupants. His definition of information architects emphasizes the *organization* and *presentation* of information:

Here is Wurman's definition of "Information Architect" [117]. *"(1) the individual who organizes the patterns inherent in data, making the complex clear. (2) a person who creates the structure or map of information which allows others to find their personal paths to knowledge. (3) the emerging 21st century professional occupation addressing the needs of the age focused upon clarity, human understanding, and the science of the organization of information."*

Wurman explains, "I mean architect as used in the words *architect of foreign policy*. I mean architect as in the creating of systemic, structural, and orderly principles to make something work." The job of information architects is more focused on "making the complex clear" through better organization and presentation of information.

1.1.2 ROSENFIELD AND MORVILLE'S DEFINITION

Rosenfield and Morville [87], took a multi-perspective approach to define information architecture:

- The structural design of shared information environments.
- The combination of organization, labeling, search, and navigation schemes within websites or intranets.
- The art and science of shaping information products and experience to support usability and findability.
- An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.

The first definition is very broad and emphasizes "structural design." The 2nd definition specifies the scope of Information Architecture. However, the context here is "within websites or intranets." The third highlights the relationship between Information Architecture, usability and findability. The spirit of IA as a discipline is well represented in Definition 4 – bringing principles of *design* and *architecture* to the *digital landscape*. It also explains why Information Architecture became a discipline in the web environment although the IA related work had been existing long before the World Wide Web era. And it continues to evolve.

1.1.3 THE DEFINITION USED IN THIS BOOK

Here is our own definition: Information architecture is about organizing and simplifying information, designing, integrating and aggregating information spaces/systems; creating ways for people to find, understand, exchange and manage information; and, therefore, stay on top of information and make right decisions.

Information architects not only design individual information spaces (e.g., websites, software, applications, intranets) but tackle strategic aggregation and integration of multiple information spaces including all channels, modalities, and platforms. They not only organize information but also simplify information for better understanding. Finally, the goal of IA design is not only to support people to find information but to manage and use information.

This definition also explains why the whole book is covering all the chapter/topics. We will revisit this definition at the end of the book.

1.2 THE EVOLUTION OF THE WEB AND WEB DESIGN

The rising and rapid evolution of the Web has brought many opportunities and challenges for the users and designers. The user population has grown exponentially from originally academic users to virtually everybody from young children to elderly people. The user needs have expanded from viewing information only to taking actions and contributing to the site's information architecture.

At the same time, user expectations of the Web, websites and search engines have risen accordingly. For example, more people expect search engines to be answer engines – giving the answer right away instead of just showing pages that have potential to find answers; people assume

that any answer should be available on the Web. The Web is no longer just made up of hyperlinks for people to browse; it is the place for people to hop on as a routine, conduct daily activities, connect with others, and experience and influence the world.

As the breadth and depth of people's interaction with the Web evolves, the boundaries between the physical world and cyber space are blurring. The needed information architecture work – organizing information, connecting information, objects and its intended users, identifying pathways for people to navigate, creating tools and rules for people to organize information on their own and collaborate with their others, and integrating and aggregating various information spaces, applications, platforms and channels – becomes so critical and ubiquitous. At the same time, because the cyber space is so much intertwined with every aspect of people's life, information architecture alone can no longer fulfill all the sophisticated user needs – the information needs to be relevant and understandable; the space needs to be organized and explorable; the interaction needs to be efficient and engaging; the overall experience needs to be pleasant, effective, engaging and trustworthy.

To accomplish these goals, information architects need to work closely with many other disciplines to ensure all the issues are taken care of and all challenges are met. Only when all the related disciplines fully leverage their expertise and skillsets, the overall user experience can be made possible. This brings the convergence of multiple disciplines as User Experience (UX) Design [27], including usability /human factors engineering, interaction design, graphical design, information architecture and many more.

1.3 INFORMATION ARCHITECTURE AND RELATED DISCIPLINES

Although many of the above-mentioned disciplines got originated in different contexts aiming to solve different problems, the evolvement and expansion of the Web are bringing them together. *Usability Engineering* is primarily concerned with human computer interaction, and its goal is to make sure the user interface allows the user to accomplish their tasks effectively, efficiently and satisfactorily. Usability engineering started before the Web era by focusing on the usability of software user interfaces. The Web explosion makes it applicable to all Web applications and websites.

Human Factors Engineering is the discipline of applying what is known about human capabilities and limitations to the design of products, processes, systems, and work environments. Originated from designs of airplane pilot's dashboards, hardware or physical products, human factors professionals obviously now apply their expertise to the Web platform.

Interaction Design is a broad concept that goes beyond computer interface design. Any design that involves people's input and the product's response can be categorized as interaction design, including home appliances, electronics, and even electronic car dashboards. However, the interactivity between the user and the system in software user interface and Web applications is so rich and omnipresent that we cannot talk about Web design and user experience without mentioning interaction design. In the cyberspace, it is getting very hard to separate *information architecture* from *interaction design* because they are both concerned with defining the system and user behavior, giving

users controls to make sense of things, take actions, and to accomplish certain things. Some people try to differentiate the two by emphasizing that interaction designers can show the dynamic interactions between the user and the system. Information architects can do the same thing if needed. It all depends what can best demonstrate the user experience concepts. People in different organizations may get different titles, but the truth of the matter is certain people on the project teams need to worry about the functional behavior of the system and of the user. These people are doing information architecture and interaction design type of work.

Recently there is a school of thought that argues that IA is not a profession. "There are no information architects, and there are no interaction designers. There are only user experience designers" [87]. In our perspective, this is not to deny the existence of Information Architecture discipline but a desire to strengthen it. The important message in this statement is, though, to call for synergy augmentation between two subcommunities which really belongs to the same big community. Although Interaction Design and Information Architecture came from different contexts and background, they are both landing on the same Web wonderland and beyond. They both have been transformed because of today's technological and social contexts where neither group had previous experience.

Visual design does not only concern itself with the aesthetical aspect of the information space and the user interface. Good visual design clarifies communication and makes the information and interaction easier to understand. Visual designers make the best use of the visual language, such as colors, shapes, layouts, spacing, alignments and styles, to help reinforce the communication between the system and the user, express emotions, trust, and personalities of the site or application and engage the user in a positive way. Visual designers bring great principles, theories, and best practices accumulated in the print world. By closely working with other disciplines, they help transform design concepts to pixel perfect screens.

In this book, we argue that information architecture is one of the most important elements in the user experience design, and the information architecture work serves as the glue to stick all the related puzzle pieces together. From a user-centered design process perspective, information architects get involved in the process from the beginning to the end:

- They work with the business to help establish business vision and strategy about the website, the intranet, or the online workspace.
- They work with user researchers/ usability engineers to identify the right research methods and determine the research goals and objectives. Also, they digest research findings and transform them into specific design concepts.
- They work hand in hand with interaction designers to define the interaction model and system behavior. They determine the system functionality and connections between information objects and workfolks.
- They work with visual designers to create user experience visioning screens upfront and later convert design concepts into final designs with all visual details in place.

- They also work with development and testing teams to make sure the design gets implemented and functions as they are intended to.

With above being said, we think information architecture has been having and will continue to have a great role to play in the user experience design practices. As information access, sharing, creation, organization, management and consumption become people's lifestyle, the collaboration among all disciplines will become even more critical and necessary.

CHAPTER 2

Information Architecture and Web 2.0

The Web is a living thing. Although it only has a short history, its content and look, as well as its design and technology, have all gone through several generations of changes. In this chapter, we will highlight major changes of the Web and characterize how the Web evolved from simple html pages to today's Web 2.0 and post-Web 2.0 era. We will then take a close look at the connection and impact of Web 2.0 to information architecture.

As we are working on this book, we also realize that the world is moving into post-Web 2.0 or Web 3.0 period. Thus, while the discussion in this chapter is still focused on Web 2.0, we introduce some post-Web 2.0 concepts, examples, and issues. Arguably, post-Web 2.0 can be characterized by small, fast, and customizable applications that get distributed virally (e.g., via social networks, such as Facebook, and Google Wave) and can be embedded into many places.

2.1 THE CHANGING WORLD WIDE WEB

2.1.1 THE SIZE AND GROWTH OF THE WEB

According to W3C World Wide Web Consortium, the first general release of WWW happened on May 17, 1991 [1]. Since then, the Web has grown at an exponential and unstoppable rate. Table 2.1 shows some estimated numbers about the size of the Web (according to [77, 75, 78, 114, 53]).

Table 2.1: The Growth of the Web

Year	1999	2001	2003	2005	2007	2009
Number of Webpages (in millions)	4	550	3,024	11,500	20,000	45,000

How big is the Web today? Take a look at `http://www.worldwidewebsize.com/`. The site provides an up-to-date weekly calculation of the size of the Web based on the estimation of the web pages indexed by Google, Microsoft Windows Live Search, and Yahoo Search and Ask.

2.1.2 THE DEEP WEB

While the total number of Web pages indexed by popular search engines is astonishing, they do not account for all the Web pages available. Many dynamic web pages generated from databases and documents contained in various digital collections are not visible to the Web search engines. The documents and Web pages not indexed by the search engines, the so-called deep Web, were estimated to be 400 to 550 times larger than the "surface Web"—the Web that we commonly access

through Web search engines [6]. Furthermore, the deep Web often provides highly relevant, highly structured, and high quality information for topic-specific information needs [34, 116].

2.1.3 THE DYNAMICS OF THE WEB

The frequency of Web page changes is another topic of research on the dynamics of the Web. Studies show that web pages are removed or replaced from the Web at a very rapid rate [54, 73]. Between the time the indexing was done and the time a search is conducted, many changes have happened. In one research, Cho and Carcia-Molina analyzed more than 720,000 pages on a daily basis over 4 months and found that 40% of the pages changed within a week, while 23% of the business pages (i.e., `.com` domain) changed daily [3]. In another study, Ivory and Megraw found significant design pattern changes over time after they examined 22,000 pages over 1,500 sites between 2000 and 2003 [9].

2.2 GENERATIONS OF THE WEB

The evaluation of the Web is often characterized by several generations, typically called Web 1.0, Web 2.0, and Web 3.0. Using different criteria one might get different views of the generations. Here, we identify several features from the IA perspective to help distinguish and compare the generations. Table 2.2 is a summary of the main features of the Web generations and a cross-comparison by these features across the generations.

As the table shows, the Web has become more capable and powerful over generations. The later generation continues to improve over the earlier generation. However, within a generation, later changes may not always prove to be better, especially when they are not driven by user needs and usability. For example, in some earlier years of this millennium, we may have noticed that many websites were full of unnecessary animations and graphics that detracted from the purpose of the site.

2.3 WEB 2.0

Web 2.0 has been one of the hottest topics discussed and explored on the Web. In this section, let's discuss in more detail the Web 2.0 definitions, applications, and its potential.

Definitions of Web 2.0

There are many ways to define Web 2.0. Here are several definitions of Web 2.0 that are relevant to our discussion:

- Web 2.0 is "about design patterns and business models for the next generation of software," by Tim O'Reilly, who coined the term.
- Web 2.0 is about "Web as platform" where software applications can communicate via application programming interfaces (APIs) and RSS (Really Simple Syndication) technologies

Table 2.2: Three Generations of the Web

	Web 1.0	Web 2.0	Web 3.0 (Post-Web 2.0)
Purpose and Motivation	Web presence and eCommerce	User participation (e.g., wikis, digg); Harness the collective intelligence.	Connect data contextually and semantically
Platform	Windows is the platform. Web is supplemental	Web is the "platform"	Linked Data is the "platform"
Major Ways of Information Access	Web directories (e.g., the original Yahoo!) and earlier search engines (e.g., Lycos, InfoSeek, and AltaVista)	Search engine with popularity-based ranking (e.g., Google); Aggregators	Context-sensitive and personalized searching Semantic web
Personalization and Customization	On individual sites	+ User controlled customization across sites, e.g., site aggregators	Context sensitive personalization
Information Architecture	From less structured links to Pre-determined structure provided by the site owner	Web 1.0 IA + Emergent IA based on user activities/ participation	Integration of displays, content structure, linked data, and usage data
Navigation	In-line Links, Frames Predetermined global + local + associative navigation	Web 1.0 Navigation + Dynamic navigation based on participation	Context-based browsing and linking
Look and Feel	Text only →Graphics →Frames →Tables	Stylesheets with consistent look and feel, branding design, user experience design	Xslt-stylesheet based RIA-interaction and user experience design
Web Applications	Page-based application	Server-driven web applications and precompiled desktop Web applications.	Boundary of Web pages and Web applications gets blurry
Content and Interaction	From static content to Database-backed dynamic content	Rich Internet Applications (RIAs) without unnecessary page refreshing	Distributed linked data; interacting with multiple web applications concurrently
Modalities and Media Type	From Text only To Multimedia from content owners (audio, video, images)	Multi-modalities and channels aggregated by the web (e.g., IM, Video Conference, digital devices)	Aggregation of content, data, and services from multiple sources/sites
User Activities	Going to multiple sites via directories, portals, or search engines. Information seeking	User contributing content and tags. Stay connected in communities based on common interests via participation	Being notified through context-based feeds (filters). Cross-community interaction

and about "a read and write Web" for users. This definition was given by Joshua Porter, a Web developer and designer at UIE, on his blog site at `Bobkardo.com`.

- Web 2.0 is "about giving complex powerful applications with guidelines (not rules) to armatures and make them act like professionals," by Jeff Veen, a former Adaptive Path co-founder and current Google user experience designer.

- Web 2.0 is "about making the global information available to local social contexts and giving people the flexibility to find, organize, share, and create information in a locally meaningful fashion that is globally accessible," by Danah Boyd, a Yahoo researcher.

Table 2.3 shows some specific examples to help you distinguish Web 1.0, Web 2.0 and even Post-Web 2.0.

Table 2.3: Web 2.0 Definition Examples

Business Area	Web 1.0	Web 2.0	Post-Web 2.0
Advertising	DoubleClick	Google AdSense	Viral distribution of small, fast, and customizable applications via multiple channels (e.g., computers and devices)
Photo Sharing	Ofoto	Flickr	
Content Distribution	Akamai	BitTorrent	
Music File Distribution	`mp3.com`	Napster	
Encyclopedia	Britannica Online	Wikipedia	
Personal Presence	Personal websites	Blogging, microblogging	
Event Organization	Evite	upcoming.org and EVDB	
Internet Presence	Domain name speculation.	Search engine optimization	
Traffic Metrics	Page views	Cost per click	
Content Push	Publishing by owner	Joint content creation with user participation	Applications embedded into multiple places
Content Management	Content management systems	Wikis	
Content Organization	Directories (taxonomy)	Tagging ("folksonomy")	
Content "Push"	Stickiness	Syndication	

Source: Web 2.0: Hype, Reality, or the Future? (`http://rallenhome.com/essays/essay4.html`) (2005).

There are many visual summaries of the Web 2.0 and post-Web 2.0's linked data. It is interesting to compare the original Web 2.0 meme Map that summarizes examples and attributes of Web 2.0 to the "official" linked data project map that shows how more and more linked data projects are linked together (Figure 2.1).

2.3.1 WEB 2.0 APPLICATIONS AND PRODUCTS

Many Web 2.0 applications and products have a direct impact on what we do with information architecture:

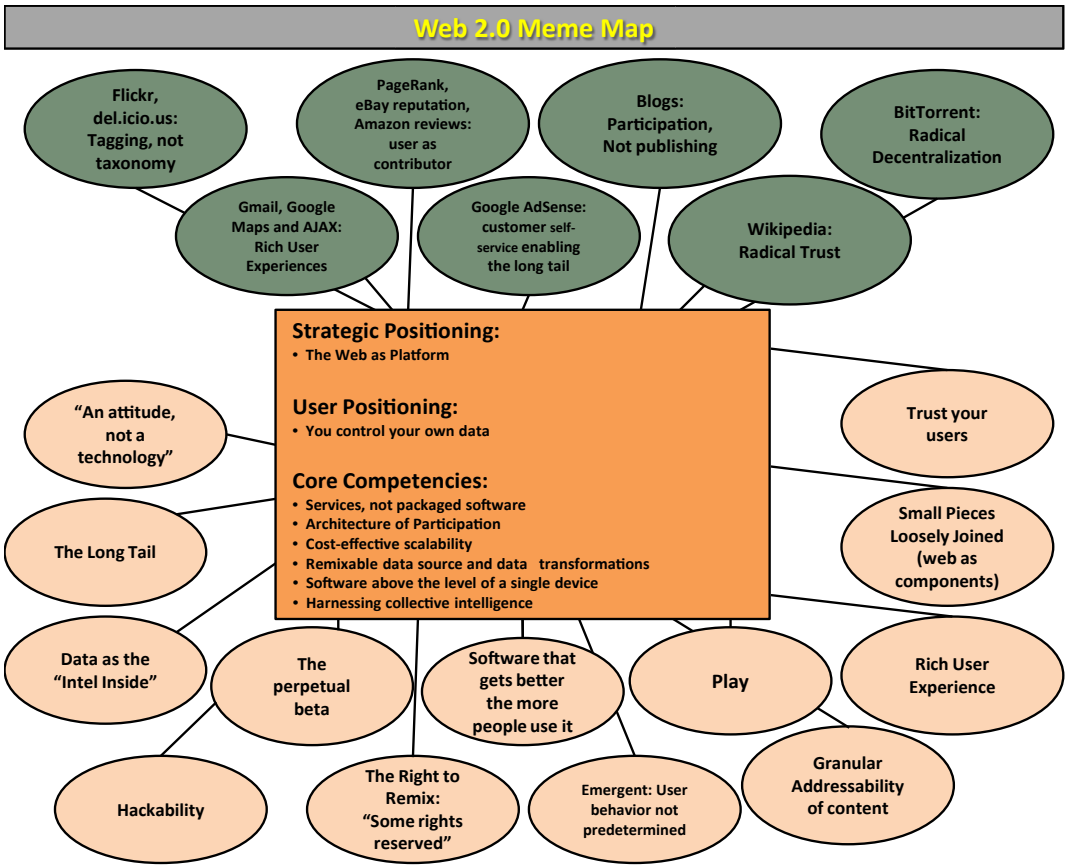


Figure 2.1: Visual representation of Web 2.0. Fig. 2.1(a) based on Tim O'Reilly's Mem Map of Web 2.0.

- Wikis, blogs, and social network applications.
- Tagging and folksonomy.
- Mashups.
- Personalization and websites aggregators.
- Web office applications (design issues).
- Rich Internet Applications—media type integration.

It is worthwhile to mention that though many of these applications came into existence long before the Web 2.0 concept, they become more popular and central in the Web 2.0 era.

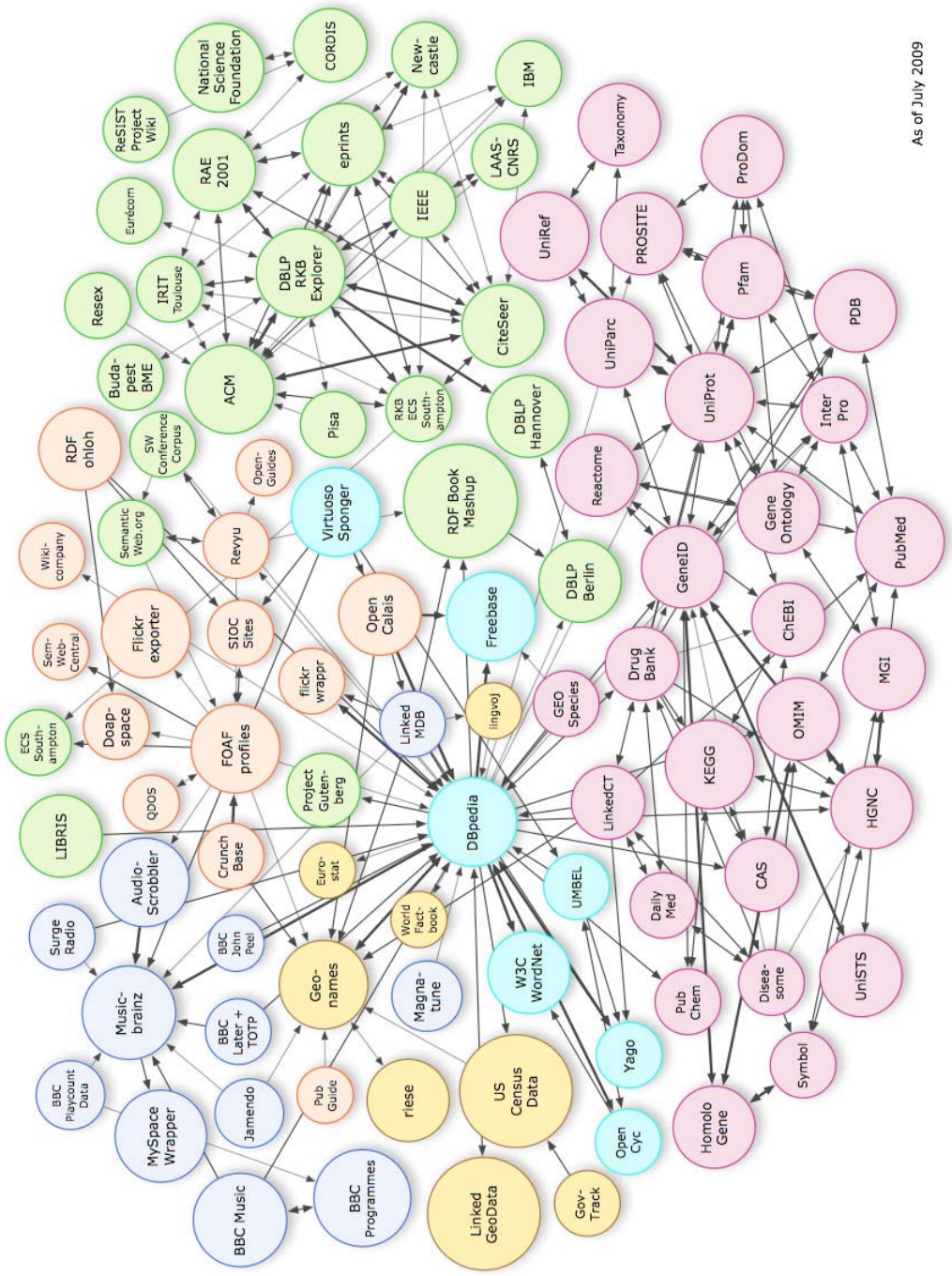


Figure 2.1: Visual representation of Web 2.0. Fig. 2.1(b) The map of linked data projects.

Wikis, Blogs, and Social Network Applications

Compared with other Web 2.0 applications, wikis and blogs (although they existed during the Web 1.0 era) are more driven by the user. The site provides a platform for individuals to easily express themselves, share ideas with other people, get feedback and contribute to the public knowledge base in a very dynamic manner. While wikis adopt a democratic model for people to freely collaborate, blogs allow bloggers and visitors to actively participate via "conversations." This is significantly different from the Web 1.0 model in which content is provided by a lower percentage of "authorities" or site owners whereas the majority of the people are passive consumers. Company blogs are a creative way for the business to engage and communicate with their customers in a more casual environment.

The simplicity of the user interface also lowers the barrier between the bloggers and their readers (usually just an input field or two and an edit/save button).

Social networks are powerful tools to connect people with all different types of interests in different settings, including social and business environments. Just like the social tagging sites, the content of the sites is contributed to by the user while they are participating. The richer the data the site owns, the more attractive it becomes to new users. While the user benefits from being part of the network, the site owner accumulates a large amount of user data which could become extremely valuable business intelligence information for profitability. That is also one of the reasons why pioneering entrepreneurs are motivated to build and host social websites. However, from a user's perspective, it could become a serious privacy threat. MySpace, was the #1 popular website based on web traffic, was rated as the worst website by PC World a few years ago. How to strike a good balance between engaging users and safeguarding their privacy is a big challenge for the business of social websites. (Facebook is now the # 1 social network site and #2 highest traffic site.)

Note there are different types of social network sites, some of which support comprehensive network building, whereas some only focus on a specific way of sharing. Some sites are adding the social networking aspect in the context of the user performing certain tasks, such as Netflix, which is a good example of differentiating designing for usefulness or cool features.

Example sites are listed below:

Wiki Sites	Blogging Hosting Sites	Social Network Sites
Wikipedia	WordPress	**General:**
wikiHow	Blog.com	Facebook
Wikinews	Blogger.com	mySpace
Wikibooks		orhkut (google)
Wikitravel		Yahoo!360
Wetpaint		Flickr, etc.
		Specialized:
		LinkedIn (business, career)
		Expensr (financial)
		Wasabe (financial)
		Mint (financial)
		Last.fm (music)
		LibraryThing (books)

Tagging and Folksonomy

Social tagging is another new trend of Web 2.0. Social tagging allows users to collaboratively contribute and categorize resources using freely chosen keywords. While "tags" is a synonym of keywords in classical information retrieval systems, folksonomy is a framework of the tagging systems, as opposed to professionally developed, well-structured hierarchical taxonomies (such as library classification systems) with controlled vocabularies. Folksonomies are unstructured and contributed by users in a free form. However, they have attracted tremendous amount of attention in the information architecture and related communities.

Examples of social tagging sites include:

- Del.icio.us.
- Flickr.
- IMDb (the Internet Movie Database).
- CiteULike.
- Furl.

Unsurprisingly, there have been different schools of thought on folksonomies. While many people think folksonomies will replace taxonomies to offer new ways for people to find, discover, and share information, others are concerned about its messiness, tagging motivation issue, scalability and global applicability. We will have more discussions in later chapters to compare tagging and taxonomies.

User-Controlled Information and Websites Aggregation

Thanks also to the remixibility of Web 2.0 technologies, many portal sites now allow users to control what information goes to their own pages. On general portal sites, the user can subscribe to news feeds and blogs, add tools and services, and even link application/sites to different pages and arrange them in a meaningful way for personal use. On certain specialized sites, such as bank or other financial investment sites, the user can aggregate and track their credit cards and billing information, or track all their investment assets from different sources. The well-known personal aggregation sites include but are not limited to the following:

- Netvibes.
- Pageflakes.
- iGoogle.
- Yahoo.

The following shows examples of types of information or sites that are available from the public portals for aggregation.

Tools: Search tools, instant messaging tools, calculators, sticky notes, to-do lists, dictionaries, etc. For example, netvibes allows the user to put Google, Yahoo, and MSN search bars on the user's homepage (or another personal page) so that the user can use any search engine without going to the specific site.

Dynamic information tracking: News, events, traffic (both commute and web), weather, product prices (airplane tickets, stock price, eBay items), latest information from other sites/applications (such as email systems, flickr, digg, technorati). The user can set up certain parameters as filters to make the information more relevant and manageable. For example, when adding "Digg" to the portal page on netvibes, the user can choose a specific topic of news being recommended in Digg and set up how many news should be displayed.

Similarly, on the intranet behind the firewall, many institutions allow their users to customize their pages by selecting and arranging content components. A good example is DrexelOne, a web portal used at Drexel University to allow all the students and university employees to access university-related information, from course registration, course materials, to financial aids and payrolls, and many others. Individual users can customize and select the content components shown on their screens. They can subscribe various community news, add/remove content channels, and add new tabs or other layout fragments to change the views, etc. The portal is an aggregation of many different systems and web applications. Depending on types of users (i.e., students, faculty, staff), users will have access to different data and applications. Again, the applications/sites aggregation efforts started in the Web 1.0 era, but the Web 2.0 technologies have high potentials to make them less costly and happen more easily.

As the Web continues to expand exponentially, these aggregation features show great promise in helping users track, filter and discover, and manage information and tasks.

Mashups

Mashup technologies allow the developers to create new applications to better support user tasks by simply assembling existing programming codes and data in an innovative and effective way. Examples of well-known mashup applications include:

- Housing Maps uses Google Maps to show housing information listed on craigslist.
- `SimplyHired.com` integrates Google Maps, DMB for company information, LinkedIn for career and social networking data, and `payscale.com` for salary estimation.
- ChicagoCrime.org shows publicly accessible crime information on Google maps.
- LibraryThing is a social book cataloging site, which allows the user to catalog their own books using cataloging data from Amazon, Library of Congress or other libraries. Users can also tag and organize them, share book reviews, or find a copy from a particular library.

In addition, there are also websites that empower end users to directly mash applications up on the fly without having to write any computer programming. Examples include: Popfly (by Microsoft) and Yahoo Pipes.

Web Office Applications

Web office applications often remind us of one of the definitions for Web 2.0—Web as the platform. Almost all the client-server applications we are using now have Web versions. Very soon all the software on the computer will be Web-based. Two good examples of web office applications are Google Docs and Zoho. Both offer a whole set of "office applications" and web-based collaboration groupware.

Thanks to the recent technological breakthroughs with Rich Internet Applications, especially the Ajax technology, most Web-based application offers very similar or even richer user experience like their desktop counterparts with powerful interaction features. Compared to the latter, most Web office applications have stronger support for collaboration and they are easier to publish.

Web-based office applications allow multiple users to view and edit the same document at the same time. This support is a major advantage of the web-based office applications. It enhances document-sharing and collaboration significantly. There are also disadvantages or issues related to the web-based applications, however. The first is that web applications have to stay within the Web browser. It thus needs to architect the controls and functionalities in an innovative way to match the menu structure in desktop applications. For example, in any Windows desktop application, one can easily switch between active files displayed in the file list through some menu item while knowing which file is which, but there is no equivalent mechanism in the main stream Web browser.

The second is that web-based applications require online login in order to use them. Security issues and privacy become typical concerns. For public applications, all the user files are going to reside in Google or other application owner's servers, which could cause privacy and security problems.

Rich Internet Applications

Rich Internet Applications (RIAs) combine the strengths of desktop applications (rich interaction) and traditional web-based applications (wide reach of web-based access). RIAs allow the user to directly interact with items on the screen and receive immediate system feedback while the data flows seamlessly in the background between the server and browser client. The page does not have to refresh to respond to the user's interaction.

Some RIAs came into existence during Web 1.0 time. They are mainly screen-based and built with Java, Flash or other similar technology. Examples include the earlier Broadmoor Hotel Reservation and `Nike.com's` shoe configuration tool. Most of the today's RIAs are Ajax-based. Ajax-enabled applications are much easier to implement comparing to the screen-based RIAs.

RIAs are not another type of applications parallel to the ones we have discussed above. Instead, it is enabled by a set of technologies (including Javascript, XML, Xhtml, and CSS) to support the user (with the appropriate design) to interact with the system more instantly and effectively. For example, the user can finish a natural work flow without being interrupted by page refreshing. Most of the Web 2.0 sites we mentioned above have RIA features, such as the following:

- Direct manipulation (e.g., drag and drop to move objects/components around on the page).
- Immediate system feedback/messaging for error handling or contextual help.
- Automatic completion for data entry (based on the beginning part of the words or phrases the user types).
- Improving system response time and minimizing unnecessary clicks.
- Changing views without refreshing the page.
- Overwritten contextual right mouse-click.
- Mouseover objects to show additional information.
- Automatic save.
- Click to edit without separation between viewing and editing.

RIAs can be very powerful, flexible and useful to the user when designed and implemented appropriately. Although the Ajax-driven coding is more complex than using the Web 1.0 technologies, the high availability of public APIs allow the developers to implement design at a quicker pace. It is critical for all the project team members to understand though that the ultimate goal of implementing RIAs is not for the coolness or richness feeling but the usefulness to the user. Without a clear understanding about what RIAs are really good for, an over-enthusiastic RIA redesign on your site may risk the user experience and defeat the purpose.

We will discuss more about the RIA features and identify the appropriate fields of use later in the context of interaction and navigation design.

2.3.2 SUMMARY OF WEB 2.0

Although many Web 2.0 components have been there since the very beginning of the Web, in the new context of technology and information environment, they start to change the way people access, contribute to and use Web resources. The following attributes can be used to summarize the spirit of Web 2.0.

User-Centered

- User generated content via wikis and blogs has become a very important portion of the overall web content and of the public knowledge base.
- Folksonomy or user-generated metadata provides alternative or supplemental ways for people to search, discover and organize web resources.
- Aggregated user activities become valuable data, which can be used as business intelligence information to help companies better align their services and products with user needs, build brands and drive loyalty.
- User-centered innovative design has been very critical to the success to any Web-based business since Web 1.0 or even earlier, such as eBay, Yahoo and Amazon. Services and products out of user-centered design are also helping Google retain its unmatchable competitive position among peers.
- The concept of user-controlled Web experience continues to evolve. With website aggregators, the users now have much more flexibility to customize relevant content from different sources. RSS allows the user to determine when to get what information.

Open and Connected

Web 2.0 companies place greater emphasis on openness and transparency in development process, technology and business models. Open services (public APIs), open technology, and open intellectual property generate great opportunities for new value-added businesses (e.g., mashups) to emerge built upon existing businesses, especially in this Web 2.0 booming phase.

Simple and Fast Paced

Many popular Web 2.0 sites/applications have a simple focus and function really well in terms of meeting user needs, like Delicious, Flickr, and Writely. They may eventually get acquired by larger companies and be incorporated into a broader context to serve for more consolidated user experience.

As a mainstream Web 2.0 technology, Ajax is considered light weighted compared to the Web1.0 technologies, such as Java and Flash, and, therefore, the development process gets shorter and more agile.

Decentralized, Distributed, and Participatory

Blog content gets generated in a decentralized form and RSS allows the blog content to be distributed to many other sites. Wikis are created based on participation. Mashups make the logic of established sites or applications work in distributed mode.

2.4 CHALLENGES AND OPPORTUNITIES FOR THE IA AND DESIGN COMMUNITY

There are both challenges and opportunities for information architecture in the Web 2.0 and post-Web 2.0 eras. Web 2.0 applications provide new ways for people to access, manage and use information via appropriate design. As Web 2.0 become more user-centered, the user-centered design approach and methodology that information architects and Web designers have been relying on will get more recognition and appreciation. We as IA professionals will likely have bigger impact in our organizations. At the same time, as the Web 2.0 application process gets faster paced, allowing quick tactical movements while ensuring the IA strategy still hold together is going to be a challenge for us.

In addition, with virtually unlimited capabilities of the new technologies, there is a risk that designers will go wild to make design more technology-driven instead of user needs and usefulness driven. We need to keep a good balance between ensuring usability and taking advantage of new technologies. Specifically, we need to strike a good balance between the following things.

2.4.1 GIVING USERS CONTROL VS. GIVING UP ON DESIGN

It is a good intention to give users control when organizing their own content because they know their own content the best. Let's go back to the examples of website aggregators (e.g., Google, Yahoo, and Netvibes). What role do we information architects or Web designers play there then? There are at least four areas we could work on there:

- Providing means for the user to organize information (tabs/pages, columns, may enabling column sizing in the future?)
- Organizing all the available content in a meaningful way so that the user can easily discover and identify content of interest.
- Helping the user deal with the content: Reminding them of the components that are already added on their personal page(s), understanding what each new component is about, and making the decision about removing or adding content.
- Providing means to introduce the Ajax new feature (such as drag and drop) which first time users don't necessarily expect to have. (Keep in mind that in most cases people don't read textual helps on the screen.)

In short, giving users control does not mean the designer jobs get eliminated. Instead, information architects assume more responsibilities to empower the users to take control.

2.4.2 LEVERAGING CONTENT FROM OTHERS AND EXPECTING OTHERS TO USE YOUR CONTENT

RSS, mashups, and aggregators help users organize, filter, and discover information in many powerful ways. The user, therefore, could minimize visits to your site while still accessing your content. Does the site architecture become less important because of this? No. It only means that the site needs to be more flexible to meet various needs, and the focus should be put on the page-level design. You should expect others to pull your content pieces and even to repurpose them. How to wrap your content with appropriate branding information is going to be a new challenge.

On the other hand, you also need to think about how to best leverage content from other sites to build cohesive user experience on your site.

2.4.3 TAXONOMY VS. FOLKSONOMY

It is not about one replacing the other but how to combine the best of the two. Figuring out a way to encourage your content providers and users to contribute to the folksonomy and make good use of it. This will strengthen your taxonomy and enhance information findability and discovery for your users. Don Norman [43] calls folksonomy as taskonomy in his recent article about Activity-Centered Design and suggests providing both taxonomies and taskonomies. He argues that the "logical, carefully organized information structures (taxonomies)" support global information needs outside of real daily use. One a particular item has been selected, taskonomic information appears. For example, if examining a pair of pants, the website might suggest shoes and shirts that match. …Buy a book, and the website suggests other books on related topics, or sometimes, books purchased by other people who also bought the book under consideration. Such recommendations based upon past behavior are often superior to recommendations based upon logic.

2.4.4 STANDING ON THE GIANT'S SHOULDER AND MANAGING RISKS OF DEPENDENCY

The mashups are trying to build their own success upon established applications. While they enjoy the free services from the business partners with lower cost and lower barriers to entry for new customers, site owners and designers also need to be aware of the tradeoffs: You will rely on partner's service level; that could mean to limit your design options to partner's specification and development schedule. Certain APIs are also severely limited.

2.4.5 USING OR NOT USING WEB 2.0

As Jared Spool stated [72], Web 2.0 is "a collection of approaches, which are all converging on the development world at a rapid pace. These approaches, including APIs, RSS, folksonomies and social networking, suddenly give application developers a new way to approach hard problems with

surprisingly effective results." However, this does not mean that user problems and business problems can now all be taken care of easily. While technologies play a critical role in building these applications, meeting user needs should always be the ultimate goal. The success of using Web 2.0 technologies will still rely on the right business model as well as the usefulness to the user.

Web 2.0 is strong in many aspects, but there are also many limitations. For instance, large corporations and institutions may stay away from enabling tagging on their sites as they feel that some "unchecked tags" might damage their brand or reputation. Tagging is also not feasible for many sites when they lack a critical mass of users. There are also other elements missing from Web 2.0, such as personal information management, security, and privacy, just to name a few.

The notion of "platform of participation" is accelerating the information creation exponentially. However, Web 2.0 has yet to provide means to support personal information management accordingly. While searching and book-marking being the primary methods for finding and revisiting information on the Web, the user's dependency on the content owners gets higher and higher. We need to figure out how to ensure the availability and stability of the distributed content for all the users on the Web. Related to this, building effective personal information management systems to help people put information in use should go hand in hand with information creation. While users are attracted to various innovative Web 2.0 sites and leave large amount of information there at this booming stage, consolidation of all the information will need to take place sooner or later.

As mentioned earlier, security could be a big challenge to many Web 2.0 applications. From an individual's perspective, some people think Web 2.0 will end your privacy. There is a concern that the more you participate on the Web, the more your privacy will be given up, and the more likely you are exposed to spamming and even crimes. Think about the Web office applications. If the user has to store all personal files on the server owner's site, there will be a serious issue, even if just temporarily.

Social, political, cultural, and ethical issues may well come into play also.

2.5 SUMMARY

In this chapter, we discussed how the Web grew and evolved from the earlier generation of simple html pages to Web 2.0 and to post-Web 2.0 era. We then took a close look at Web 2.0, its concepts, its components and applications, and its impact on information architecture and Web design. Although an in-depth discussion is beyond what we can cover within one chapter, we hope that the discussion in this chapter will motivate you to explore the connections between the current context and IA and to experience how the concepts and techniques of Web 2.0 would transform your IA and web design experience. We will revisit some of related issues later when we get into the specific IA context.

CHAPTER 3

IA Research, Design and Evaluation

Creating complex websites requires an interdisciplinary team involving business sponsors, user researchers, visual designers, software developers, project managers, content writers and other experts. In order for everyone to collaborate effectively, a structured development process must be agreed upon. The process may vary from project to project depending on many factors, but the ultimate goal should be the same: Increase the business value of the design and meet the user needs. In this chapter, a user-centered design and development (UCD) process for information architecture will be discussed. The process emphasizes that research, design, and evaluation are three iterative activities that should be embedded in every stage of the IA development. A well-defined design and development process is repeatable and re-usable, and it leads to higher quality outcomes.

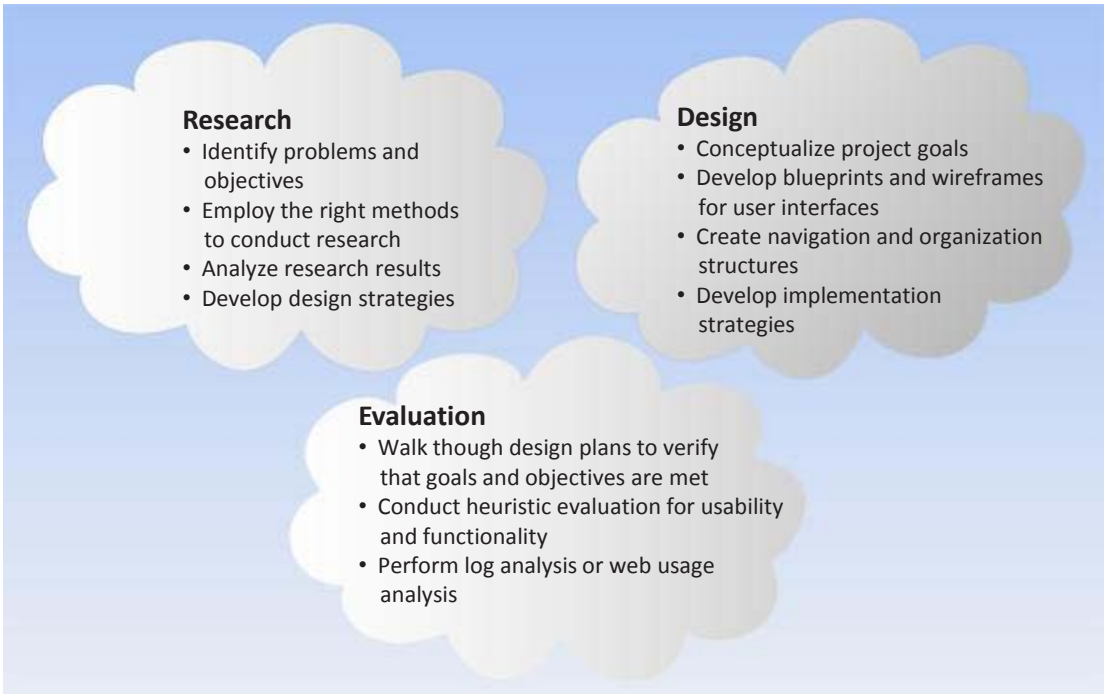


Figure 3.1: Three clouds of IA process.

3.1 RESEARCH

3.1.1 THE NEED FOR RESEARCH

Any design process requires significant research activities. For information architecture, research is needed for the following:

- Lay foundation for the IA strategy and actual design work.
- Prepare a collection of relevant objective data, facts, best practices and design principles that help the team stay focused, serve the same goal, and understand the design rationale.
- Save money and avoid unnecessary mistakes. Spending time on research will help shorten the durations of the downstream phases and therefore shorten the overall timeline of the project.

Focusing on different aspects, IA research can be further divided into sevel sub-areas:

Background research (understand the problems and challenges as well as the goals and objectives; develop short-term and long-term goals; learn existing technical infrastructure; develop schedules and budgets, etc.).

Communication channels research (interview and develop working relationships with stakeholders, management team, technical team, intended users, etc.).

Content research (learn who creates, maintains or updates content, who owns what content, how content is used currently, etc.).

User needs, tasks and their environment (understand culture, work flow, and sophisticate levels of users).

Benchmarking (include both competitive benchmarking and before-and-after benchmarking. The best time to start benchmarking surveys or research is before the project starts).

Outcomes of the IA research are clearly stated objectives of the IA project/program, and one or several research summary reports on users, in addition to, the content and the context of the program/project, which serve as the data to support the strategy rationale and justification.

3.1.2 RESEARCH METHODS

IA research will need to focus on context, content, and user, the three IA components discussed in Chapter 1. Morville and Rosenfeld [61] provides an excellent summary of research tools and methods. We reproduced their summary in Figure 3.2

Instead of describing these methods and tools here, which you can read from Morville and Rosenfeld's book, we provide a detailed comparison of selected research methods in Table 3.1 with pros and cons as well as appropriate uses. The goal is to help you select the best method for your research purposes. Note that some methods are usually combined together to be more effective. In

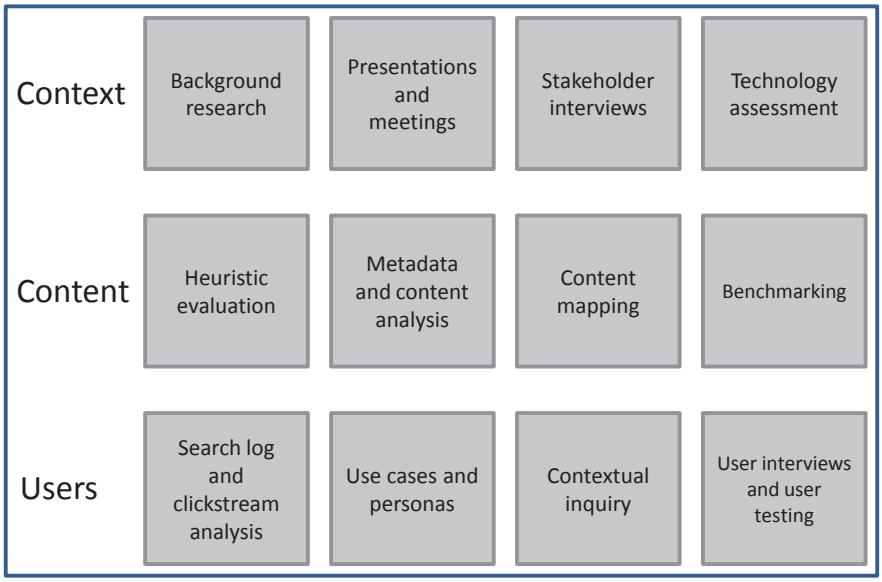


Figure 3.2: Research methods in information architecture (based on [61, p. 234]).

general, to choose the right research method or methods combination, one needs to consider a set of criteria from the sample size, nature of data, purpose of research to time and resource constraints.

We do not include "Personas" and "Personarios" in the table because they are more of a design tool that is created based on certain research methods or their combination. They are discussed in the next section.

3.1.3 USER PERSONAS AND PERSONARIOS

User personas are fictional characters created to represent different user types. Personas are developed as an aggregate of real users based on research data about the users. In other words, user personas are created via various research methods and can be used to communicate the data collected from these methods.

A persona has a name, occupation, social status, interests, expectations, goals, stories and tasks. Personas serve as a design tool to help the design team understand the user and aid design decisions. Personarios are the combination of persona and the associated realistic scenarios. In general, most personas cannot be used effectively without the contextual scenarios.

The persona concept was first introduced to the user interface design field by Allan Cooper [14]. He notes that designers often have a vague or contradictory sense of their intended users and may base scenarios on people similar to themselves. Personas can help the designers stay

Table 3.1: Comparison of IA Research Methods

Research Methods	Pros and Cons	Best Used for…
Survey	**Pros**: Reach many people without geographical barriers.* **Cons**: Low response rate. Ambiguity in question and/or answer (no clarification). Subjective (self-reporting) and retrospective (subject to error).	Collect preferences and opinions from one or many large group(s).
Interviews	**Pros**: No ambiguity, can ask follow-up questions to probe unexpected topics or clarify issues. Easy to conduct. **Cons**: Subjective and retrospective (subject to error).	Understand business stakeholders and their objectives. Gain quick understanding about issue, problems and questions based on verbal report (can be used following observation or usability testing for clarification).
Focus Groups	**Pros**: Like a group interview. Can reach multiple people at the same time. Participants may be inspired by each other and provide more valuable opinions and ideas. **Cons**: Participants' opinions may be influenced by others. Out of context of the task.	Collect opinions, ideas and visioning data. Good for high-level starting points and trend data.

* Geographical barriers are no longer a major issue with the advances of telecommunication technologies.

Continues.

Table 3.1: Comparison of IA Research Methods *(Continued)*

Research Methods	Pros and Cons	Best Used for…
Observations/Contextual Inquiry	**Pros**: Data gathering takes place in the context of user's work. Data is more concrete based on in-the-moment experience. Data is more objective, natural and gathering is less intrusive. May discover unanticipated issues. **Cons**: Opportunistic, time-consuming, large amount of data, analysis takes time.	Understand user tasks based on behavior. Understand user's working environment.
Usage Statistics, Log Analysis, Technical/Customer Support	**Pros**: Data is objective and rich. May discover in-depth information about user failure. **Cons**: Sheer volume of data. Need coding or special software to do analysis.	Identify usage patterns and find problems that need research. For example, search log analysis can help leverage user search language to augment the controlled vocabulary, and identify popular queries and even IA problems (when the site navigation is confusing, the user may use search as the last resort). Use technical support center logs to identify common user problems.

Continues.

Table 3.1: Comparison of IA Research Methods *(Continued)*

Research Methods	Pros and Cons	Best Used for…
Usability Testing	**Pros:** Rich data both verbal and behavioral. Materials being tested can be low or high fidelity. **Cons**: Lab setting and artificial tasks may decrease the value of the data. Like observations, hard to reach a large number of participants due to the time-consuming nature.	Effective in identifying design defects in site organization, labeling, navigation as well as page details. Usually combined with post-session interview for clarification.
Card Sorting (free listing, open/close card sorting)	**Pros**: Powerful tool can be used both qualitatively and quantitatively. **Cons**: Quantitative analysis needs special software. Results need to be presented in a meaningful way to clients.	Best used for building IA structure and studying users' mental models combined with other methods before or afterwards. Terms can be created based upon results from many other research methods, such as interviews, observations, and log analysis.

focused on the user, avoid designing for one's self, or avoid designing for needs that don't really exist. Personas have been adopted for information architecture and website design as well.

3.1.3.1 Use of Personas

There have been different practices in using personas:

- Using personas to create a rigorous form of user model, based on behavioral patterns that emerge from ethnographic research. Personas can be used to represent the key behaviors, attitudes, skill levels, goals, workfolks and the environment of real people. Personas also lay the foundation on which to build user scenarios. The two are then used to guide the system's functionality and design.

- Conducting quantitative analysis based on personas to determine and prioritize system/product features to be built. Pruitt and Grudin [81] use "persona-weighted feature matrix" to help the development team to determine what features and capabilities the system should have.

- Using personas as a medium for communication. As described by Pruitt and Grudin [81], while comprehensive user research reports provide valuable insights into design, many team members may not actually read them through or end up remembering very little about them. When the results are represented by personas, they can engage team members more effectively. Personas utilize the power of narrative and storytelling to enhance attention, memory, and organization of detailed user data. They also invoke the human mind's powerful ability to extrapolate from partial knowledge of people to create coherent wholes and project them into new settings and situations. Once the team gets familiar with the personas, they will be able to easily make inferential conclusion in new situations.

- Considering personarios as one of the many drivers for design. This kind of practice is slightly different from Cooper's in that it acknowledges that many other pieces of research data may not best fit into the persona structure (e.g., the business and technological context, and the metadata issues, etc.).

Using personas is best when it is impossible to list exhaustively all the user types and characteristics. When there is a possibility to get complete statistics about users, the comprehensive user profiling approach might be more appropriate to use.

3.1.3.2 Benefits of Personas

Personas is both a design tool and a communication tool. Its main benefits include the following:

- Help team members share a specific, consistent understanding of various audience groups. Data about the groups can be put in a proper context and can be understood and remembered in coherent stories.

- Help to create criteria to check how well various team members' solutions meet the needs of target users. Features or functions can often be prioritized based on how well they address the needs of one or more personas.
- Provide a human "face" so as to focus empathy on the persons represented by the demographics.
- Create a good container to hold majority of the research data through the comprehensive persona document.

3.1.3.3 Personas Construction

Constructing personas is a dedicated process. Special attention is needed to the following:

- Start with the right research and build personas around the identified behavioral patterns.
- Determine how much information can be fictional and how much should be based on real data.
- Avoid resume-like personas, and separate persona posters (for communication with other teams) and the comprehensive persona document with references (for designers themselves).
- Beware of the strengths and constraints of personas and use them appropriately.

3.2 DESIGN

Design is the process of making use of the research data to create concrete action plans. In the context of information architecture, design is parallel to research in many ways. Table 3.2 shows a parallel comparison of actions between IA design and research.

Table 3.2: Comparison of IA Research and Design

Research	Design
Identify problems/objectives	Conceptualize project goals.
Employ the right methods to conduct research	Develop blueprints and wireframes for user interfaces.
Analyze research results	Create navigation and organization structures.
Develop design strategies	Develop implementation strategies.

Design is also iterative and often includes sub-phases like conceptual design (with low fidelity prototype or wireframes), logical design (high fidelity) and documentation. Usability tests can be conducted at the end of each sub-phase, and the findings are used to further enhance the design.

3.2.1 DESIGN METHODOLOGY

The most prevailing design methodology for information architecture is User-Centered Design (UCD). Although some others might call it "customer-center design" [109] or "contextual design" [7], the ideas are the same—the user must be the center of focus during the whole design process. The user here can be customers or workers, current users or potential users, public users or internal users. Website designers must carefully consider all of these users to improve usability and maximize effectiveness.

An international standard, ISO 13407: Human-Centered Design Process for interactive systems [42], has been established to provide guidance for UCD activities throughout the life cycle of a system or product development. The standard specifies four general user-centered design activities:

- Understand and specify the context of use.
- Specify user and organizational requirements.
- Create design solutions through iterations.
- Evaluate design solutions against requirements.

The ISO 13407 can be applied to all kinds of interactive systems, including software applications, websites, services, and other interactive products. In the next section, we will translate these general activities into specific design process for websites. Before we do that, we need some discussions to clarify potential misconceptions about UCD.

UCD puts the user in the center. However, it does not mean that UCD minimizes the influence of other players such as executives, companies (business goals), technologies, and designers. It is important to clarify the following potential misunderstandings.

UCD does not mean focusing only on user needs and ignoring business goals and market opportunities.

Instead, UCD helps designers align business goals with user needs. In either a commercial or non-commercial setting, a user's activities help achieve business goals. How do you resolve a conflict between the user needs and business goals? Reconcile the two through prioritization. For example, suppose that one of the business goals is to reduce the cost of customer services whereas the user need is to have help available at anytime. What are the implications for the design? The direct implication is to provide easy-to-use, easy-to-understand, online contextual help in addition to the centralized comprehensive FAQ section or Help Center so that the user needs for manual help are minimized. This is the ideal situation. Nevertheless, some scenarios may still arise in which the user needs to directly contact a live person from the site. Then the prioritization comes into play. Option 1 is based on the conclusion that the business goal has higher priority than the user needs. Therefore, the designer may decide not to make any customer service phone number (or instant messaging, click to chat or video conferencing features) visible, or even not available at all to the user. Option 2 is based on the opposite conclusion and always having their contact information (e.g., click to call or chat) highly visible and easily accessible in the right context. Which one is the right choice? It really depends on the situation. Depending on the business model, company culture and other

factors, some companies (e.g., financial companies) are more likely to think direct contact increases opportunities to earn more business from the user while others deem cutting manual support as the #1 business priority.

UCD does not mean that the design is against new technologies or changes.

Technology-centered design is like preparing a meal by equipping the kitchen with utensils and then ignoring quality of ingredients. Without a thorough understanding of the user needs and the use of the information, it is hard for the design to provide value to the user and the business. At the same time, it is critical for design professionals to be sensitive to the new capabilities of available technologies and leverage them to improve the user experience and design. Sometimes, certain technology may change the way people interact with the website or any system, and managing changes is always a challenge for Web design. For example, RIA technologies promised to improve the user experience by making the interaction more immediate, direct and less cumbersome. Although it may take time for the user to get used to the change, designers should consider creating suitable paths for the user to overcome initial barrier to take advantage of the technology (when appropriately implemented). The key is to find the best match between problems at hand and the right technology.

UCD does not mean that users themselves can best design the sites for their own use.

UCD is really about the design driven by user needs. Users are usually very good at telling what problems they have; they do not necessarily always have good solutions. Here is a Henry Ford's famous quotation: "If I would have asked my customers what they wanted, they would have asked for a faster horse." It is true that many popular websites originated from personal uses, such as YouTube and Facebook, but in general, it is the designer's and the information architects' responsibility to clearly understand the user problems and user needs, and transform them into robust design solutions. One might remember the classic episode of The Simpsons, where Homer meets his long lost brother, gets to design his dream car, and eventually ruins his brother's business. That story tells us what might end up with when users try to design for themselves.

3.2.2 DESIGN PROCESS

Figure 3.3 illustrates the design process for information architecture. There are two parallel themes in the design process: One is the UI design and the other is the metadata and controlled vocabulary design. In most cases, the two should go hand in hand. For example, when designing a search capability, the UI piece looks fairly simple (usually composed of a search box for quick search, a link to advanced search, and the results display page), but the majority of the work is behind the scenes. Without appropriate metadata schema, search engine, relevance ranking mechanism or controlled vocabulary, search could easily fail the user. We will discuss searching and metadata more in later chapters.

Let's take a close look at the iterations of the design for the UI piece. While most of the work behind the scenes is done by information architects, webmasters and content people, the upfront UI design involves information architects, visual designers, user/usability researchers and many other experts (e.g., interaction designers if there is such a role in the organization in addition to

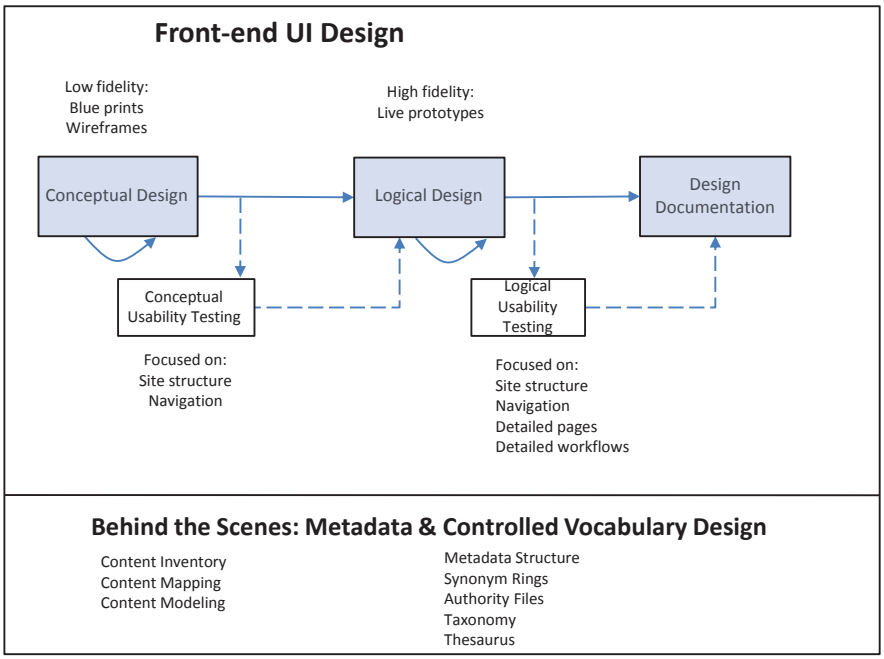


Figure 3.3: Detailed view of the design process.

information architects). Although the UI design constantly evolves and reiterates, it is still meaningful to differentiate the high level conceptual design from the more detailed (could be pixel-perfect) logical design. The conceptual design is more focused on the site structure and navigation—whether the user can easily tell where they are or what they can do, whether the labels make sense, and where else they can go from here. Visual details and specific interactions are often handled during logical design. Usability tests are recommended at the end of each sub-phase to help further validate the design with a sample of targeted users. The feedback is then incorporated into the next sub-phase. (Usability testing has been widely adopted for website/user interface evaluation. More appropriate usability tests may be conducted before and during the design phase. The key is to test early so that problems can be identified and fixed early, more easily and less expensively.

In many companies and organizations, the user-centered design process (UCD) has been embedded into the overall system/application development process. While the information architects conduct conceptual designs (sketching design concepts), the business client and business system analysts gather requirements. The design concepts (along with the design vision out of the design strategy) are often used to guide the requirement gathering activities and the requirements in turn help refine the design. Only after all the business requirements are officially gathered, reviewed and finalized, can realistic commitment be made by the IT team to the business client.

Having official business requirements will greatly benefit the design work. The following defines what the requirements will do:

- Ensure that the system's expected behavior is captured, documented, and understood by both the business client and the IT project team.
- Define boundaries of the system.
- Provide basis for more precise estimation of costs and schedule.
- Establish and maintain agreement with business stakeholders on what the systems should do.

3.2.3 DESIGN DELIVERABLES

Information architects (along with other experts) create many deliverables during the design phase, some of which are for within-team uses and some for external uses:

- For conceptual design: Blueprints (or high-level IA diagram), wireframe (rough), work-flow diagrams/story boards.
- For logical design: Detailed wireframe and prototype. Used for various design reviews and user tests.
- Final documentation: UI specification document, detailed navigation diagram, and detailed IA diagram. They are meant for the developers to fully implement the design.

A good set of examples of design deliverables is provided by Fulcher, Glass and Leacock [26]. Figure 3.4 provides two examples of design diagram for the Drexel University iShcool home page.

3.2.4 FROM DESIGN TO IMPLEMENTATION

Some people may think once the design documentation is handed over to the development team, information architects and designers can move on to another project. In reality, it is hardly that ideal. Although the major development team members might have been closely involved since the very beginning (at least from the requirements/conceptual design phase), and reviewed different versions of the design and the UI Specification documents, there are always some technical constraints identified in the last minute or during the implementation process, which prevent the design from being implemented as specified.

The designer needs to work with the implementation team throughout the implementation and evaluation phrases of the project. During the implementation stage, if the technical constraints cause changes in business requirements (the agreement between the IT shop and the business client) and, therefore, in the UI design, it often needs to go through a change control process. If it only affects the design, the issue should be documented in the UI Specification document. The designer and the development team should then work together to come up with the best alternative solution. At the end of the implementation phase, although there is a specialized testing team (or quality

assurance staff) focused on testing, the designers and information architects often need to validate the implementation and provide feedback to the development team.

3.3 EVALUATION

While Website analysis and evaluation is a huge topic and deserve another entire book to discuss, here we only focus on its use for continuous design improvement or major redesigns. As critical as understanding the mission and objective of the site before building it, the post-site evaluation and usage monitoring can further explain how well the design meets the business goals and user needs. More importantly, it provides data to drive the redesign effort.

3.3.1 DESIGN WALKTHROUGH

There have been a lot of discussions around information architecture evaluation. The paper "Evaluating Information Architecture" by Steve Toub in 2000 [104] is a typical starting point, especially for us to understand the challenges the earlier design professionals were facing when most organizations did not conduct website evaluation. Note this paper talks about IA evaluation in various design phases, and our focus here is for the purpose of redesign and continuous site improvement.

Compared to the situation described in the paper, the website design practice has come a long way. More attention is being paid to the overall success of the user experience, good design guidelines are getting adopted, and design patterns are emerging cross sites. A lot more companies have their own in-house information architects and designers. Successful companies benefiting from their user experience designs, such as Google, eBay, and Yahoo all have dedicated staff dealing with the web usage data, analyzing user feedback, and tracking web metrics. However, as we are all aware, there are still many poorly-designed sites up there frustrating the user and suffering from business losses as well. Why? There are still many sites without clear visions and understanding about what their goals are and what their user needs are. There are still sites violating design guidelines and against best practices. In addition, people's expectation of the Web usability is getting higher and higher. When users develop some good experience with well-designed websites, they become less tolerant of poor design and they are more likely to abandon websites that are not up to date to today's usability standards.

Evaluating the Website as a whole from usability and overall user experience perspectives will provide valuable feedback to the design team. The Toub paper discusses these aspects of information architecture evaluation: Evaluating structure, grouping, and labeling systems. These are variants of the usability evaluation technique—heuristic evaluation with a focus on the IA components.

3.3.2 HEURISTICS EVALUATION

Heuristic evaluation is a usability engineering technique that allows design professionals to identify design problems against a formal or informal set of design guidelines (heuristics). It has been widely used for website evaluation as well as other interactive system evaluations. The concept of heuristic

evaluation was first developed by Jakob Nielsen [66] based on his years of experience in teaching and consulting about usability before the Web era. Nielsen has published several books and articles on website evaluation and is considered as "the world's leading expert on Web usability" (if you have never visited his site, you should at least spend some time on `http://www.useit.com` and browse through some articles there).

In his books "Designing Web Usability: The Practice of Simplicity" [67] and "Homepage Usability: 50 Websites Deconstructed" [68], Nielsen outlines 113 guidelines for ensuring homepage usability. Figure 3.5 shows examples from the Homepage Usability book. Some of them might seem to be "common senses," but it is useful to list them out as a checklist when you evaluate a Website. Note many of them are not only applicable to the homepage design but to the whole web site as well. When evaluating websites, it is helpful to set balanced focuses on the homepage and interior (detailed) pages. There has been some debate around which page is more important to the user (homepage vs. interior pages). While Nielsen stated that "homepages are the most valuable real estate in the world" earlier, his latest user research (in his recent book "Prioritizing Web Usability" [71]) does show that people spend more time on interior pages (between 45 and 60 seconds) than homepages (between 25-35 seconds).

3.3.3 WEBSITE LOGS AND WEB USAGE MINING

For most of Web re-design projects, website logs provide an abundance of information about how people have been using the sites and where they are running into problems.

Even the simplest site logs track who visited the sites over a given time, how many pages were requested for viewing, and many other variables. These data represent the real-world behavior and interests of the user in their natural environments. By analyzing the web usage data, designers can better identify the pattern of user behavior and intentions, assess whether their Web-based services are fulfilling the intended purpose, and then make the redesign decisions accordingly. The quantitative nature of the web usage data can empower the designers to communicate ideas and convince their business clients more effectively.

The following table comes from Diamonds' article Web Traffic Analytics and User Experience [18], which gives a great list of possible metrics that are typically used for site analysis. Keep in mind, it is critical to select the metrics that are aligned with the site evaluation or redesign objectives.

Web usage mining has attracted much attention from different fields. It became "a methodology for the extraction of knowledge from data." Due to its huge potential of commercial benefits to the business (site owners), They can be used for the business to align its marketing strategy with the specific user needs, personalize services and product offerings, and make recommendations (e.g., cross-sales and up-sales) based on usage behavior.

In addition, the search log can also be used to get insights into design problems of the site. If your web log shows search is the most important feature of your site, that does not necessarily mean your users are search dominant (unless it is a search engine site). Instead, a very likely reason could be

Table 3.3: Matrices for Site Evaluation (from Diamond, [18])

BASIC SITE METRICS		
Metric **Overall Site Metrics**	**Description**	**Reason**
Total site visits Total site visitors/users	Number of visits the site received Number of individual visitors the site received (based on cookies)	Trending and basis of additional calculation Trending and basis of additional calculation
Total site page views	Number of pages viewed on the site	Trending and basis of additional calculation
Average time spent per visit	Usually a minutes:seconds of average visit length	Trending and basis of comparison
Referring pages	Key sites/links that the user used to get to the site	Strategic review of advertising, partnerships and search engine optimization
Page-level Metrics		
Visits/visitors to page	Number of visits and visitors each page received	Trending and basis of additional calculation
Page views	Number of page views each page received	Trending and basis of additional calculation
Visits to page as entry page Visits to page as exit page	Number of visits to the page that were the first page view of the site Number of visits to the page that were the last page view of the site	Identify where users entered the site Identify were and how users exit the site
Average time spent on page	Length of time on average that was spent viewing this page	Trending and basis of additional comparison
Single access page	Number of visits to the site that included ONLY the page	Indentify whether page is useful, or is turning users away
Clickstream	Pages looked at prior to and after target page	Understand the links and user path to the core page

that the users got so confused by your site's structure and navigation, and they used search as the last resort to find information. With design improvement, the users' reliance on search and help may go down dramatically. Jared Spool [109], a Web usability pioneer, has been suggesting analyzing search log data to improve your design and information architecture before spending money enhancing your search engine.

Finally, it is important to be aware that, like any research method, web usage analysis has its own strengths and constraints. With the log data alone, you may get a good idea about what happened on the site but not necessarily why. You need to leverage multiple methods to achieve your goal.

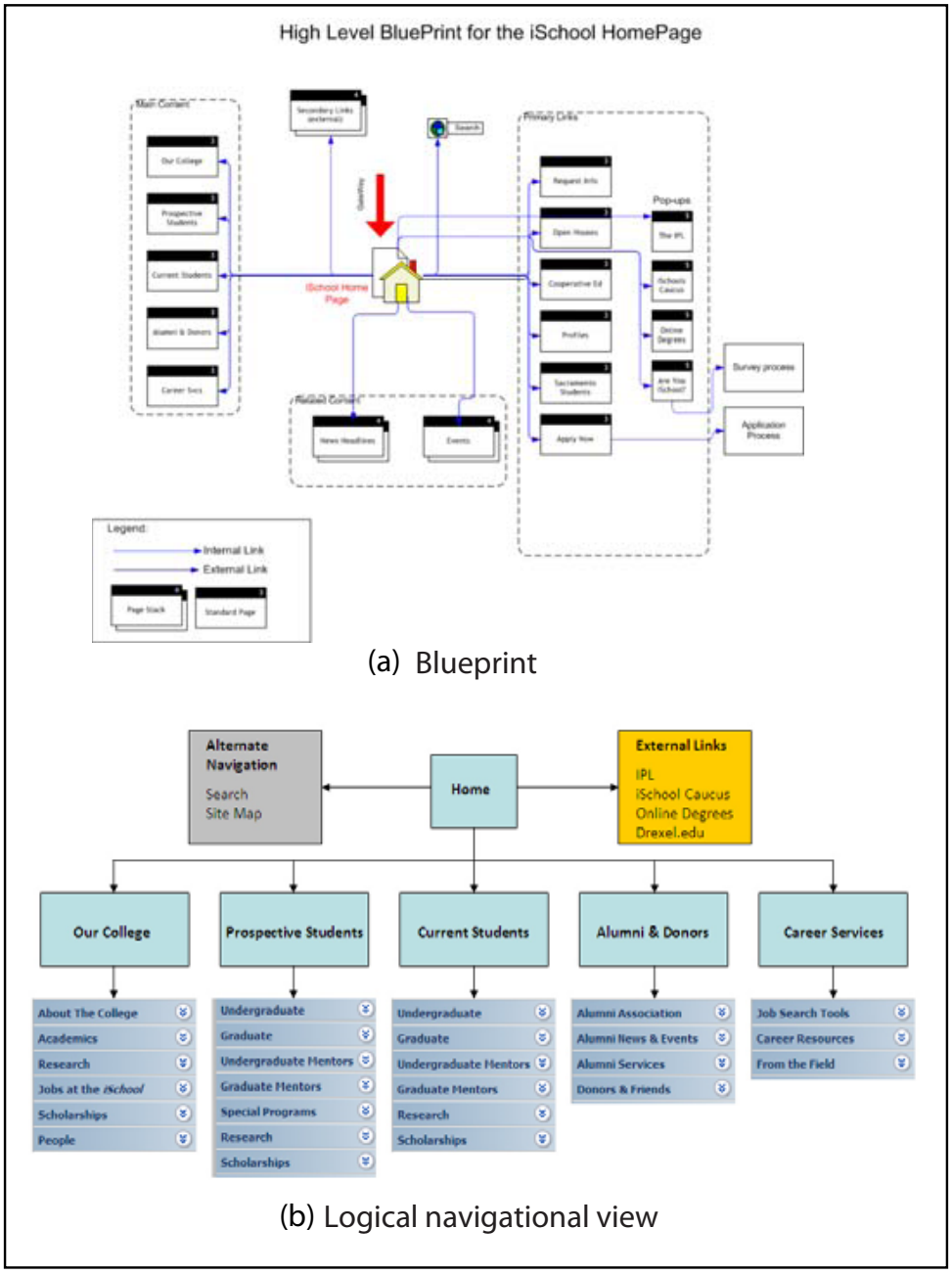


Figure 3.4: Examples of IA deliverables (Courtesy of Stephen Croce (a) and Ryan Phillips (b)).

Examples of Nielsen's Homepage Usability Guidelines: Total of 113 guidelines.

Communicating the Site's Purpose

1. Show the company name and/or logo in a reasonable size and noticeable location
2. Include a tag line that explicitly summarizes what the site or company does
5. Clearly designate one page per site as the official homepage

….

Communicating information about your company

8. Include a homepage link to an 'About Us" section …
12. Include a 'Contact Us" link on the homepage …..

…

Content Writing

17. Use customer-focused language, Label section and categories according to the value they hold for the customer, not according to what they do for your company.
20. Use consistent capitalization and other style standards

….

Figure 3.5: Examples of heuristics used for homepage evaluation.

CHAPTER 4

Organization and Navigation Systems

Information architects need to spend significant time in planning and designing the organization and navigation systems of web sites (or other information products). How people interact and navigate a web site greatly depends on how the content of the web site is organized and what kinds of navigation mechanisms are implemented. In this chapter, we discuss organization and navigation systems together as they are closely related to each other.

To learn about organization and navigation systems for Web sites, the first thing one should do is get familiar with certain organization and navigation methods and techniques that are quickly becoming the norm of the Web. In general, to have good information architecture for a website, one needs to consider the following components:

- Logical Organization

  e.g., alphabetic, numerical and hierarchical organization schemas as well as placement and labels.

- Semantic Organization

  e.g., metadata, controlled vocabularies, content indexing, tagging, etc.

- Structural Navigation

  e.g., global, local, and contextual navigation, process/wizard navigation, browsing aids and site maps.

- Search

  e.g., search algorithms, search result displays, search interfaces, and other search aids.

Each of the components will be discussed below.

4.1 LOGICAL ORGANIZATION

One of our favorite references on organization systems is:
"*The Order of Things: How Everything in the World is Organized …into Hierarchies, Structures, and Pecking Order*" by Barbara A. Kipfer [51].

Kipfer provides ample examples of "naturally organized" structures for things "from the inner workings of the smallest things to the complex system of the universe." She shows that orders exist

in the nature and in our civilization. If we can identify the orders and organize our knowledge accordingly, we can make every subject easier to understand and follow. A vital approach for Website organization is to identify and make use of the "natural orders." No matter what types of websites and what subject areas you are working on, there are certain order systems that appear natural to the user and are easier for the user to follow. Here are some order systems used often for many websites and their content:

- Alphabetical (e.g., staff directory, department directory, state/country lists).
- Numerical (e.g., items sorted by price, distance, size, or other quantitative attributes).
- Chronological (e.g., time-sensitive information such as news, blogs or articles sorted by recency).
- Geographical (e.g., information that can be easily attached to its geographical locations).
- By tasks (e.g., the eBay site is organized by buy, sell, and community, etc.).
- By audience types (e.g., the university website is organized by audience types: For everybody, current students, prospective students, and alumni).
- By metaphor (e.g., rainbows of colors, solar systems and other things that have apparent natural order).
- By popularity or usage frequency. Instead of being based on pre-determined order, the sequence of items change dynamically based on usage or participation (e.g., tag clouds).
- By relevance. Depending on the way the relevance is calculated, it can be based on a combination of several of the above methods.
- Personalization and customization. Things can be arranged based on personal preferences.

All these methods have an "order" that can be defined systematically. For website organization, information architects will need to decide which of these organization methods to implement and how to let users understand the method used to organize the content and the displays.

4.2 SEMANTIC ORGANIZATION

The above list could include one method called "by content," but the content is hardly a simple "order" that can be defined clearly, so we separate it from others. Organizing by content is to organize by semantic relationships of the content. Semantic organization is one of the most important organization method for information architecture, and it has its own descriptive languages and methods. Following, we discuss four major methods of semantic organization: Metadata, controlled vocabulary, faceted classification, and folksonomy.

4.2.1 METADATA

Metadata is the first step to get information organized. Metadata, or "the data about data," is to treat information as a describable digital object and categorize the object in term of its content, context, and structure [29]:

> *"Content relates to what the object contains or is about, and is intrinsic to an information object.*
>
> *Context indicates the who, what, why, where, how aspects associated with the object's creation and is extrinsic to an information object.*
>
> *Structure relates to the formal set of associations within or among individual information objects and can be intrinsic or extrinsic or both."*

There are many important aspects of metadata. For information architecture, two aspects of metadata should be emphasized in particular. The first is the standardization. Metadata is the very first attempt to provide a standardized descriptive framework for Web pages. Dublin Core Metadata Set, for example, defines 15 metadata elements to describe Web pages (Table 4.1). As simple as they are, they provide a much needed structure for the Web space. The Dublin Core (DC) metadata standard was based on the traditional library's cataloging principles. The whole IT industry learned about the beauty of it soon after its creation and use—as simple as asking every Web page creator to provide a title and author of the page, the Web becomes a much better place. DC metadata now has become a default metadata that are embedded in almost all other metadata standards. It provides a nice framework for creating content organization both manually and automatically.

The second function of metadata is to improve the quality of indexing, which by far is the main motivation of using metadata in the real world. Since most search engines have put heavy "weights" on metadata terms, adding appropriate metadata terms will significantly improve your web page's retrievability (findability). People add many terms in their metadata in order to improve the ranking of the documents/links for certain queries (as part of the effort of Search Engine Optimization—SEO). On the other hand, abuses of metadata lead to Spamdexing, which methodically misleads search and indexing programs to give a page a ranking it does not deserve.

It is interesting to note that the original motivation of having DC Metadata was the first aspect (promoting standards), but it is the second aspect that makes it more practical and widely acceptable.

The bottleneck of metadata application is still the difficulty in generating metadata automatically. While a lot of progress has been made, particularly in research, for automatic metadata creation, most of web sites' metadata are still created through a manual process.

4.2.2 CONTROLLED VOCABULARIES

Other than those defined elements (many of which are optional elements), metadata have no specific content structures. For specific domains, additional content structures can be added through controlled vocabularies or thesauri.

Table 4.1: The 15 DC Elements (Source: Dublin Core Metadata element set, version 1.1: `http://www.dublincore.org/documents/dces/`)

DC Elements	Definitions
Contributor	An entity responsible for making contributions to the resource.
Coverage	The spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant.
Creator	An entity primarily responsible for making the resource.
Date	A point or period of time associated with an event in the lifecycle of the resource.
Description	An account of the resource.
Format	The file format, physical medium, or dimensions of the resource.
Identifier	An unambiguous reference to the resource within a given context.
Language	A language of the resource.
Publisher	An entity responsible for making the resource available.
Relation	A related resource.
Rights	Information about rights held in and over the resource.
Source	A related resource from which the described resource is derived.
Subject	The topic of the resource.
Title	A name given to the resource.
Type	The nature or genre of the resource.

Controlled vocabularies are a collection of terms selected and organized by domain experts to represent a specific domain knowledge. Generally, some standards will be established for the coverage and term selections. Every concept within the coverage domain will be assigned a unique term (called descriptor, subject term or preferred term). Other terms with similar meanings will be called equivalent terms, lead-in terms, or synonyms, etc. The relationships of descriptors are established through hierarchical relationships such as Broader Term (BT) and Narrower Term (BT), and associative relationships such as Related Term (RT).

Controlled vocabularies establish a precise mapping between a term and a concept and reduced ambiguity caused by homographs, synonyms, polysemes and other problems existed in natural languages. Once controlled vocabularies are created, terms in the vocabularies can be used as subject terms in metadata to index web pages or documents. There are several advantages of using controlled vocabularies in metadata. First, the content of web pages will be represented more precisely through the carefully selected terms. Second, term relationships established in the controlled vocabularies will add an additional content-based navigation structure, which would be very helpful for user's browsing activities. Third, the precision of indexing and searching will be improved greatly through the terms and structures of controlled vocabularies.

Disadvantages of controlled vocabularies include the labor-intensive creation process and the difficulty to maintain and update the vocabularies. In the Web environment, true controlled vocabularies are rare. They are mostly replaced by less controlled vocabularies—taxonomies. Taxonomies are generally organized hierarchically (or poly-hierarchically). The hierarchy can be mixed—not necessary strictly broader/narrower relationships; cross-reference can be defined; the terms can be added/deleted more easily.

4.2.3 FACETED CLASSIFICATION

A special, more structured type of taxonomy is Faceted Classification which has received a great deal of attention recently in the Web community. By definition, faceted classification is to classify information objects by concepts from multiple orthogonal categories (facets). The requirement of "orthogonal," or "mutually exclusive," is fundamental to faceted classification. Ideally, each facet should also be a complete description of the universe. Each information object can be described by one and only one category within each facet. But in practice, both orthogonality and completeness might be difficult to achieve.

Faceted browsing has been adopted by many eCommerce sites for merchandise selection. Examples of them can be easily found in web sites such as `HotJobs.com`, Yahoo! Shopping, ebay Express etc.

4.2.4 FOLKSONOMY

Recently, a new form of content organization, folksonomy, has attracted tremendous amount of attention in the information architecture and related communities. In contrast to professionally developed, well-structured hierarchical taxonomies and controlled vocabularies, folksonomies are unstructured and free of "controlled." Users can select and decide to use whatever terms they like to tag Web pages; the uniformality and the organizing power emerge from the collective tagging activities of the user community.

Unsurprisingly, there have been different schools of thought on folksonomies. While many people think folksonomies will replace taxonomies to offer new ways for people to find, discover, and share information, others are concerned about its messiness, tagging motivation issue, scalability and global applicability. In the following, we highlight several advantages of folksonomies in the context of information architecture.

Tagging is More Flexible With Lower Cognitive Cost than Categorization

Tagging allows the user to describe one object in multiple ways while categorizing usually requires fitting the object to one unique location in the hierarchy (sometimes it is necessary, e.g., each book in the library needs to have a unique physical location). Multiple tags increase the possibility for the tagger to find the object later since they provide multiple access points. Also, tagging is easier and enjoyable than categorization because tagging is a 2-step process while classification involves three [93].

Tagging Interfaces Power up Folksonomies

Another way to explain the low cognitive cost of tagging is its easy-to-use interfaces. Tagging interfaces are an essential component of any successful utilization of folksonomies. Figure 4.1 shows a recent version of Del.icio.us tagging interface. Several features of the interfaces are popular among all the tagging interfaces. For example, (1) the interface automatically fills in the known data when the user opens up this tagging interface (in this case, the url and title are automatically fill-in); (2) it shows a list of recommended tags (from your existing tags) and a list of popular tags (from everyone's tags). Users can click on any of tags in the lists to tag the current web page; (3) it provides the type-ahead function to let users easily select from the tags they have used previously; and (4) it lets users decide whether or not to share tagging of this page with the public or with users' own network friends. All these features contribute to the easy-to-use interface and make the tagging process pleasantly easy and effortless.

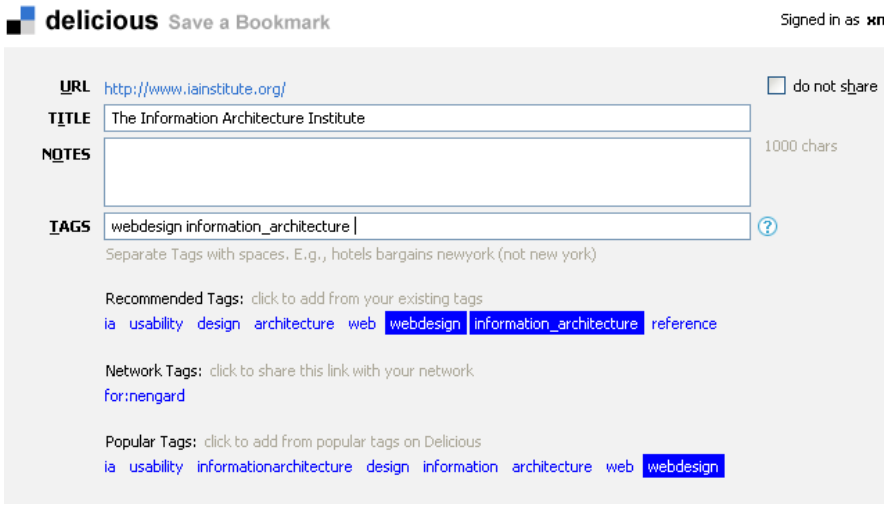


Figure 4.1: Sample tagging interface (Del.icio.us).

In addition, in many tagging systems, each user's resulting tags and tagging frequencies automatically make up the personal tag cloud, which over time dynamically reveals the structure of the user's interests and the makeup of the user's resource pool. The tag cloud also serves as the emergent navigation schema—instead of following a predetermined hierarchy to navigate, the user can navigate through the system via a dynamic network built through shared interests.

Folksonomies Benefit from Collective Intelligence

In a social tagging system, although a major motivation of tagging is for personal use, as a side-product (with enough user participation), the aggregation statistics also reveal a lot of otherwise implicit relationships, from which the users can benefit.

After tagging a certain resource, the user can see some immediate system aggregation results:

- How many people have tagged this resource?
- What tags have been applied to this resource in a visual tag cloud?
- Who has used what tags for this resource?

The aggregation basically tells the user whether this is a popular (it could be an indicator of quality or value) resource; what are the most popular tags for this resource; who shares same interest with me? What other interests do these people have, and so on. According to a study [91], the pattern of tag usage emerges rather early and remains stable over time.

The user may also use one known resource to get to other relevant resources via the common tags (similar to the feature at `Amazon.com`—people who bought this also bought the following). Note this feature is similar to citation-based information retrieval. `CiteULike.com` is applying this mechanism for academic resource sharing and organization. This is an efficient way to discover new resources. It also contributes to a positive user experience—it allows the user to benefit from others' tagging via his or her own participation.

In summary, folksonomies represent a new approach to information organization. Rather than building trees as in traditional classification systems and taxonomies, folksonomies create "piles of leaves" and rely on the power of networks, search engines, and collective intelligence to get the order out of the piles. David Weinberger [113] made a good argument that "piles of leaves" is the dynamic information organization needed for the digital space. He believes that users will be able to create useful organization that makes sense to them from the "piles."

4.3 NAVIGATION SYSTEMS

4.3.1 PURPOSE OF NAVIGATION

The purpose of navigation is to provide context and help users move around. Using the building metaphor, we can say structuring and organizing information is about creating rooms and producing floor maps whereas navigation is about adding doors, stairs, elevators and hallways. Navigation structures add meaningful connections to the organization and structures to facilitate task completion. Because the user comes to your site with different motivations, you often need to provide multiple ways for navigation.

To create a good navigation, you need to help the user answer the following questions:

1. Where am I? (orientation).
2. What can I do? (content, interaction, search).

3. Where can I go from here?

    - Drill up via global navigation.
    - Parallel move via local navigation.
    - Drill down via associative navigation.

4.3.2 NAVIGATION TYPES

Navigation can be within one web site, across multiple web sites, or having the entire Web as the navigation space. The web browser, search engines, internet aggregators as well as the early web directories (the original Yahoo! and others) provide different types of navigation for people to navigate the whole Web sphere. For information architects, navigation design often focuses on within-site navigation:

- Global navigation and sectional navigation.
- Local navigation.
- Supplemental navigation.
- Process navigation.

Figure 4.2 illustrates typical locations of major navigation types in a web site. They will be discussed in details in the following sections.

4.3.3 GLOBAL AND SECTIONAL NAVIGATION

Global navigation brings together the key set of access points that users might need to get from one end of the site to the other. Anywhere you want to go, you can get there (eventually) from the global navigation (When users get lost, they often go back to the global navigation and start over again).

Typical designs for global navigation are Tab Rows (e.g., `apple.com`), Navigation Bar (e.g., Epicurious), Flyout Menu across the top (e.g., `citicard.com` and Sam's Club), Navigation Menu on the left-hand side (could be hierarchical), or across the top and then on the left-hand side (e.g., Microsoft's website).

Left-hand global or sectional navigation is the convention. Can there be right-hand side navigation? Right-hand navigation is more commonly seen for utilitarian/associative navigation. One of the considerations was that although you have a targeted screen resolution for design, some users may still have lower resolution or smaller monitor, in which cases horizontal scrolling may be activated. It would become quite cumbersome when the user has to scroll to the right-hand side to use the main navigation.

How to choose the right design for global navigation? It depends on many factors. The Tab/Sub-Tab or Navigation Bar structures provide good prominence for the categories and subcategories to show while the fly-out menu and left-hand navigation offers greater capacity and scalability and serve as a screen real estate saver.

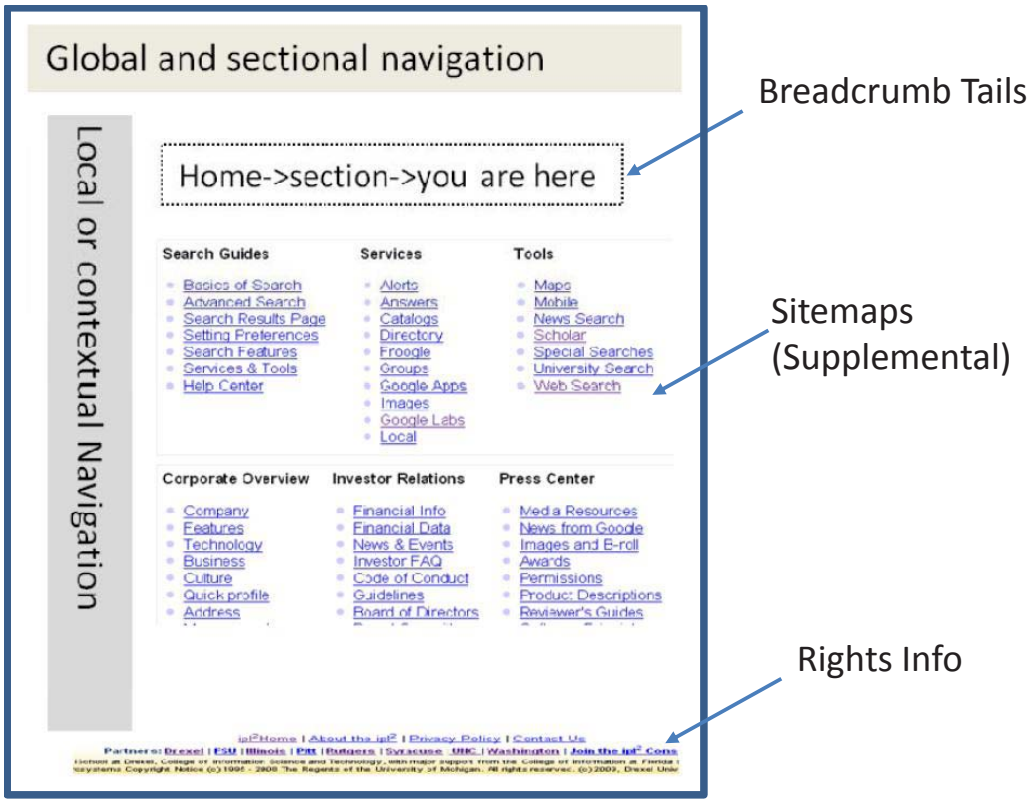


Figure 4.2: Illustrated Navigation types and locations.

4.3.4 LOCAL NAVIGATION

Local navigation includes page-level navigation and contextual navigation. *Page-level navigation* helps the user easily move around different sections of the page. For descriptive pages (e.g., a college-saving page on `Vanguard.com`), there could be an overview/anchor links on the top or on the side, back to top links, etc. For pages with large datasets (e.g., a search results page on hot jobs), interactive mechanisms should be available to facilitate decision making, such as comparison and selection. These things are mainly about interaction design, but they support navigation as well.

Contextual navigation follows content and context, rather than structures. The links are usually embedded in the context of the content (via inline links) or displayed in a specific area of the page (e.g., associative links for related items), commonly seen on the right-hand side, on the upper right corner or at the bottom of the page. This type of navigation supports associative learning. "Social navigation" in essence is a kind of associative navigation. The only difference is that social navigation

calculates the relationship between items/content pieces based on common usage or interests among users (collaborative filtering).

4.3.5 SUPPLEMENTAL NAVIGATION

Special devices can be created to help users navigate globally and locally. Typical examples include sitemaps, site indexes, breadcrumb trails, FAQs, special guides or tutorials, etc. Site maps and site indexes were more commonly seen in the early websites. Sitemaps are generally considered a top-down approach to content organization while site indexing as a "bottom-up" approach. Thus, sitemaps emphasize overview functions where site indexing will provide more details. The paper in Boxes and Arrows, "Sitemaps and Site Indexes: What They Are and Why You Should Have Them" [23] provides an excellent summary and discussion on this topic. Comments and discussions by various readers, particular by Paul Kahn, a pioneer in sitemap and site index design, enrich the article further.

Paul Kahn is regarded as the most knowledgeable person on sitemaps. He was running a "Mapping Web Sites" seminar for several years. He collected many examples of sitemaps, and he divided them into different categories such as manually-created vs. data-driven, text-only vs. graphical, 2-D vs. 3-D, etc. His seminar was influential and inspiring. Most of the materials are now published in his book: "Mapping Websites: Digital Media Design" [48].

4.3.6 PROCESS NAVIGATION

Finally, navigation that guides the user go through a serial, multi-step process to complete some complex task is called process navigation. A process step indicator (navigation bar) is often used to provide an overview to users about where they are and what they need to go through to finish the process.

Figure 4.3 shows TurboTax's navigation. If you are familiar with TurboTax, you have probably experienced its EasyStep Navigator. Simpler process navigation may only contain "Cancel" (or "Back") and "Continue" (or "Next") buttons. This type of navigation is task-flow oriented helping the user concentrate on the particular flow. If it is embedded in a website, the global navigation of the site could appear at the beginning and the end of the process but usually is recommended not appearing during the process.

4.4 SEARCH SYSTEMS

Searching is a means for the user to access information or web pages directly through queries. With a search engine, users can bring related pages (pages that match the search query) together instantly and then traverse through them. They can also "jump" from one page to the other through executing a new query. However, having a good search engine does not guarantee that the user can successfully search and navigate through the web site. There are many factors that will significantly impact the user's searching behavior. First, users need to know what they need. This turns out to be the most difficult problem for information retrieval. A lot of times, users just have a problem to solve. They

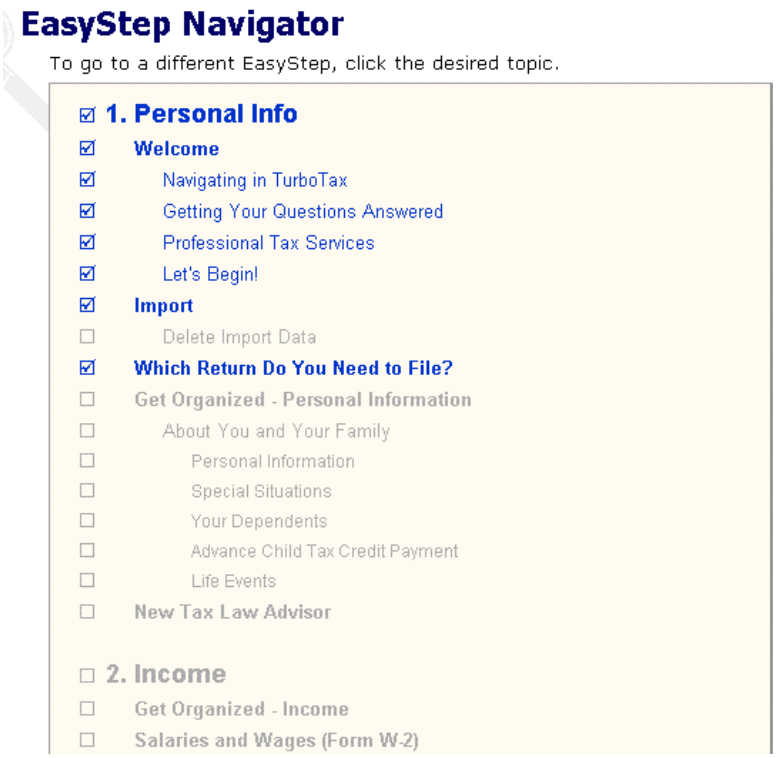


Figure 4.3: TurboTax's process navigator.

don't know what information will help them solve the problem. In other words, they do not know what they are searching for. Second, users need to express their needs in queries. Queries stated in a few words are not the best way to represent one's information needs. Still, that is the only way people use the search engine right now. Third, the search engine needs to index the content appropriately (there are so many options and there is no one optimized way that will work best for all user's queries). Fourth, the search results need to be displayed in a way that users understand.

There are a lot of misunderstandings about the role of search engines in a web site. As an information architect, one big challenge is to communicate to content owners and users about what search engines can and cannot do. This book will not cover in detail search engines and how they impact on information architecture. Here is just a short summary of some potential misunderstanding of search engines:

- *It is not there if I cannot find it through search engines*. Many users might think this way. They assume that each site has an optimal search engine for their information needs. The fact is

that a search may fail for many reasons, including problems in queries, query mapping process, indexing scope, and vocabulary matching, etc.

- *Users can always use search engines to find what they want*. That's a good excuse for not doing a good navigation design. Research indicates that user's success rate with search engines is less than 50%. Half of the time users still cannot find what they want after trying various searches.

- *All we need is to have Google on our site*. Google is, currently, the best search engine. But its real advantage lies in its indexing of the whole Web space; it may not work as well as it should on your site. For example, Google relies on "popularity contest" for query matching and query result ranking. In a small site, there may not have much data for "popularity contest."

In short, search cannot solve all the problems of way finding in websites. It is important to provide robust navigation methods and search functionality to support users' browsing and search tasks depending on user's needs, site genres and many other factors. Peter Morville's books on findability [58] and on search patterns [60] are excellent places for you to explore further about IA and search.

CHAPTER 5

User Information Behavior and Design Implications

In earlier chapters, we emphasize that there is nothing more important than user research in the IA and UCD process. We also examined various methods for user research and usability evaluation as well as their uses in different scenarios. In this chapter, we are discussing how to apply the empirical findings resulted from the research to the actual design. Note, there are two types of empirical findings: One type is the findings and recommendations based on your own research in a very specific context (for your site), and the other is the general usability findings and design guidelines that are being widely acknowledged or adopted in the industry. While the former takes precedence when there is a contradiction, our focus here is on the latter (remember though there are always exceptions of design guidelines). Note, these findings and guidelines either come from repeated empirical studies and/or based on theories and principles from information science, HCI and other related disciplines. Seasoned information architects and designers take advantage of both to inform and drive their designs.

To talk about design guidelines, we first need to understand the user information behavior on the Web.

5.1 UNDERSTANDING USER NEEDS AND INFORMATION BEHAVIOR

Why do we need to spend so much time and energy conducting user research? Here, are the primary reasons:

- You are not your users—That's why designers need to conduct user research. Be extremely cautious when having to make certain assumptions.
- Users are different—their demographics, goals, attitudes, behaviorism, preferences, knowledge, skills, social contexts, and many other characteristics can be different, which could lead to different designs. That's where user personas and/or other user profiling techniques come into play. You identify and prioritize user types. Create scenarios for each user type, and try to learn as much as possible about the information needs and information seeking behaviors. Also, using personas could serve two purposes for you: In addition to aligning your design with the personas you will propose, you can also use examples to show how the current site/design fails your personas. If you can come up with specific examples, that would be a powerful tool to critique the current design.

The personas articles [30, 36, 82] provide many practical suggestions on how to create your personas. "It's easy to assemble a set of user characteristics and call it a persona, but it's not so easy to create personas that are truly effective design and communication tools." Some suggestions are very relevant to your project:

- Personas represent behavior patterns, not job descriptions.
- Keep your persona set small.
- Add life to the personas, but remember, they're design tools first.
- Each persona should have three or four important goals that help focus the design. Keep in mind that goals and tasks are different.
- Personas must be specific to the design problem.

Users are also the same—the knowledge about human beings' cognitive psychological characteristics (e.g., attention, memory, learning, and problem solving), information seeking behavior, and communication patterns—mostly coming from the fields of HCI, cognitive psychology, information science, anthropology, linguistics and many others—can help designers make better decisions to meet the user needs and expectations. In addition to the Fitt's Law and the statistics about color deficiency between men and women (mentioned in the book), other theories or principles, such as the "principle of least effort," the "information foraging (scent)" theory, and the "basic level categories" theory have important implications for IA and Web design as well. Many usability and design guidelines are created based on these theories and empirical evidence.

5.1.1 HOW PEOPLE USE WEBSITES

Studying user information behavior started long before the Web era by many information science and HCI researchers. The Web phenomena, however, made the user population "explode" so quickly and created additional usage patterns as well. The following patterns are summarized based on the studies at different times in various contexts.

Note most of these findings were more focused on non-repeated uses of public websites. Some of them may not be completely applicable to frequent users of a website, intranet or enterprise web users.

5.1.1.1 Web Users Don't Read Pages. They Scan

Much of our web use is motivated by the desire to save time. As a result, web users tend to act like sharks: They have to keep moving, or they'll die. We just don't have the time to read any more than necessary. In the physical world, people are already good at scanning newspapers, magazines, and books.

Nielsen's eye tracking study with 200+ web users identified a strong reading pattern [70]. Users first read in a horizontal movement, usually across the upper part of the content area. This

initial element forms the F's top bar. Next, users move down the page a bit and then read across in a second horizontal movement that typically covers a shorter area than the previous movement. This additional element forms the F's lower bar. Finally, users scan the content's left side in a vertical movement.

5.1.1.2 Web Users don't Make Optimal Choices. They Satisfice

Unlike the general rational decision-making model, which includes identifying a problem, gathering information, identifying the possible solutions, and choosing the best one, web users are often in a hurry, and they tend to adopt a similar model that is often used by people like firefighters, pilots, chess masters, and nuclear power plant operators [52, Krug]. These people make high-stakes decisions in real settings with time pressure, vague goals, limited information, and changing conditions. They do not compare options. Instead they take the first reasonable plan that comes to mind and do a quick mental test for problems. If they do not find any, they have their plan of action.

In addition, there's not much of a penalty for guessing wrong in the web environment; weighing options may not improve the chances; and guessing is more fun.

5.1.1.3 Users Tend to Sacrifice Information Quality for Easy Access

The "people problem" that Morville [58] describes in his new book is that users are willing to sacrifice information quality for easy access.

"Why visit the library when Google's on your desktop? ... This fast food approach to information consumption drives librarians crazy. 'Our information is healthier and tastes better too' they shout. But nobody listens. We're too busy Googling." Morville is concerned about the "sanity of this fast food diet." *"Maybe our willingness to trade quality for accessibility is not entirely rational. Aren't academic libraries facing stiff competition from powerful Web search engines? "*

5.1.1.4 Web Users don't Figure Things Out, They Muddle Through

Krug's #1 law of usability is "do not make me think" [52]. He observed that web users were not willing to figure things out. They just quickly moved on. "It doesn't matter how many times I have to click, as long as each click is a mindless, unambiguous choice." He also suggests that "instructions must die because no one is going to read them—at least not until after repeated attempts at muddling through have failed."

5.1.1.5 Relying More on Web Search Engines than Individual Websites

Nielsen and Loranger [71] found that when the user was let loose to anywhere they wanted on the Web (during usability testing), 88% of the time they went to a search engine. The authors observe that "the Web as a whole has become one agglomerated resource for people who use search engines to dredge up specific pages related to specific needs, without caring which sites supply them. Rather than looking for sites to explore and use in depth, users now hunt for specific answers. The job of search engines is no longer resource discovery but to answer questions."

This is not good news to most information architects and designers working on public-facing websites/applications. How to deal with this? Some experts in the field suggest four ways to grab value from search engine visitors: provide narrowly focused pages with clear answers to common problems as flytrap content, embellish the answer with rich related links to related content and services, create quality content with unique perspective and in-depth analysis, and publish newsletter to get connected with the user.

Again, this observation is based on the public-facing websites. Intranets and internal applications while facing similar threats from Web search engines have their natural advantages of keeping their users.

5.1.1.6 People Taking Time on Online Window Shopping

When it comes to money spending on the web, users tend to be more cautious. Shoppers are taking an average of 34 hours and 19 minutes from the time they first visit an e-commerce site to when they finally make a purchase, according to an analysis of 2.6 million online sales (on 470 Web sites from May 2005 to May 2007) by ScanAlert [89], an online security firm. This duration is more than 80% longer than it was in 2005. Among the factors attributed to this change, the availability of greater sourcing choices and faster internet access was the major ones.

5.1.1.7 How Do People Search?

Here, is a summary of findings about how people search on the internet:

- Number of search words per query: 2-3 words.
- Do people use advanced search features?

  According to Jansen and Pooch [46], less than 8-9% of queries used Boolean operators or advanced features.

  According to Nielsen and Loranger [71], only 1.2% of queries during usability testing sessions used advanced search syntax and 3.5% used quotes.

  Both studies found that many queries used Boolean logic incorrectly.

  Jansen and Pooch [35] concluded that advanced searches do not generate more relevant results.
- How do people adjust their queries if no relevant results found?

  82% of users would revise their queries (iProspect Survey, 2006).

  Public queries are short, not much modified, and simple in structure [96].
- How do people examine search results?

  8 search results on average, majority of users only examined the first 5;

  4-5 organic results (natural search results) and 6-7 advertisements which are displayed on the side as sponsor links (Nielsen and Loranger, [71]).

- How much time do people spend on results examination?

  Spink and Cole [95] based on search log analysis, report the following findings:

  "A substantial percentage of web sessions are less than 5 minutes. Searchers do not appear willing to go to the second or three results pages. Typical users view an average of 8 web documents per session. A significant % of web search engine users, however, view no more than 5 web documents per session. Typically, a web searcher will spend about ***5*** *minutes or less evaluating a Web document, with almost 15% spending less than 30 seconds."*

  Nielsen and Loranger [71] got the following data from their usability observations:

Only the 1st search engine results page (SERP) was visited in 93% of searches; users got to the second SERP in 7% of the searches, among which 5% of users actually clicked the links. Only 47% of users scrolled the 1st SERP while 53% of users only saw results above the fold, typically 4-5 organic results + 6-7 sponsored results.

5.1.1.8 Searching, Browsing, and Asking

There are three common ways for a user to get information in the online environment: Searching, browsing, and asking. Sometimes, searching is an equivalent of asking.

Some studies [71] found that half of their usability participants were search dominant at individual website level, about a fifth of the users are link-dominant, and the rest exhibit mixed behavior. "The search-dominant users will usually go straight for the search box when they enter a website: They are not interested in looking around the site; they are task-focused and want to find specific information as fast as possible. During usability test sessions, 88% of the time users went to a search engine when let loose."

Other studies, such as [97], did not end up with similar results. Instead none of the users in this study were search dominant and about 20% of the participants chose links exclusively (link-dominant). The author of the study argues instead of users being search dominant; some sites were search dominant and others link-dominant, depending on the genre and products of the site. In addition, the participants who said they would go to search immediately did not actually do that. The author also argues that users tended to go to the site search as the last resort after the site's information architecture failed them.

A more comprehensive research conducted in 2003 [50] seems to be more aligned with findings in [97]: Various factors influence the user's decision of whether to browse (following links) or search for a product on the website. The research suggests, however, that site search should not be used to compensate for the poor design of the navigation and site structure.

In terms of asking, in addition to search engines, people go to community forums (such as `answers.yahoo.com`) or their own social network to get answers to questions.

5.2 THEORIES AND PRINCIPLES ABOUT USER INFORMATION BEHAVIOR

5.2.1 THE PRINCIPLE OF LEAST EFFORT AND USER'S INFORMATION BEHAVIOR

The Principle of Least Effort is also called Zipf's Law. In Zipf's words [119], "Every individual when considering a course of action, will choose the action that requires the least amount of effort." This principle has been widely cited in the library and information science literature to explain the user information seeking behavior.

There are two well-known conclusions based on this principle: One is the 80/20 rule. Among all the information sources available, people use 20% of them for 80% of their information needs. (Jared Spool's extreme example in his recent presentation was that 98% of the users on `Microsoft.com` were only using 2% of the content.) The other conclusion is people will choose easily available information sources of relatively low quality over expending the effort necessary to access higher quality sources.

The Principle of Least Effort can also be used to explain why the Wikipedia gets so popular over more formal encyclopedias nowadays. The following comparison was made by Andrew Hinton in his presentation at the IA Summit 2007 [35]. Notice the quality metric below. Do you see the pattern of "easy access (with low cost) over quality" here?

Table 5.1: Comparison Between Encyclopedia and Wikipedia, Courtesy of Andrew Hinton

Encyclopedia	Wikipedia
Complex	Simple
Accurate	Close enough
Expensive	Inexpensive
Authoritative power (one-way delivery, instruction)	Collective intelligence (conversational)
Rigid structure	Loose structure

As we can see, many web usage patterns mentioned above are rooted in this principle. Rather than complaining that "people are lazy," we should acknowledge that users are efficiency-driven. From a design perspective, it could also help us prioritize tasks and goals when constrained by time and budget. At the same time, we need to understand this is a strategy for survival not for excellence. It may not apply to all situations.

5.2.2 PARADOX OF CHOICE: MORE IS LESS

The book written by Barry Schwartz "Paradox of Choice: Why Less Is More" [90] has been widely referenced by the design community. In the book, two types of people are identified based on their decision-making patterns:

- Maximizers: trying to make the best possible decision.
- Satisficers: Selecting the first one meeting minimal Requirements.

While satisficers are content to select products or services that meet a minimum set of requirements, maximizers compare all possible options.

According to the book, when there is no choice, life is miserable; but with too many choices, issues come up:

Analysis Paralysis: When there are so many choices, you end up not being able to make a choice quickly. A grocery store did an experiment with two treatments. One was to allow customers to sample 24 or 6 different flavors of jam. With 24 options, more people came to the table but 1/10th as many people actually bought jam than the other setting. At Stanford University, students were offered to write an essay for extra credit towards their degree. In one group, students got 30 topics to choose from, and another group got 6. More students wrote essays in the 6-topic group.

Decision Quality: With too many choices, the decision making process gets exponentially more complex. People tend to adopt the most simple and avoid the complex criteria, but simple ones aren't necessarily the most important criteria. As a result, they end up making a worse decision.

Decision Satisfaction: Doing better and feeling worse.

If you managed to overcome paralysis and ensure decision quality, satisfaction is the 3rd factor, in which situation, people are doing better but feeling worse.

When there are more choices, it becomes easier to regret—satisfaction is reduced. If you did not examine ALL options, you assume one or more other options might have been better.

Opportunity Cost: Even though you made the right decision, there is no easy way to tell this is truly better than your next best alternative. That will make you feel less satisfied with your choice. "Everything suffers from comparison."

Escalation of Expectations: Seeing more choices raises higher expectations. When your expectation is higher than the selection, you regret.

Another example Schwartz gave was about a study on college seniors looking for jobs. Maximizers got jobs with $7500 more or 25% higher for their salary, but they felt worse (and were also more pessimistic, overwhelmed, stressed, and disappointed) than the satisficers.

How to Cope with Too Many Choices?

Schwartz offered some advice for people to cope with too many choices. At the individual level, try to be a satisficer instead of maximizer so that you can make yourself feel better; or hire an agent to go through the choices and make the decision for you. In a Google presentation, Schwartz mentioned people using search engines is like hiring an agent.

From the designer's perspective, here are the things you can do to help the user:

- Set up default settings to the best interest of people because people tend to do nothing when facing multiple choices. This is consistent with the findings about how much customization users bothered doing with their software—only 2% of the Microsoft Office users actually customized their toolbars.
- Use invisible filters (e.g., based on previous behavior, profile preferences) and visible filters (allowing the user to articulate their selection criteria) to limit choices for the user.
- Organize choices hierarchically because hierarchical structure feels smaller than flat lists.

5.2.3 THE *BERRY-PICKING* INFORMATION BEHAVIOR MODEL

Marcia Bates' berry-picking model [4] has been well known in the library and information science field. It has been used to explain the pattern of exploratory information discovery and got introduced to the IA industry by Rosenfield and Morville. According to Bates, interesting information is scattered like berries in the bushes. The query is continually shifting; users may move through a variety of sources; new information may yield new ideas and new directions; the query is not satisfied by a single last retrieved set but rather by a series of selections and bits of information found along the way. A searcher "moving through many actions towards a general goal of satisfactory completion of research related to an information need."

5.2.4 THE INFORMATION SCENT THEORY

Related to the Least Effort Principle, the Information Foraging/Scent Theory, proposed by Stuart Card at Xerox PARC [10] has been widely adopted for Website design (and it is quite similar to the berry-picking model). It uses the analogy of wild animals gathering food to analyze how humans collect information online.

Like wild animals making optimal decisions on where, when, and how to eat in order for survival, informavores (information seekers) constantly make decisions on what kind of information to look for, whether to stay at the current site, when to move to another site, which link to follow, and when to finally stop the search. The decision is made such that the user gets maximum benefit for minimum effort (least effort principle again). One of the important concepts of information foraging is "information scent."

Information scent is used to predict a path's success. In other words, it is used to describe how people evaluate the options they have when they are looking for information on a site. When

presented with a list of options users will choose the option that gives them the clearest indication (or strongest scent) that it will step them closer to the information they require. "Informavores will keep clicking as long as they sense that they are "getting warmer"—the scent must keep getting stronger and stronger or they will give up. Their progress must seem rapid enough to be worth the effort."

Spool [98] has been advocating for "information scent" oriented design. Based on the information scent theory, Spool also developed a set of usability guidelines for designing various interior webpages (contrast to the homepage).

It is interesting that he argues that homepage is the least important page for a website. He uses an analogy of "hotel lobby" to describe the homepage to the user. In his words, no traveler really pays attention to the lobby. The top places the traveler wants to go to after check-in are: Hotel room, bathroom, and/or bar. While this is a vivid expression, we need to consider a set of factors when talking about the importance of the homepage:

- How does the user come to your site? Via search engine, feeds, direct urls, or other links?
- First-time user vs. returning (loyal) user with personal login?
- User tasks: Exploration vs. answer seeking.
- Public-facing sites vs. intranet sites. What is your default homepage for your home computer? How about your computer at work?

Jacob Nielsen [71] argues, "The homepage is the most important page on most websites, and gets more page views than any other page." "Homepages are most valuable real estate in the world. It's the company's face to the world." If a user arrives at a Website through the homepage, that page is indeed critical. But Nielsen then quickly points out, in the "Prioritizing Usability" book, "Of course, users don't always enter a website from the homepage. A website is like a house in which every window is also a door: People can follow links from search engines and other websites that reach deep inside your site." "Deep links enhance usability because they are more likely to satisfy user needs. Interior pages accounted for 60% of the initial page views and homepages 40%."

5.2.5 BASIC LEVEL CATEGORIES

The Basic Level Category (BLC) concept is really based on Lakeoff's book "Woman, Fire and Dangerous Things." Donna Mauer, an Australian IA researcher, summarizes the BLC concept as follows [56]:

- Categories are organized from most general to most specific. But there is a basic level somewhere in the middle of a hierarchy.
- This cognitively basic level is learned the earliest, usually has a short name, and is used frequently.

- Basic levels are the highest level at which single mental image can reflect a category.
- Most of our knowledge is organized around basic level categories.

She also made suggestions to make best uses of BLCs in IA design:

- In organizing the site structure, we can work from the middle out by starting with basic levels of categorization.
- Because they can be identified quickly (short and frequently utilized) basic levels have a good information scent. They make good "trigger" words to help people choose their information path.
- Try getting people to the basic level of the hierarchy as soon as possible.

For those of you who are working on folksonomy for your first group project, think about this question: Are tags at the basic level? If yes, they might have natural advantages over their counterparts (taxonomies).

5.3 DESIGN IMPLICATIONS

Our knowledge about user information behavior informs the design to better meet the user needs and minimize user frustration. Here, are some general design guidelines:

- Create site structure and navigation to meet users' mental model and expectations.
- Design to support quick scanning and strong information scent.
- Help people know what they don't know and combat the "Principle of Least Effort."
- Set up the right default settings.
- Allow people time for decision-making and motivate people to purchase by
  - Narrowing down options and supporting easy comparison.
  - Keeping unfinished shopping carts for users.
  - Showing actual # of items remaining if applicable.

Specifically, let's discuss the following topics:

5.3.1 HOMEPAGE VS. INTERIOR PAGES

Which page is more important? As mentioned earlier, there is no magic answer to this question. They are both important. According to the specific situation, the design team should make conscientious decisions about where to focus the resource and effort on.

As design guidelines for interior pages, many of the principles/guidelines introduced for homepage design are still applicable. In addition, interior pages need:

- Clear identity: Designers should include the site's name and other important links on each and every interior page (at the very minimum a home link), so that when one does access it 'through the side door' they know where this page is located, who is providing the information and how to find out more information on the site.

- Navigation and orientation: Avoid orphan pages that do not have links or site-specific navigational means to go back to the owning site. It is no longer safe to assume the user can use the browser's back button to navigate back especially when the user comes directly to this page. One click to the home page is recommended. Using breadcrumbs or other means to show where the page is in the site's hierarchy is very helpful.

Finally, and most importantly, keep in mind the content on the page is the real reason for the user to look at this page. Users spend the vast majority of time looking at the content area. Therefore, quality content is key to interior pages.

5.3.2 SHORT PAGES VS. LONG PAGES

Do users like short pages or long pages on the Web? Do people like to scroll up and down or do they prefer pagination? What type of pages are more effective? We may get many different answers from people in different contexts.

Here, are the factors to consider whether to have long pages or short pages:

- Content (viewable) vs. data entry forms (especially when there are dependencies between the datafields).

  If the user task is to fill out a long form in which later user workflow varies dependent on the values the user enters to in datafields, the common approach is to provide a multiple-step "wizard" (serial processing) by breaking the information into short chunks across several pages. If the page only contains information for viewing and pagination may interrupt the user task, a long page might be more suitable.

- Content heterogeneity vs. homogeneity.

  While many people don't mind scrolling up and down to compare information, it may not help the user if a long page holds different types of information serving different purposes. The sections down below are very likely to be ignored by the user. Therefore, for these types of pages, it is recommended to give section titles and display them as anchor links on the top (across the top or on the top left) of the page.

- Information relevance and completeness vs. information overloading.

  We all know that users need enough information to make decisions, but when the amount of information exceeds certain threshold, the user can get overwhelmed and frustrated. While the "one-page user interface" concept is meant to give the user everything s/he needs to take actions

without leaving the page, caution needs to be exercised to ensure only relevant information is presented in the right context.

- Page weight and page performance.

  Page weight is the total number of kilobytes associated with a single page of content. If page loading/refreshing takes too long, long page can easily lose its advantages as well, especially for pages containing large images or videos.

- Homepage vs. interior page vs. search results page.

  Nielsen's research in "Prioritizing Usability" shows his usability participants "scrolled 1.3 screens worth of information on average—meaning that they saw a total of 2.3 screens, including the initial one above the fold. Any page longer than 2.3 screens risks being overlooked, even by those few users who care enough about the page to scroll it." "Users don't even bother using the scroll wheel on their mouse most of the time."

Other factors that might affect the scrolling behaviors are:

Experience level: Nielsen found that high-experience users scroll slightly more than low-experience users.

Page type: Users are more likely to scroll a search engine results page or an interior page than a homepage.

Table 5.2: Scrolling by Page Type (Nielsen and Loranger [71, p. 47])

Page Type	Users Who Scrolled
Homepage 1st visit	23%
Homepage 4th and later visits	14%
Interior pages	42%
Search engine results page	47%

Context of use for the targeted user population: Some physical or technical contexts of use also need to be taken into consideration. For example, majority of PC and laptop users have wide-bandwidth of internet access, which eases page performance issues; most computer mouses have a scroll wheel that makes scrolling easier. However, in the mobile web environment, due to limitations of screen size, resolution, cursor control, and wireless network speed, some long pages may not work equally well as for the conventional web (more detailed discussions can be found in Chapter 9).

Design Guidelines for Long Pages

- Putting most critical information above the fold.
- Providing enough visual cues to indicate there is more information below the fold.
- Give visual cues to remind people of more information below the fold. Do not add a lot of blank space near or on the fold or something that looks like a closure.
- Providing visual structure to support scannability and information scent.
- Repeat actionable buttons or links on the top and at the bottom for interactive forms. For long tables (when necessary), repeat column headers for every screen.
- Avoid horizontal scrolling and nested scrolling as much as possible.

5.3.3 DESIGN FOR SEARCH SYSTEMS

Users browse (follow links) and search as well. Whether search-dominant or click-dominant depends on multiple factors. While search systems deserve a whole book to discuss, we are treating them as one of the IA components here in this book. These components work together to make the website/application as a whole to achieve much higher performance than the sum of the individual systems.

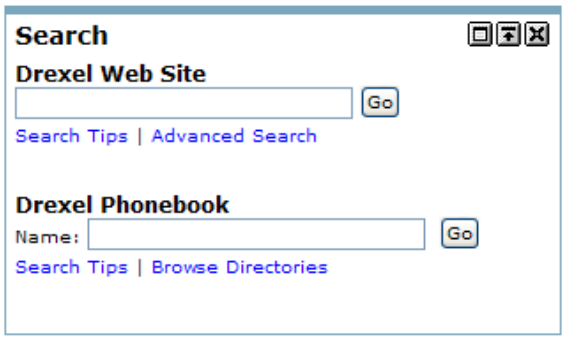
When designing the search interface, the following issues need to be considered carefully:

- How long should the search box be?

  Do long queries lead to better search results? Longer search boxes invite more search terms, however, natural language searches haven't gained its ground on the Internet. Users are gradually increasing their search terms per query, but when the number of search terms reaches certain threshold, the number of search results drop dramatically and it does not guarantee most relevant results. Madden, et. al. (2007) concluded "best search strategy is a combination of simplicity and scrutiny." Encouraging interactive searches and let the users pick more keywords from the relevant results seems to be more helpful and effective.

- How many search boxes are needed?

  It is common to see multiple search boxes on Intranet sites and one search box on internet sites. The screenshot below shows people search and site search boxes on the Intranet of Drexel University. Which one is better, one search box or multiple? It depends. When combining search boxes, it often involves a dropdown list to show multiple sources or displaying sources separately above the search box. `Amazon.com` makes the default source dynamic based on the page you are on. Google uses the latter. There are pros and cons associated with each option.



- Providing search assistance.

  Useful search assistance, such as auto-complete, spelling checking, stemming, and thesaural searching, proved to be very helpful to the user. Google actually got popular after it launched its spelling correction "Do you mean…?" feature.

  Check out the search interfaces of the following websites:

  - `Alltheweb.com`
  - `Google` suggest.
  - `Ask.com`
  - `Staples.com`

- Separate Advanced Search from Quick Search.

  Given that only a small number of people use advanced search features, quick search with the best default setting should be provided for the users to easily execute searches.

- Meaningful display of search results.

  When the search is against multiple sources, the search results can be displayed separately corresponding to the source/type, such as in Google. With the same query, you get different results based on the search type/source (e.g., images, news, websites, etc.). Or the results can be combined together in one list with certain visual cues to indicate the source as part of the results display. Sometimes, certain values can be displayed in different columns for sorting purpose as well.

5.3.4 THE 3-CLICK RULE REVISIT

You maybe familiar with the 3-click rule: Everything should be reachable from the homepage within 3 clicks. What do you think about this? Many usability experts in the field suggest that as long as the information scent is strong, users don't care about how many clicks it takes to get the right information. In Prioritizing Usability, the authors think the "3- click rule" actually causes problems for some users. Here, is some quote:

> "The 3-click rule seems intuitive – a good way to respect user's time – which is probably why it has achieved the status of usability folklore. However, it doesn't hold up in testing for one simple reason: What makes users give up is the total amount of trouble you put them through.
>
> Each click is extra trouble, so longer paths are worse than shorter paths, if all else being equal. But all else isn't equal because having to think more about each click and having a grater risk of clicking the wrong link creates trouble in itself – usually much more trouble than a simple extra click. Attempts to force a large website to fit with the 3-click rule usually result in obscure and overloaded navigation systems."

This applies to the situation in which users know what they are looking for. When introducing something that people don't necessarily expect (but very useful to them), it got to be in front of people's face, either in the right context (like `Amazon.com's` "people who bought this also bought…" feature) or on the most frequently visited page.

5.4 CONCLUSION

Once again usability guidelines cannot solve all your design problems. IAs and User Researchers need to weigh in with their own findings based on user research in a very specific context (for their own site) as well as the general usability and design guidelines. It is equally important between following general guidelines and knowing when to deviate from them.

CHAPTER 6

Interaction Design

This chapter discusses the intersection between Interaction Design and Information Architecture in the Web contexts. Best design practices and design principles are to follow.

Here, is the definition from the Interaction Design Association's website [44]:

> *Interaction design (IxD) is the branch of User Experience Design that illuminates the relationship between people and the interactive products they use. While Interaction Design has a firm foundation in the theory, practice, and methodology of traditional user interface design, its focus is on defining the complex dialogues that occur between people and interactive devices of many types— from computers to mobile communications devices to appliances.*

As mentioned earlier, IxD is a broad concept, emphasizing the interaction between people and the product. Established as a discipline with different concerns on focus, IxD was emerged from traditional User Interface Design (aka "man-machine interaction" or "human-computer interaction (HCI)"), while IA was driven by the needs for information organization. The former is more concerned about the user's control and the systems response, and the latter emphasizes the connections between information chunks and between related functionalities. However, in the Web and mobile world, IA and IxD are more and more intertwined together, and the overlap between the two is getting increasingly bigger. The Interaction Design we are discussing here is mainly focused on the overlapping areas.

6.1 INTERACTION DESIGN COMPONENTS

Just like information architecture, work existed before the IA discipline, The interaction design practice had started way before the Web era. Interaction design exists in desktop applications, handhelds, kiosks, TV-based interfaces, automotive interfaces, appliances, audible interfaces and many more.

The focus of this chapter though is on the Web platform. As we all know that originally webpages are the building blocks of the Web user interface. Like a book, each website is composed of a number of pages (called views and forms). Controls within each page serve as the fundamental interaction of the Web and provide an efficient way to "flip" these pages [5].

6.1.1 VIEWS, FORMS, AND WORKFLOWS

Based on the function they serve, there are two basic webpage types: Views and forms.

Views are the pages used for information viewing and navigation;

Forms are used for data creation, editing and submission.

The controls on the page, such as links, buttons, icons, and selection devices allow the user to conduct the interaction with the system, such as get/put data from or to the server. When different views and forms are combined together to support a certain user task, they become a *workflow*. There are different types of workfolks: Hubs, wizards, and guides (the combination of hubs and wizards).

Hubs are used when there's a primary view page containing a collection of data elements and a series of one-page forms for editing the elements. Hubs are found in a variety of applications, such as calendars and email. Usually, there is no dependency among the (sub) tasks (forms) in the hub structure.

Wizards, also called serial processes, are made up of a sequence of forms linked with "Previous (back)" and "Next (continue)" buttons. Wizards require users to fill out forms one at a time, navigating through the process in a predetermined fixed sequence (shown in Figure 6.2). After completing

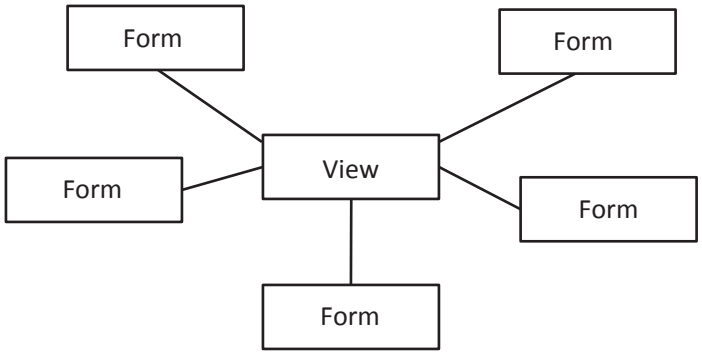


Figure 6.1: Hub structure.

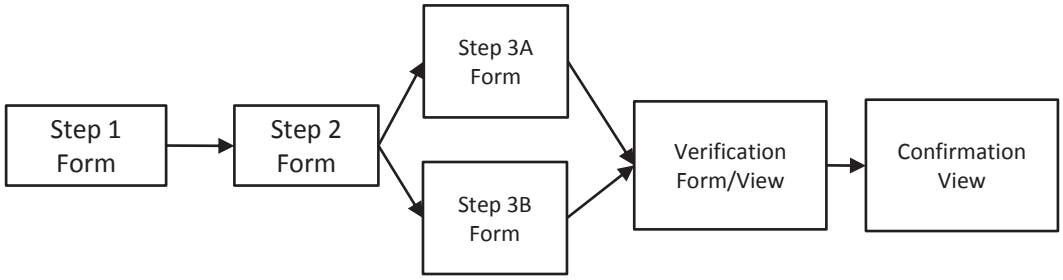


Figure 6.2: Wizard structure.

all the forms in the sequence, the user is typically taken to a view page summarizing the choices. Typically, the "Shopping cart checking out" process on e-Commerce sites takes a wizard approach. It is commonly used for desktop software installation as well. The wizards approach breaks the complex

user tasks into multiple simple steps and guides the user through the process. Wizards is one of the best examples in which multiple short pages are advantageous over one or a few long pages.

6.1.2 FILTERS AND CONTROLS

Filters and controls are the devices available on webpages for the user to interact with the system. There are many of them, including drag and drop, zoom in/out, sliders, buttons, links, checkboxes, expand and collapse, tabs, selection devices, search and filter, auto-complete, and date picker. Clicking on them on a traditional webpage often requires page refresh, which takes time and may interrupt the user's workflow. With the RIA technologies, some of the traditional Web interaction mechanism gets more dynamic and responsive. For example, unnecessary page refresh can be eliminated, and the separation between viewing and editing is no longer mandatory. This starts to change the fundamental structure of the Web from page-based interaction to different statuses of the same page. Accordingly, many Internet browser features based on the original Web structure need to be revisited as well.

6.1.3 RICH INTERNET APPLICATIONS

Rich Internet Applications combine the strengths of desktop applications (rich interaction) and traditional web-based applications (wide reach of web-based access). RIAs allow the user to directly interact with items on the screen and receive immediate system feedback while the data flows seamlessly in the background between the server and browser client. The whole page does not have to completely refresh to respond to the user's interaction.

Some RIAs actually existed during the Web 1.0 time. They are mainly screen-based and built with Java, Flash or a similar technology. Examples include Broadmoor Hotel Reservation and `Nike.com's` shoe configuration tool, but the RIAs we are focused on today are mainly using Ajax (which was coined by a well known Information Architect, Jessie James Garnett). Compared to the screen-based RIAs, Ajax-enabled applications are easier to implement.

RIAs are not another type of applications parallel to the ones we have discussed above. Instead, it is enabled by different sets of technologies, including AJAX (Javascript, XML, Xhtml, and CSS), Flash or Java Applets to support the user (with the appropriate design) to interact with the system more instantly and effectively. For example, the user can finish a natural work flow without being interrupted by page refresh. Most of the Web 2.0 sites we mentioned above have RIA features:

- Direct manipulation (e.g., drag and drop to move objects/components around on the page).
- Immediate system feedback/messaging for error handling or contextual help.
- Automatic completion for data entry (based on the beginning part of the words or phrases the user types).
- Improving system response time and minimizing unnecessary clicks.
- Changing views or getting status updates without refreshing the whole page.

- Overwritten contextual right mouse-click.
- Mouseover objects to show additional information.
- Automatic save.
- Inline edit without the separation between viewing and editing, and many more.

RIAs can be very powerful, flexible and useful to the user when designed and implemented appropriately. Although the AJAX-driven coding is more complex than using the Web 1.0 technologies, the high availability of public APIs allow the developers to implement designs at a quicker pace. It is critical for all the project team members to understand though that the ultimate goal of implementing RIAs is for the usefulness to the user and meeting business objectives. Without a clear understanding about what RIAs are really good for, an over-enthusiastic RIA redesign of your site may risk the user experience and beat the purpose.

The following lists some common mistakes seen in RIA implementations:

- Breaking familiar Web interface conventions (links, navigation, controls).
- Not making options and affordances immediately evident (e.g., drag-and-drop).
- Creating subtle changes on the page that users don't notice because the page doesn't refresh.
- Not providing a clear task flow ("what do I do Next?").
- Requiring fine motor skills to manipulate interface elements (sliders, fly-out menus).
- Increasing the potential for disruptive user errors.
- Overloading users with too much information and unnecessary visual complexity.
- Decreasing accessibility (connection speed, ADA Compliance, and finer motor skills).

6.2 INTERACTION DESIGN PRINCIPLES

Interaction design principles come at multiple levels. Cooper [15] categorize them into four levels: Design values, conceptual principles, behavioral principles and interface level principles.

The design principles we are focusing on in this chapter are mainly at behavioral and interface level. Here, is the list:

- Design for Fitts.
- Design for Color Blindness.
- Design for Affordance.
- Design for Efficiency.

- Design for Forgiveness.
- Design for User Perceptions.
- Design for Help.

6.2.1 FITT'S LAW: DESIGN FOR FITTS

Fitts' Law maintains that the time required to move rapidly from a starting point to a final target area is a function of the distance to the target and the size of the target. Therefore, it's better to put targets closer to where they are likely to be used (put buttons next to the activities they relate to), and to make them larger.

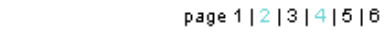
To summarize, Fitt's Law tells us when designing an (actionable) object (e.g., buttons or links) on the page:

Bigger is better: Important functions should be presented with large objects (reasonably big).

Closer is faster: The contextual action buttons or links should be presented within the reasonable proximity of user activities.

The less fine motor control is required, the easier: Correspondingly, when the target is so small or surrounded so closely by other objects, the user will have to slow down their pace to move the mouse very carefully in order to avoid misclicks.

Let's look at these pagination examples:



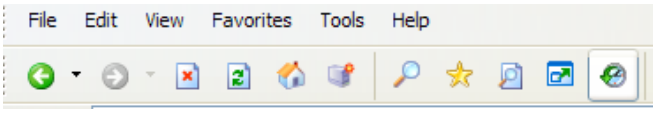
(from `eluxury.com`)

(from `washingtonpost.com`)

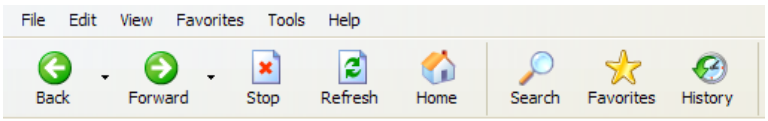
(from `shopping.yahoo.com`)

Which design above do you think is easier to click? You may think the answer is no brainer, but it really reflects the Fitts Law. Between `eLuxury.com` and `Washingtonpost.com`, the latter is easier to click on due to the larger size. When the font size is the same, the design with larger clickable areas win (between `washingtonpost.com` and yahoo! Shopping). The latter makes the square area surrounding the number clickable, which is easier to do then just clicking on the number itself.

Here, is another set of examples:



This shows the IE toolbar of icons without text labels.



This shows the same toolbar of icons and text labels.

Which one is easier for you? The difference may not be quite significant if you are already very familiar with the icons. For people with some motor disabilities, the buttons that have both text and icons are easier to hit because the clickable areas are bigger (let alone labels reduce ambiguity of the icons). In addition, each button is more spread out, which reduces the possibility of clicking on the wrong button by accident.

In addition, we should take advantage of certain areas of the screen for better Fitts: They are the corners and edges. These areas are "infinitely targetable" and require very little fine motor control because of the boundary created by the edges of the screen.

Compare the designs of the Start button in Microsoft Windows (Figure 6.3). Which one gives better Fitts? Prior to Windows 2000, the Start button had a single "dead" pixel along the left and bottom sides of it in which clicking didn't open the Start menu. It may look better artistically, but in a usability perspective, it resulted in lower acquisition times and a startling number of missed clicks. With the newer design, the clickable area for the "start" menu is much bigger and also due to the elimination of the dead pixel, it gained infinite Fitts.

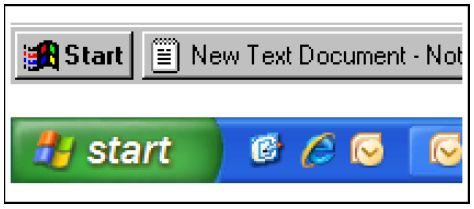


Figure 6.3: Different versions of the Windows Start menu.

6.2.2 DESIGN FOR COLOR BLINDNESS

According to statistics, approximately 8% of human males and .5% of females in North America have some form of color blindness, and red-green color deficiency is most common. Therefore, any time you use color to convey information in the interface, you should also use clear, secondary cues to convey the information to those who won't be experiencing any color coding today.

For example, when you fill out an online form, clicking on "submit" and you may get an error message saying there is some invalid input. It is common to use red to highlight errors. If the originally form uses green for field labels, and red is for highlighting errors. For people with red-green color deficiency, it will not work for them. It is ok to use them, but don't solely rely on the color contrast to communicate error message. Add some icon in front of the invalid data field. Also, show summary on top of the page about which fields are problematic, etc.

This is one of the site accessibility issues.

Look at traffic signs (Figure 6.4) in the physical world. Besides color, they also use shapes to convey the information.

Figure 6.4: Traffic signs.

6.2.3 DESIGN FOR AFFORDANCE

An affordance is whatever can be done to an object. For example, a chair affords sitting, a button affords pushing, and handle may afford turning or pulling, depending on how it is designed. Norman's insight was that perceived affordances are even more important than real affordances in terms of usability. Affordance is only as effective as it is perceivable.

To ensure perceived affordance, the design should meet user expectations. Following conventions usually gives good affordance. Make sure people can easily tell which is clickable and which is not. Clickable objects have a perceived affordance of clickability. At the same time, make sure non-clickable objects don't have clickable affordance.

Explicit affordance (such as an actual button label, "Print") or implicit affordance (e.g., visual cues or context) can be used together to reinforce each other. When there is only implicit affordance used, (for example, a scrolling bar indicator gives implicit message – there is more information below the fold), do not expect that the user can easily get it. Additional cues should be provided as well.

What are the good ways to communicate the affordance of Drag and Drop on the Web?

The chart below shows different mouse cursors to indicate different states of documents or objects, traditionally in the windows or client-server environments? Can they be applied to Web applications, especially to Rich Internet Applications?

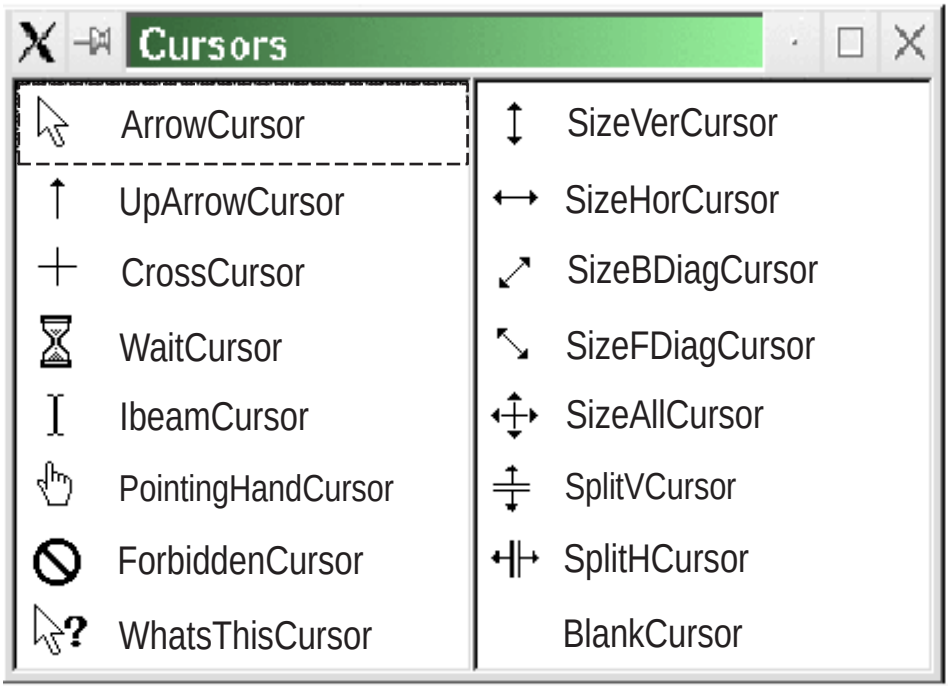


Figure 6.5: Mouse cursor indicators.

6.2.4 DESIGN FOR EFFICIENCY

Efficiency allows the user to accomplish the task more quickly. General usability findings suggest that users don't mind painless clicks as long as the path leads to the right information, especially when people interacting with new websites or infrequently used websites. However, many users would like to have as few clicks as possible when dealing with familiar applications and tools everyday. For example, to create 5 Group Pages in Blackboard, an e-learning courseware used by many universities, you have to repeat the same process five times, which could be annoying. In fact, when not sacrificing usability, all types of users need efficiency.

In the *Maximizing Human Performance* paper, Bruce Tognazzini [103] discusses different ways to ensure efficiency, including decreasing data entry and limiting decision making on the user's side. To decrease data entry, the system can auto-fill information for the user based on previous user activities, such as the 1-click ordering feature on `Amazon.com`. Suggesting allowable data range or using selections can also save users' time and prevent errors. To limit decision making by the user, the system should only present applicable choices (instead of presenting everything and then showing errors after the user selects invalid ones) at any point.

Remember the Less is More research? Be mindful of the fact that every pixel on the screen adds something to the amount of information the user's brain needs to comprehend; therefore, to a leaner, more focused interface is almost always better. Also, putting every possible thing a user may need (or that an organization may want the user to see) in front of the user's eyes at once is counterproductive. Pushing too many choices leads to cognitive static and user anxiety. The system should shape choices based on likely user needs, and provide additional choices in relevant contexts where the user may find them most valuable.

6.2.5 DESIGN FOR FORGIVENESS

Forgiveness allows the user to feel less anxiety about making mistakes, and allows for imperfections in human activity. There are different ways to offer forgiveness:

Easy Reversal of Actions

Human beings make mistakes unintentionally either in a rush or in stressful situations. Easy reversal of actions protects users from being penalized by unintended actions. For example, commonly seen buttons like undo, reset and cancel and some confirmation (are you sure?) dialogs help the user to take actions more conscientiously, especially before committing to significant actions. Again in Blackboard, if you mean to delete something, the system asks you to type in Yes in a textbox. These are all good practices for increasing forgiveness. Sometimes, however, it is important to make sure that forgiveness is not in the way of user efficiency.

Error Prevention

Designers should predict common problems and try to prevent them from happening. For example, data entry can be minimized and, therefore, error rate can be minimized when menu selection is offered rather than free form fill-in. Also, it is helpful to instruct the user upfront about certain rules (for example, in password creation). When errors cannot be completely avoided, try to isolate them as much as possible. For example, one of the benefits of wizards is to help the user fix the problems that occurred in the current step so that they won't lead to more mistakes in many more subsequent steps for the whole process.

Error Handling

Error handling should be the last resort to fixing the error. When users make an error, the error message should be written to help detect the error and offer simple, constructive, and specific instructions for recovery.

6.2.6 DESIGN FOR USER PERCEPTIONS

User perceptions are not always right. However, it is very important for designers to be aware of it during the design process. The first thing to remember is during user research and usability testing, data collected based on user perceptions cannot be directly used to inform the design. What they

think/say could be quite different from what actually happens. Secondly, engaging users to reduce anxiety can dramatically increase user satisfaction.

The story below is cited from Tog's same paper [103]:

> A classic example occurred in the 1930s in New York City, where "users" in a large new high-rise office building consistently complained about the wait times at the elevators. Engineers consulted concluded that there was no way to either speed up the elevators or to increase the number or capacity of the elevators. A designer was then called in, and he was able to solve the problem.
>
> What the designer understood was that the real problem was not that wait time was too long, but that the wait time was **perceived** as too long. The designer solved the perception problem by placing floor-to-ceiling mirrors all around the elevator lobbies. People now engaged in looking at themselves and in surreptitiously looking at others, through the bounce off multiple mirrors. Their minds were fully occupied and time flew by.

When it comes to time, user perception could be wrong. In one of Tog's studies, each and every user was able to perform the task using the mouse significantly faster with an average of 50% faster, but interestingly, all of them reported that they did the task much faster using the keyboard. Do similar situations exist in searching vs. browsing? Maybe. As discussed earlier, depending on the user task, the site, and nature of the information, we may get different answers. However, it is important to provide multiple ways to accommodate different users so that they can choose the preferred method to perform their tasks. In addition, it is very important to reduce the "subjective" or "perceived" system response time when it cannot really be shortened. Tog recommends the strategy to keep users engaged. He also offers tactics for reducing the subjective experience of system "down time." On many of websites, you can see those similar types of techniques used to show progress status which helps make the wait time less boring and more tolerable.

6.2.7 DESIGN FOR HELP

How often do you use the help feature in the Web environment where competition is just one click away? Probably minimal unless it is an application that you have to deal with everyday for your class, work or life and you have no other choices. Here, are the principles of designing for help.

The best ideal help is to make the design intuitive enough so that people don't need help and the UI requires no explanation. Why? We know, based on the least effort principle, only a small number of people who bother reading help documents; we also know on the Web, people often muddle through. They are not interested in learning your site especially when it is hard.

Because the ideal is, by definition, not always real, we should consider providing help where it is necessary. Because people naturally learn best while doing, it is often more useful and effective to provide help in the context of the user task. For example, displaying specific instructions when the mouse cursor is in the datafield so that the user can adjust their input dynamically (see Figure 6.6).

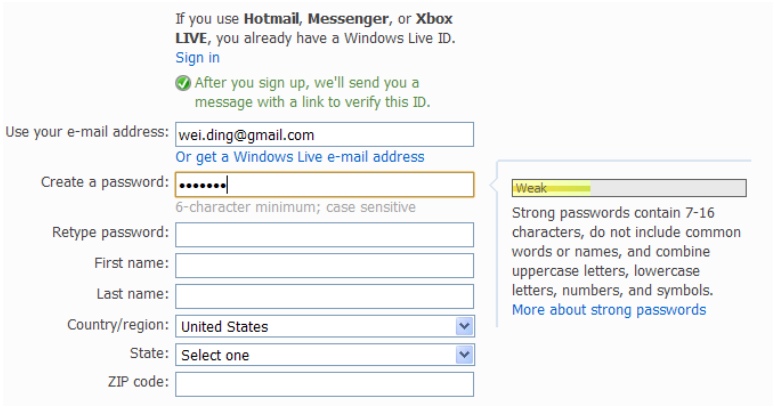


Figure 6.6: Microsoft's user sign up form.

6.3 PERSONALIZATION AND CUSTOMIZATION

Personalization and customization are now commonly seen on many client-facing websites and Intranets. While the two are closely related and sometimes used exchangeably by some people, we differentiate them for our discussion purpose.

Personalization is systematically-generated view of the user's own information based on certain user attributes or activities in the past, and *customization* allows the user to "take control over some combination of presentation, navigation, and content options."

Personalization based on voluntary self-reporting data (e.g., demographics, preferences and interests) is less reliable than that based on the history of actual user activities. Personalization-based recommendations (marketing information) should be carefully created. Un-useful information can only add clutter to the screen, overload users, and may eventually turn the users off. Well-known personalization examples include `Amazon.com`, Netflix and eBay (the My eBay area). While the non-personalized areas contain all information that everybody could possibly need, the personalized area contains only and all relevant information/data for the user. In addition, the user can easily navigate between the personalized and the public areas.

Many e-Commerce sites take a personalization approach because it can potentially offer a great way to connect the users' and the business' interests. It provides a more personal experience to the user while the business enjoys the opportunity for more relevant and targeted marketing (cross sell and up sell), by making user-activity based recommendations (e.g., past purchase history), social recommendations (past behavior of similar users), and item-based recommendation.

In the intranet environment, personalization can be based on job function, role and many other detailed HR data points (see more discussions in Chapter 7).

My Yahoo! was the earliest internet portal site that offers customization capabilities and many portal sites and aggregators support it (including iGoogle, pageflakes, and `netvibes.com`, just to list

a few). Customization allows the user to choose what to see when they want to see it. Specifically, the user can decide on which page/tab and where on the page to display what information. The challenges are obvious too: It is hard to determine how much control is enough for the user—too much control can easily become overwhelming. When the user can add widgets/modules /portlets to one or multiple customized pages, they enjoy the convenience of seeing everything they need in one centralized place. However, as they keep adding stuff and more pages to the customized space, things start to get disorganized again. In addition, while the user needs change dynamically, it is not guaranteable that pre-determined customization can always match the user needs, let alone predicting user needs. In addition, the designer still needs to make their best shot for default views given the notoriously low customization rate by the end user. Majority of users won't do things that are not well worth the effort (least effort principle again).

While appropriately designed personalization and customization help improve information relevance and build client loyalty, they cannot eliminate the need to design the overall site information architecture and navigation. Furthermore, even the personalized areas require good information architecture and navigation.

CHAPTER 7

Enterprise IA and IA in Practice

Enterprise Information Architecture is about, within institutions of different sizes, organizing and managing information, designing, integrating and aggregating information spaces/systems and facilitating information sharing and collaboration in order to foster enterprise culture, improve employee productivity, ensure quality of customer service and competitive advantage, and support business profitable growth and innovation.

There are many issues concerning Enterprise Information Architecture (EIA). Our focus here is primarily on enterprise Intranet strategies and online workspace integration solutions.

As far as practising information architecture goes, we are going to discuss how IAs work within user experience design teams, their competencies and various team configurations.

7.1 ENTERPRISE INFORMATION ARCHITECTURE

7.1.1 INTRANET STRATEGY AND DESIGN

7.1.1.1 Define the Intranet Problem

Almost every institution has its enterprise Intranet and sets of Intranets at different levels. However, how much employees rely on their Intranets in their daily work varies. Common problems usually are as follows:

- Information is scattered across share drives, intranets, and local drives leading to poor version control, duplicate or conflicting information, and information gaps. Users, especially new employees don't know where to find the gold copy of the information.
- A disparate array of applications were developed based on point solutions without enterprise guidelines, which leads to duplicate team efforts among organizations and unnecessarily different solutions to similar problems. Inconsistent navigation, interaction and information presentation adds frustration to the user experience.
- Users are forced to find information based on organizational structure. If you are not familiar with the organizational chart, you cannot find the information needed. However, the org chart may change from time to time, which then leads to obsolete and fragmented information and high maintenance costs.
- Information overloading and irrelevance. Did you ever feel that there was a lot of information on the Intranet, but very little relevant to yourself, especially when the site architecture does not match the way you thought it should be?

7.1.1.2 Understand the Business Strategies and Objectives

Information Architects need to work with the senior management to understand the business strategies and objectives. For example, the business objectives can be as follows:

- Business needs to communicate the company's culture, vision and initiatives via the Intranet and build stronger relationship with its employees (communication).
- Increase employee's knowledge about their job and their profession, knowledge about the business and the organization (knowledge management).
- Encourage employee self-provisioning to minimize manual processes, reduce operational costs, and increase the organization's competitiveness.
- Maintain scalable and consistent infrastructure to support business growth and ensure cost-efficiency.
- Promote company advantages (benefits and perception) and, therefore, increase or improve employee retention.

7.1.1.3 Understand User Needs

It is very important to conduct in-depth research with key organizational groups to identify major employee issues and needs. Focus groups, interviews, and/or surveys are often used to collect such information. For example, the user needs can be stated as follows:

Awareness: Help me be aware of what I need to know. Help me understand what I don't know. Help me understand what's going on in the company and in the division as well as in the industry.

Job efficiency: Help me manage my tasks and get my job done efficiently.

Information relevancy and findability: Just give me the information relevant to me and help me find all information of interest.

Work-life balance: Help me take advantage of the company's offering for work-life balance.

Career development: Help me advance professionally.

7.1.1.4 Establish the Intranet Vision and Design Strategy

The Internet vision should unite all interested parties across organizations and support both business goals and the needs of employees. Most importantly, it should clearly outline the intended purposes of the Intranet. Depending on the industry sector, size and other specific situations of the institution, the Intranet vision may vary from company to company. The following statement is one example from a large financial company.

The company's enterprise intranet is:

A consistent channel of delivery for communicating the company's vision, business interests and culture, and maximizing awareness and understanding (authenticity of B2E communication).

The central portal that aggregates, integrates, and presents all relevant information to the employee in the proper context in a flexible and customizable manner, therefore supports task management and increases employee productivity and satisfaction (implies personalization, customization and central repository of knowledge and tools).

The primary forum that engages employees in all business units and locations, facilitates knowledge management and sharing, and supports collaboration and community building.

The testbed of innovation that serves as a proving ground for new technologies before they are rolled out to the company's public websites, allowing for development of best practices in a safe environment.

In this example, the vision clearly defines the role of the intranet as a *communication* tool, *a task management* tool, *knowledge management* tool and an *innovation sandbox*.

Once the Intranet vision is created, communicated, refined and agreed upon, the user experience design team and related parties need to define the Intranet design strategy, which can be used to guide the design process, prioritize Intranet features, and keep teams on the same page.

Intranet design strategy needs to address many issues that external websites do not necessarily have to, such as application aggregation and integration, and personalization and customization (see Section 7.1.3).

7.1.2 COMMON INTRANET USES AND FEATURES

Common uses and features of the Intranet can be categorized as follows:

- Business information dissemination and communication e.g., news articles/multimedia, executive blogs, corporate calendars, events, and social endeavors.
- Access to information on work practices, job aids, products and services, business procedures, HR policies, professional development resources, periodically updated reports, etc.
- Employee self-service tools/applications including accessing compensation related personal data, accessing job boards, signing up for learning courses, ordering supplies, requesting software/hardware/equipment, booking travel, updating profiles and HR forms, electing/modifying benefits, shopping online stores, etc.
- Manager self-service tools/applications including aggregated team reports, team calendars, employee profiles, performance review assistance, etc.
- Knowledge management and sharing, such as site search, staff directories, departmental wikis, etc.

- Accessing job-related applications or online workspaces.
- Integration of business applications and single sign-on [79].
- Instead of simply surfacing links to programs/applications, the former allows users to access tools and information without having to go and choose the source program. For example, a manager can approve her direct report's PTO request without going to the application; the latter frees the user from having to login to each single application again and again within an active session.
- Personalization (e.g., personal dashboards, tools and applications based on job role, favorites/bookmarks) and customization (preferred language, portlets of choice, page layout selections, etc.).
- Community building and social networking features, e.g., employee contributed picture/videos (enterprise Youtube), eCards, etc.

According to the Nielsen Norman's Intranet Annual 2008 [79], here are the major Intranet trends:

- Increased personalization.
- Integration of information sources, often resulting in a single "one-stop shopping" page.
- Emphasis on mission-critical applications and information.
- Improved event and project calendars.
- Special sections to help orient new employees.
- Integration of external and company news, often in the form of customizable feeds.
- Integration of alerts with the main intranet to inform users of important messages.
- Redesigned and improved search features, which often went from horrible to good and generated ecstatic user feedback.

7.1.3 A CASE STUDY: THE ENTERPRISE INTRANET OF THE VANGUARD GROUP

Vanguard is large investment management company with over 12,000 U.S.-based workers cross multiple sites. Its corporate intranet, branded "CrewNet," is among the earliest to adopt the role-based personalization and customization approach to facilitating employee task management and improving job efficiency. The Intranet is considered as a central place for each employee to start their day and go back to it many times during the day.

As one of the lead IAs working on this program for multiple years, the author takes pride in what has been done to the site. Now let's take a closer look.

Overall Site Architecture

The overall site is made up of several major components:

- My Crewnet: is a personalized area made up of several specialized tabs.
- Public content area presents information that anyone in the company can access, including a news portal, company info, work practices and business operations, compensation and benefits.
- Global features and tools. The global header area is reserved for information that people frequently use or constantly look for, such as directories, categorized enterprise applications/forms, specialized contacts, subsites, glossaries as well site search/and employee search. They are always one click away from any page.
- Departmental/divisional subsites follow standard design templates and are linked from the enterprise Intranet.

News: Personalized and Customizable

Delivering internal news is the most common feature across almost all Intranets. The key is to ensure the news gets its maximum readership with highest relevancy. On Vanguard's Crewnet, the news is categorized into corporate, departmental, and industry news, tagged by location, and also differentiated as mandatory and subscription-based news. Everyone in the company gets to see the company news headlines and their own departmental and location-specific news by default, which is systematically determined based on the user's affiliation and cannot be changed. At the same time, the user can subscribe to other departments' or other location-specific news as well as non-mandatory news (such as industry news) via customization. For external news feeds, the user can opt in/out certain categories or sources based on his/her own preferences.

The "My Crewnet" Area

The My Area aggregates or populates role-based or personalized data from multiple applications, in each particular context (e.g., My Job, My Rewards, My Career and Learning, and Manage My Crew—manager portal), to make up the big picture so that the user doesn't have to manually go to separate systems to piece together all the needed information in order for decision making. At the same time, it provides contextual action links to these applications/tools/websites. In addition, reference links are provided to the corresponding durable content areas on the Intranet.

My Job

It supports the Intranet vision of "the only central portal" for the employee to start their day. It also allows the user to group and organize tools and references relevant to their daily job. It serves as a dashboard to show the big picture about what needs to be done for the day or the week so that they can prioritize the tasks efficiently.

The public content area, aggregates critical information from various applications and surfaces it via different "portlets" to make up a big picture. The user logs in the morning and a web browser automatically launches the Intranet, default to the My Job page. It shows what "my day" looks like –from a task management perspective–with information such as today's schedule (pulled from the email/calendar application), "my work queue" (pulled from the primary applications I use as part of my daily job) or things that need my immediate attention. In addition, there are portlets called "my contacts" (see details in Figure 7.7). It is a list of people "I" often need to touch base with and their phone extensions within the company – customized by using the online people finder), "my tools or apps"(like bookmarks), and a list of reports I am subscribing to (as well as its last updated date), etc. If "my contacts" have a different time zone from me, their local time shows up so that I know when is appropriate to call. If one of my contacts is out of office (set up via the email system), I will see an "out of office" indicator next to the name. The Federated Site Search box and "People Finder," in the global header area, are always zero click away from any page.

There is also an aggregated role-based corporate calendar covering various events and reminders along different themes. The user has access to the calendar entries that s/he is authorized to and can choose to filter/view events based on the theme, such as work-life events/workshops, career development events/dates, diversity events, etc. The user can also with one click add event reminders to his/her personal calendar.

This kind of capability/feature helps promote the business to employee (B2E) communication and makes information more easily accessible. While making the intranet usable, useful and desirable is a long term effort, picking low-hanging fruit like this could allow the UED team to demonstrate their value to the business relatively quickly.

Aggregation of Enterprise Applications

My Rewards Page aggregates all the relevant information about "my" benefits and compensation from multiple HR systems. It gives the user a big picture about the whole package they are getting from the company. The business message is what you get is not just the base salary. This page cluster serves the business goal of promoting the total rewards concept for employee retention. See details in Figures 7.1.

The summary view of each section such as summaries for Total Rewards, Payroll, Time (Paid Time Off), Retirement and Benefits also supplement what is lacking in each individual HR systems. Below the summary information, it displays links to the specific systems so that the user can easily navigate to for actions if necessary. The third subsection provides reference links to the public content area, where the relevant HR policy and rules are explained.

The page layout is consistent across all "My Areas." Central column shows personal data. The left column is used for news and business awareness—for example, before benefits enrollment starts, benefit department sends out a reminder/new article about the upcoming event. The news headline would show up. The right column shows the contact information in the right context: HR departments and service provider contacts. People often complained about not knowing who

to contact. This is meant to solve that problem. (Of course, there is also a central place hosting all the company-wide contacts information residing in the global header.)

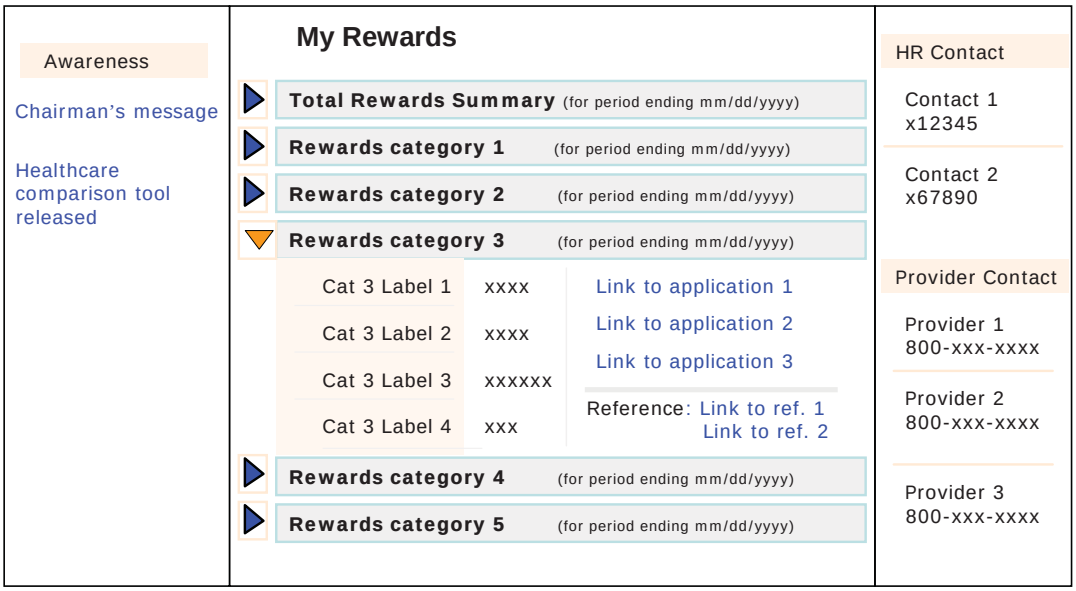


Figure 7.1: My Rewards page shows the compensation and benefits information in an aggregated way.

It surfaces summaries of the user's learning activities (e.g., course enrolled), subscribed job posting information, performance management applications, and job history data.

The manager portal – Manage My Crew integrates data from different management systems and populates them into different portlets, such as "My Approvals" and "My Crew." The former allows the manager to see all approval requests sent to him/her from his/her direct reports via different systems. For most requests, the manager can approve them via the portlets without even having to go into specific systems. The "My Crew" portlet allows the manager to see all his/her direct reports' names, extensions, and working status (on PTO, training or in the office). Also, the manager can view a particular direct report's public profile and then drills down to the "confidential profile" as shown in Figure 7.2.

This page allows the manager to easily gather all relevant information about the direct report, which is very helpful for the manager (especially for new managers) to get to know his/her team or prepare for a one on one meeting. On the Confidential Profile page, the manager can easily switch to another direct report or the current direct report's subordinate by clicking on the people lists on the right-hand side. The list on the upper right shows the current employee's peers and the lower right show the current employee's direct reports when applicable.

Figure 7.2: Manager can view his/her direct report's comprehensive confidential profile.

Creation of New Applications on the Enterprise Intranet

Another noteworthy feature on Vanguard's intranet is the attached applications. One example is the Retirement Planning Tool embedded in the Retirements section of "My Rewards."

Unlike other sections, the retirement plan data is pulled from `Vanguard.com` instead of any HR system, showing the current balance and the user's 401K contribution rate. Vanguard is a mutual fund company and the employees' retirement plans are managed by the Vanguard's institutional investment unit. In addition to the data updated every business day, the contextual action links (e.g., going to `vanguard.com` to make changes, or going to financial engine also residing on `vanguard.com` to do some calculations or analysis) and reference link to the retirement benefit policy area, we also embedded a little "retirement planning tool" to help people better plan for their retirement. This replaces paper statement the company used to send to every employee once a year. The bar chart gives the user a quick snap shot about where s/he is standing towards the retirement goal (shown as dotted line across the top on the chart). It is also a teaser to use the planning tool.

Clicking on the bar chart or the Retirement Planning Tool link leads to the retirement planning screen as shown in Figure 7.3. Here, are some highlights about this application:

First, it takes advantage of Javascript technologies to provide dynamic online help. Because retirement planning is such a complicated subject that most users need hand-held help with taxes related issues, inflation rate, investment rate of return, etc. When the mouse cursor is in a certain data field, contextual help shows up on the right-hand side. Given that fact this was implemented in 2005, when AJAX and other RIA technologies were not yet popular, the design was considered intuitive and innovative.

Second, this application takes advantage of the fact that the employer's HR systems know so much about each employee's compensation and retirement details. These data are personalized and pre-populated, which helps avoid unnecessary human errors and allows accurate retirement planning projections.

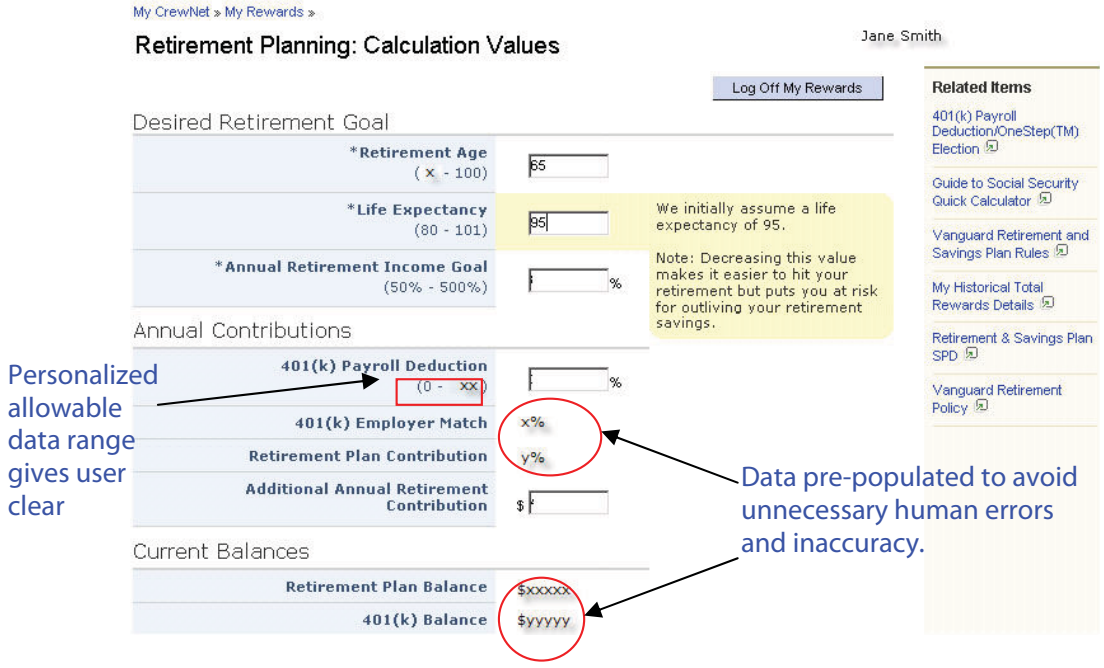


Figure 7.3: The retirement planning tool is embedded in the retirement section of "My Rewards." (Courtesy of Vanguard, Inc.)

Third, the design of the Results page as shown in Figure 7.4 went through multiple iterations with several rounds of usability tests. The design team learned a great lesson that when there are graphics on the page, the most important textual information (as marked in red in the Figure) should be placed below the graphics because human eyes are almost always immediately drawn to the graphical display first. When the paragraph was originally placed on the top of the page, almost all participants overlooked it.

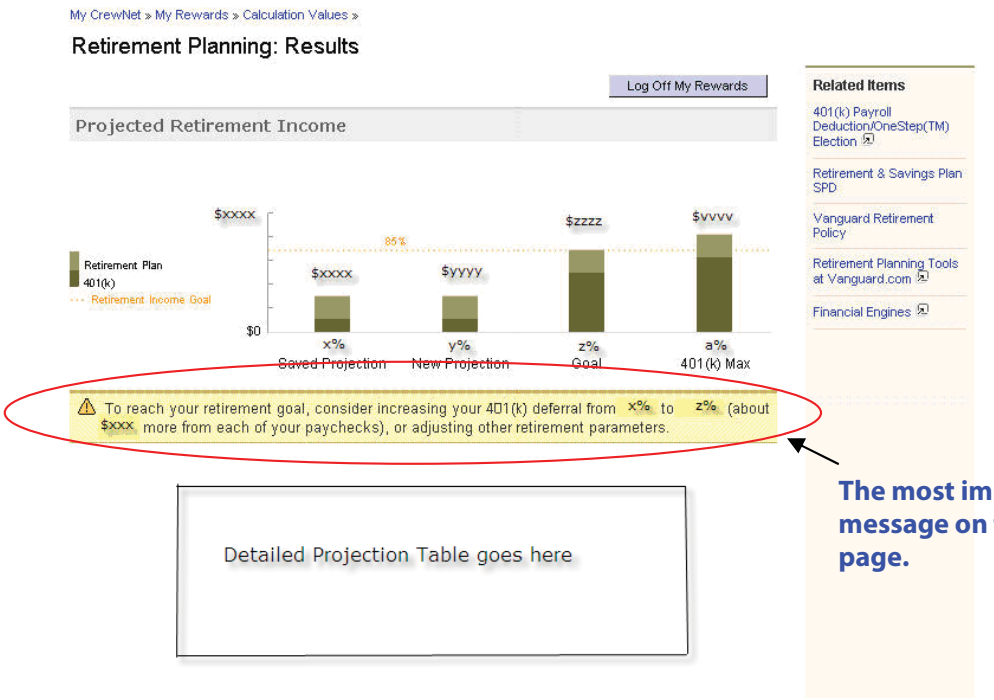


Figure 7.4: The retirement planning tool is embedded in the retirement section of "My Rewards." (Courtesy of Vanguard, Inc.)

7.1.4 INTRANET MODELS

What is the relationship between the company's intranet and the divisional/departmental websites? Again, we are running into the "centralized" vs. "distributed" vs. "hybrid" issue. In the centralized intranet model, all employees go to the same website and have role-based access to relevant information, based on your administrative affiliation and job function, in addition to the public information available to everyone. For the distributed model, like at Drexel, there are separate websites at the University level as well as at the School/College/Department level.

Which model works better? It depends again on various factors, such as the intended use of the information, targeted users, nature of the business, the size of the institution, the functions of the departments and business lines. However, regardless of the model (although a distributed model with some a centralized homepage/start point is more realistic for large organizations from a content generation perspective), the org-chart based site structure (IA) eventually should be replaced by topic-based structure. Here, are several reasons:

- Topics are usually universal to everybody in the company/organization while organizational structure potentially changes from time to time.

- Each group/business unit generates content not only for their own group but often generates content for their internal clients in other groups. If the departments serve exactly the same user population, close coordination is highly recommended. For example, corporate departments (as opposed to business lines), such as HR, Financials, and University Libraries, serving all people within the organization, should organize their (client-facing) information based on user needs as opposed to organizational structure–it would be perfect if the organization structure matches the way users think about their HR information.

- Users should not be forced to constantly learn the organizational structure in order to access all information, just like library users don't have to always know the author in order to find a book.

It is also critical to have a centralized governance board responsible for coordination and collaboration. Having a consistent enterprise-wide look and feel is an important step, but a consistent metadata structure and a strategic content creation model would benefit the user and the organization even more.

Less centralized or distributed models may work better for departments of a university (similar to business lines) because they are primarily serving different users.

7.2 ONLINE WORKSPACE AGGREGATION (OWA)

In this section, we are going to discuss a case study about Vanguard's efforts to create an enterprise-wide framework for producing unified online workspaces. This framework was developed to accommodate diverse business lines and job roles for employees to efficiently accomplish tasks across multiple websites and applications by leveraging cross-organizational design patterns, components and services. The project was worked on by a group of experienced and talented IAs, led by one of the authors between 2007 and 2008 [20]. At the same time, other agencies are taking similar approaches to tackling this problem, such as the Jacada Desktop solution for call centers, back offices and customer service centers [45].

7.2.1 PROBLEM DEFINITION

Today's corporate employees often face an overwhelming array of information and functionalities spread across multiple online resources, such as a company intranet, client-facing websites, home-grown desktop or web-based applications, and third-party sites or applications. Such a complex information environment can lead to increased training times, contribute to feelings of information overload, and impact a worker's ability to efficiently find and interact with the information he or she needs.

Vanguard supports many types of clients, including personal investors, institutional investors, and financial advisors and maintains a number of websites targeted at these client bases. Many of the company's employees directly serve the client base. Dedicated phone groups answer client questions, help clients understand available actions, resolve client issues, and act on client accounts. Back office employees process client paperwork and transactions. Sales staff focuses on relationship management with the client. Other groups manage the financial infrastructure that supports the company's financial products.

As any company grows, so does the number of information sources and applications. Many of Vanguard's applications are very specialized and were built to satisfy a small set of requirements or to support only a single employee role. As the company built out client-facing websites, much data and information was duplicated. As a result, some tasks require an employee to consult multiple sources, or enter information into multiple systems. In addition, as the internal systems have become more intricate, training times for new employees have increased.

7.2.2 EARLY SOLUTION AND ISSUES

Efficiency, accuracy, and quality of client service are key requirements for all employees, but the information environment did not support these goals. Microsoft Windows™ features such as the Windows taskbar are useful, but they offer limited customization options to support internal users' workfolks. In addition, applications/websites displayed in different windows do not generally share data. One Vanguard business line attempted to solve these issues by creating an "online workspace aggregator (OWA)" to join the client-facing website with existing internal systems in an integrated desktop view. Thus, when an associate serves a client over the phone, s/he can see exactly what the client sees on the website while also accessing internal functions and views via a side window on the same screen or a globally accessible area (see Figure 7.5). This approach minimized the need to manipulate windows and switch applications during a task, and it enabled the user to focus on serving clients without being distracted by complex computer operations.

Once employees familiarized themselves with the new workspace, many of the expected efficiencies were quickly realized. This increased job efficiency, employee productivity, and satisfaction. It was soon discovered that having a single location for all information about a client account was invaluable.

Over time, other business groups serving the same client base began to use the workspace aggregator. This presented a challenge since it was not designed to support many of their tasks. Hence, the newer users could not fully benefit from the aggregator. As other business lines considered building their own OWA's, it became clear that the company needed an enterprise solution flexible enough to support various types of users and scalable enough to address new challenges holistically. There were design goals for this enterprise effort:

- Minimize development costs by building one flexible solution rather than a number of individual solutions.

- Harness collective design experience to build a cohesive experience across business groups.
- Manage different tasks and roles to accommodate different working styles while ensuring efficiency.
- Create a scalable solution that could withstand the incorporation of new technologies.

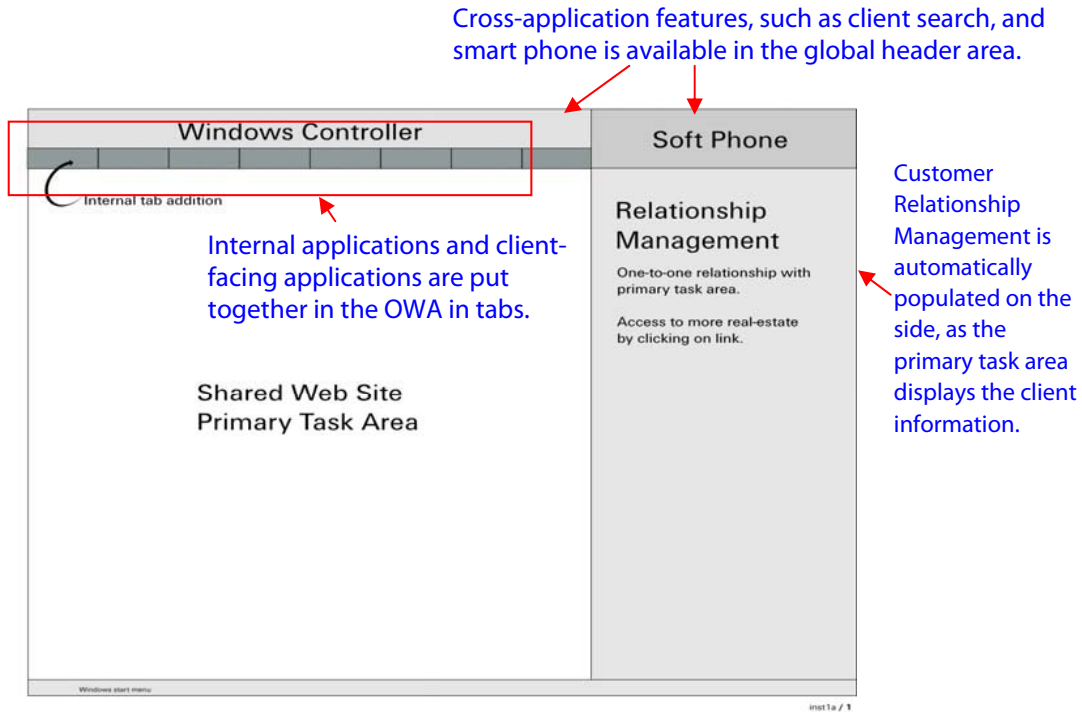


Figure 7.5: The original Online Workspace Aggregator (OWA) layout.

7.2.3 USER RESEARCH AND DATA ANALYSIS

To gain a clear understanding of the various user and business needs within the company, the IA team analyzed all existing user research data, conducted additional research, and consulted various business sources. Outside solutions, such as [31, 39, 49], and [86] in the literature were also examined. By the end of the longitudinal research effort, 35 unique user personas had been accumulated with associated sets of tasks. Figure 7.6 shows the research process.

Based on the team's collective OWA design experience, and the wealth of research data, a set of differentiating factors or attributes were identified, such as job function, working style, job role along with business area.

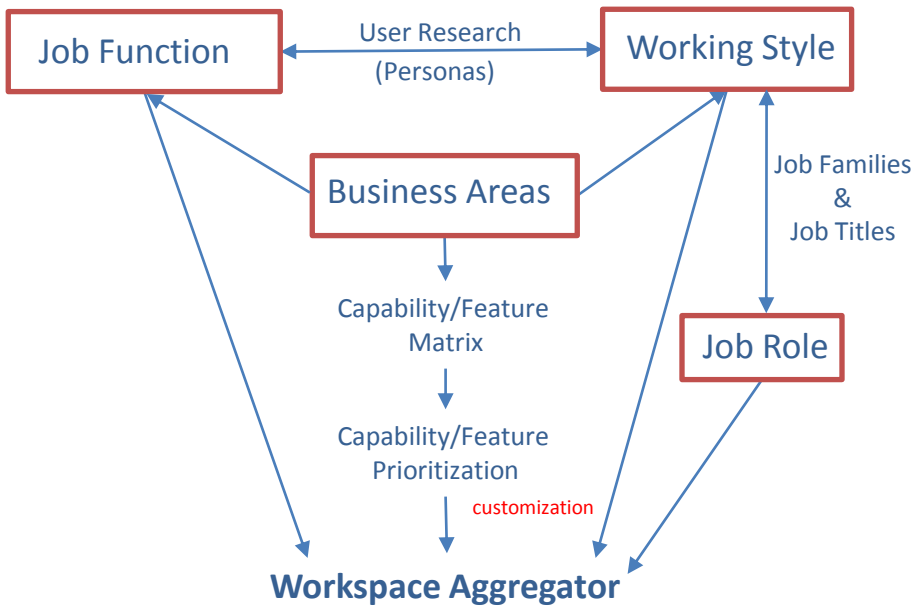


Figure 7.6: Research and analysis process for OWA creation.

The combination of user characteristics (in boxes) determines the specific makeup of the OWA for the corresponding user group.

Job function was one of the important workspace differentiating factors. Similar job functions exist in multiple business lines at Vanguard, including Call Centers, Processing Centers, Customer Services, Client Relationship Management, Investment Analysis, Data Administration, System Analysis and Development, and Project/Resource management. Each function requires that certain system capabilities be packaged together in specific ways.

It also became obvious that there exists a spectrum of working styles in the company, with event-driven workers at one end and self-paced at the other end, and most others falling somewhere in between. For event-driven workers, productivity, promptness, and accuracy are the primary concerns. Their work is triggered by an incoming call or the automatic assignment of processing work. They need quick access to all relevant information from various systems in order to respond promptly to client's requests.

Self-paced workers, on the other hand, typically engage in a great deal of multitasking, with the ordering of their tasks being largely self-determined. They are required to reprioritize tasks throughout the day as new requests and issues arise. Support for time management and task management is critical to them.

While the event-driven users benefit greatly from seeing related information from different systems simultaneously, our observations showed that self-paced users seemed very comfortable holding information in short-term memory as they toggled between windows. This was a key finding that clearly differentiated the needs of event-driven workers from those of the self-paced.

The analysis of user tasks and the business process research led to a matrix of OWA capabilities/features against each identified user group. Those capabilities were then prioritized based on criticality and frequency of use for each user group. An investigation of the company's 26 job families and 156 job titles further validated the definitions of Job Function, Job Role and Working Style.

The combination of these attributes mentioned above can largely dictate what kind of capabilities or features are needed for a particular OWA as well as the corresponding components and design patterns, which in turn formulates a knowledge base determining the relationship between the attributes and the OWA design components.

7.2.4 NEW SOLUTION: AN ENTERPRISE WORKSPACE FRAMEWORK

The diagram (as shown in Figure 7.6) led the team to recommend an enterprise OWA framework. The framework consists of a master set of OWA patterns, features and components. Each OWA, based on its attribute values and customization, can be derived from this framework and tailored for a specific user group (see Figure 7.7). Specifically, this framework supports the following.

Role-Based Information and Application Integration

This includes easy access to all critical applications/sites and tools, including the company's intranet via the tabs on the top of the window. Users can easily switch between these resources. Critical information applicable to all applications is displayed in the global header area for convenient reference.

Meaningful connections (interoperability) are automatically made between applications, to minimize manual steps and human errors. For event-driven workers simultaneous views of multiple applications and forced workflow controls are available where appropriate, with related data grouped together. For example, when a client calls in, the key client data screen displays automatically, with recent client contacts and transactions shown in the side window.

Strong Support for Task and Information Management

The aggregator fully utilizes the global header area to provide quick access to frequently performed tasks and tools at personal and group levels, as well as to shared utilities for cross-application uses. These tools support knowledge management (e.g., federated search and online bookmarks), task management (e.g., task lists, dashboards, and aggregated calendars), and communication and collaboration (e.g., personal staff directory, alerts, feeds, instant messaging, and click-to-chat). Many of these tools are already available on the company's intranet via portal technology and they are portable services for other applications to use. Making these utilities directly accessible in the OWA increases their usefulness and promotes company-wide reuse.

One example is the "My Contacts" tool as mentioned early in the Enterprise Intranet Section 7.1.3 (shown in Figure 7.7). This tool allows the user to pull his/her frequent contacts from the company's staff directory and have the key information always visible on the list, including name, phone number and status (e.g., "out of office" or local time if in a different time zone). Each contact is linked to the employee profile on the company's intranet for more detailed information. By surfacing this tool in the global header of the OWA, the user can view their contacts' information any time. Same thing is true for the Search function.

In addition, OWAs incorporate tools for users to participate in collaborative group work, such as Group Contacts and Bookmarks, "top content searches," etc.

"Attribute-Driven + Customization" Approach

Using the OWA knowledge base as mentioned earlier, we are building an OWA "visioning" tool. With this tool, designers and business sponsors who are planning to build a new OWA can specify users' key requirements and attributes, and a corresponding OWA model will be formulated. Specifically, the tool recommends what applications/websites to be included in the tab structure, what goes to the shortcuts, what global utilities and enterprise tools are displayed in the global header, and what UI layout is suitable for the particular user type. It can then be further fine-tuned via business customization and preference setup. Alternatively, an existing OWA stored in the tool can be chosen as a starting point for further customization.

User groups in the same business line may share critical applications, but they may get a different UI layout for their OWA's due to the working style differences. While it is critical for event-driven workers to have tightly coupled applications with split window views and follow enforced workfolks, self-paced workers, on the other hand, need more support for multi-tasking. Therefore, the recommended design for self-paced users highlights the availability of tools for task prioritization, time management/planning, and status tracking.

This attribute-driven "aggregator assembly process" enables new business areas to take full advantage of the User Experience Team's accumulated expertise in designing OWAs. It also saves them from reinventing the wheel while ensuring a cohesive user experience across all OWA's. From a development standpoint, this solution is more cost-beneficial since one effort can benefit all sharing groups.

7.2.5 SUMMARY

This case study is a good example to demonstrate that information architecture is not only concerned with the organization and navigation in a single online space or within one product but also concerned with how to integrate company intranets, client-facing websites, and home-grown applications as well as third-party tools to support task management and employee productivity. The resulting framework aggregates diverse information spaces and accommodates a wide range of user types, tasks, and workstyles, ensuring a cohesive user experience across multiple workspaces.

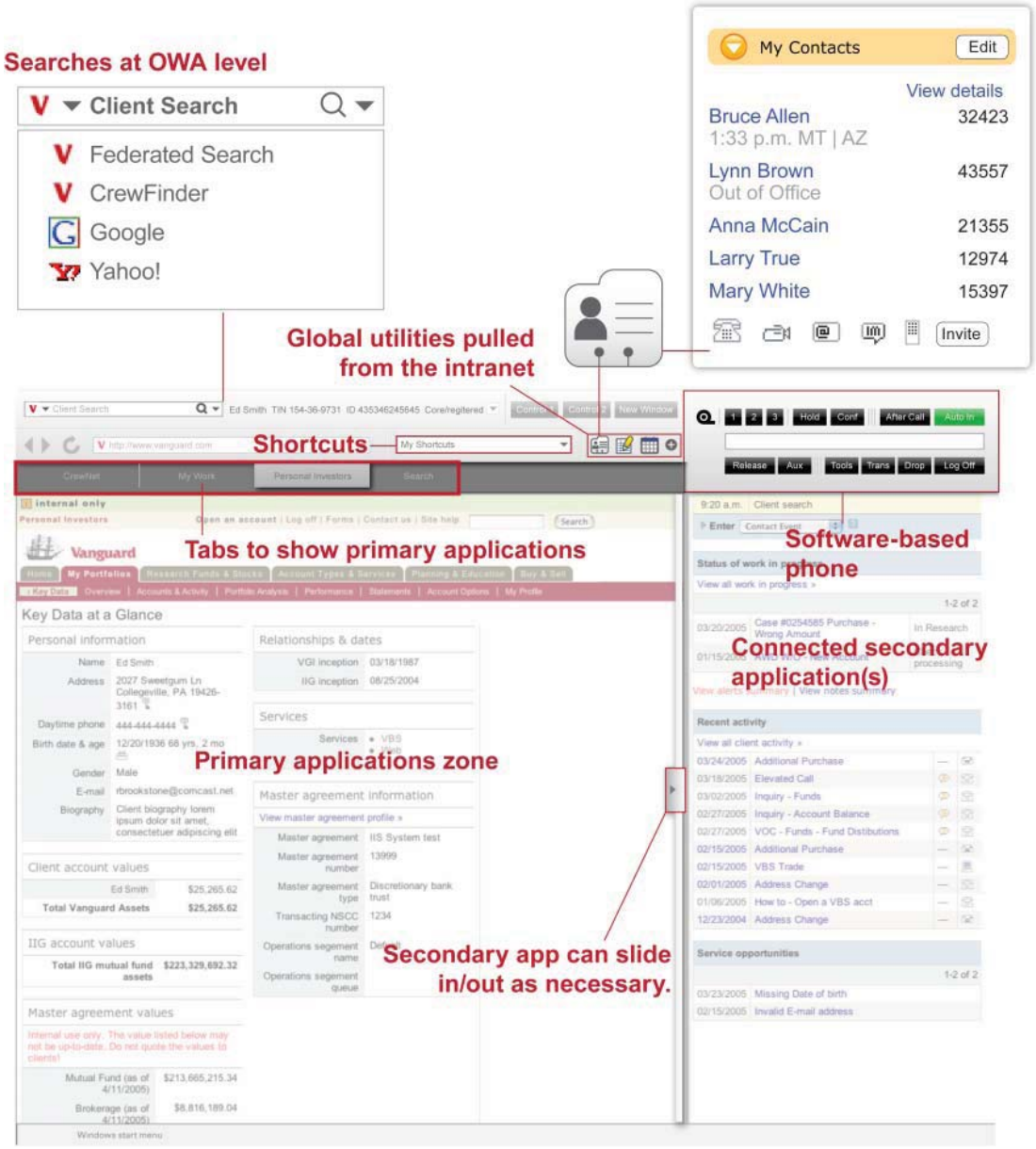


Figure 7.7: An example of an OWA. In the global header area, sharable services are surfaced from other apps, e.g., My contacts and the Search Bar. Split window views allow all relevant info pulled together from multiple apps.

Although this framework was created to meet workspace integration challenges for one financial company, it should also inspire other large enterprises dealing with similar situations where employees are forced to move between complex and multilayered information spaces.

In addition, this should trigger further thinking around personal information management in the public Web context. When the Internet users have to deal with so many websites, devices, channels and platforms, information and functionality aggregation, and integration will become more and more necessary. While there will be challenges in terms of security and authentication, information architects should start looking into the opportunities help people manage their life more easily and efficiently.

7.3 PRACTISING INFORMATION ARCHITECTURE

When discussing the UCD methodology, we touched on many aspects of the IA practice. In previous chapter, we also talked about the relationship between Information Architecture (IA) and Interaction Design (IxD) as the critical components of User Experience Design. The focus here is about how IAs work with related disciplines and create business values.

7.3.1 MAKEUP OF A USER EXPERIENCE DESIGN TEAM

In addition to the consulting firms, more and more organizations now have their in-house design teams. Depending on many factors, the staff doing design work may have different titles and form various team configurations. We are introducing a typical model—the design staff coexists in a multidisciplinary team, usually called User Experience Design (UED or UXD). The team is usually made up of the following:

- User Researchers and/or Usability Engineers.
- Information Architects (aka UI Architect, UI Designer, or User Experience Architect) and/or Interaction Designers.
- Visual Designers/Creative Designers/Information Designers.
- Content Writers/Strategists.

The Chart on the next page shows an example of the makeup of a typical User Experience Design team, based on our own experience. Along the timeline (x-axis), each role is involved with a different pattern of effort levels (y-axis). In the case of specialized IA and ID roles, IAs tend to be involved in the earlier phase (visioning and conceptual design phases) while the ID picks up the work as it comes to the logical design phase all the way through documentation and post-design support. The IA and ID roles may be played by the same people on some UED teams.

The Usability Engineer (UE) or User Researcher gets involved in the project in a peak and valley pattern. When it is the time to conduct user research, they have their peak time. Then they gradually fade out until at the end of the conceptual design. It comes to their second peak time when

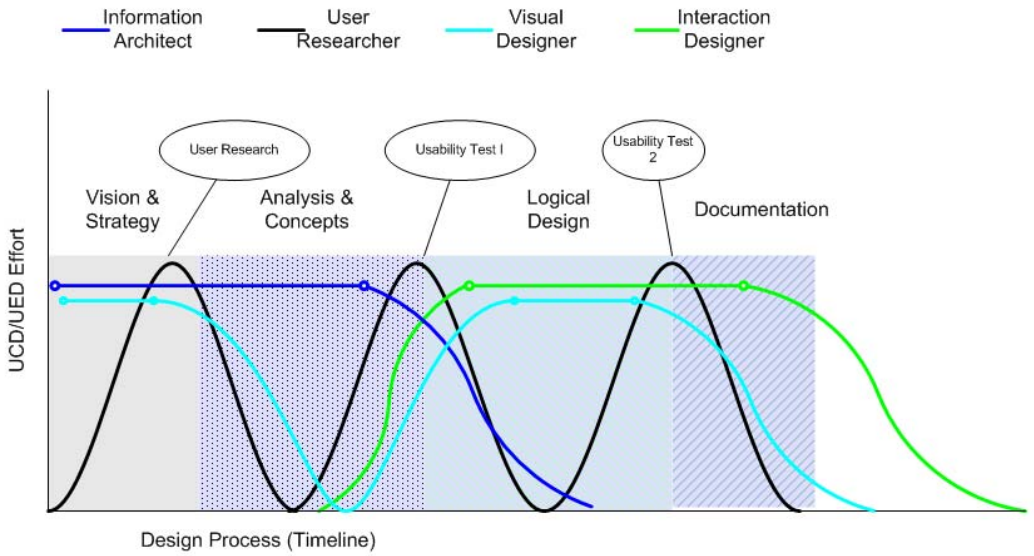


Figure 7.8: User Experience Design Disciplines in the UCD Process.

conducting the usability test. The third peak time comes at the end of the logical design phase–conduct UT with the logical design prototype.

The involvement of Visual Designers follows a different peak/valley pattern.

7.3.2 SPECIALISTS VS. GENERALISTS

In his IA Summit '06 presentation [99], Jared Spool talked about generalists and specialists based on the different team models. Generalists are the same people wearing multiple hats and play multiple roles on the UED team while specialists focus on their own disciplines and collaborate with specialists from other disciplines. Large organizations, as the design teams get mature, tend to support specialists for several reasons: One being each role requires a different set of skills, and two being some roles (e.g., user researchers) need to maintain certain objectivity in assessing the design. We often use this analogy to describe the relationship between designers and usability engineers–if designers are attorneys, usability engineers should play a judge role. This does not mean that designers are intentionally biased, but somehow they make certain unconscious assumptions along the way. When specialists work together, seamless collaboration and communication is key to the success of the team. However, Spool warned that during an economy downturn, many companies may not choose to employ specialists. Therefore, "information architects must be versed in other user experience disciplines."

7.3.3 CENTRALIZED VS. DISTRIBUTED ORGANIZATIONAL MODELS

In large organizations, there could be multiple design teams supporting different business lines. What is the ideal organizational model for the design teams? There are four business models to my knowledge. In some companies, there is a centralized UED group composed of individual UED teams for each business line. The UED group stands between the IT shop and the business groups. In other companies, each UED group is part of the IT group supporting each business line. The way the third model works is that the each UED group is embedded within each business line. The fourth one is hybrid. There are pros and cons for each of the three models.

- Model 1, Centralized: The centralized model allows the UED department to be the "Big Picture" keeper for the organization it makes it easier to push for enterprise design standards and guidelines as well as design pattern sharing and reuse, and it minimizes the learning curve for users (with coherent/consistent user experience). In addition, it allows for easier collaboration (across business lines) and best practice sharing. The UED department as a whole can have a stronger voice and higher visibility.

- Model 2, Distributed across the IT shops: This model allows each design team to focus on specific needs (of each business line) and also allows easier vertical resource management (the design team and the IT development teams report to the same division/department). However, it is very easy to create isolated "design islands," which can be barriers for cross-organizational collaboration.

- Model 3, Distributed across the business lines (similar to Model 2): The only difference is design teams in Model 2 are more likely to have intimate technological knowledge.

- Hybrid, a combination of the above models.

How to choose the right model? It depends on many factors, such as the size and type of business, the communications process the business needs, and the competitive advantage in providing a stellar user experience. For small organizations, there may not be a sizable UED team. The design can be provided by external consultants or internal staff who may not have an IA or designer title (e.g., webmasters).

7.3.4 MAXIMIZING THE IA IMPACT

Because IA is an emerging discipline, their value to the business may not have been fully seen by many people. Therefore, selling IA is as important as creating successful IA designs. In almost every organizations, IAs need to sell their ideas to people at different levels to justify their existence, demonstrate their value, and build up their reputation. In order to be successful, IAs need to pay attention to the following aspects:

- Understanding the business model.

- Knowing your audience. You need to deal with different types of people including IT shops, business sponsors and stakeholders, and senior management. You need to understand their interests and needs and use their language when advocating IAs. For example, IT teams are interested in less rework and reusable code; business sponsors need to see how your designs are aligned with their business objectives. Senior managers and executives are ultimately interested in how UED will lower costs, increase sales, and improve employee productivity. You need to manage the HiPPOs (Highest-Paid Person's Opinions).

- Fighting the right battle. Do not expect that you can change the world over night. Prioritize the things and allow people time to have the buy-ins. Also, keep in mind, you are not fighting against people, you are fighting for the right way to do things. At the end of the day, you need to have friends outside of the UED teams and disciplines instead of enemies, which leads to the next bullet point–

- Working on early adopters of UCD methodology and usability in the IT and business areas. The early adopters can then become UED champions to help spread the words and advocate the value.

7.3.5 DESIRED COMPETENCIES AND SKILL SET FOR IAS

For those of you who are interested in becoming information architects, the following competencies qualifications are commonly seen in IA or related job descriptions. This is also what the author requires her team of IAs to have [19].

Being Strategic with Attention to Detail

Good IAs have ability to work in great detail. But, at the same time, they can focus on broad strategic issues. The best information architects take the user research, content analysis, business goals, and all of the other input information, and synthesize it into something that really works. They can see the big picture and keep an eye on all of the specific details.

Independent Thinker with Flexibility

Good IAs should demonstrate highly independent thinking. At the same time, they need to demonstrate flexibility to listen to others, open to good ideas and accommodate unpredictable needs.

Leader and Team Player

Any IA should be willing to take initiatives and leadership in any size or any type of effort. At the same time, they need to work closely with other team members and be willing to be a cooperative team player.

Problem Solver

A capable IA should be able to quickly digest a wealth of information thoroughly and make decisions effectively. Avoiding to fall into the trap of analysis paralysis is very important for any one who is working in a fast-paced environment.

Being Passionate About User Experience Design

Passion differentiates an excellent IA from a good IA.

Design Skills

Good IAs or designers should be experts that are skilled at converting user needs and business goals into appropriate designs. We consider this as the top competency of any good IAs. We would like once again to differentiate "user wants" and "user needs." Good IAs/designers listen to the user, diagnose the problem, and then provide solutions. It is risky to simply give what the user or the business sponsor wants. We don't want to underestimate the value of visual design, but it is important to know that the aesthetics alone cannot improve design effectiveness if the user needs are met. It must be well integrated into the overall interaction flow.

In addition, IAs should have in-depth knowledge in the following aspects:

- Information organization and information retrieval knowledge.
- HCI knowledge including user cognitive characteristics and user behavior patterns.
- User research methods and usability engineering techniques.
- Knowledge about UCD methodology and system development process.
- Communication, marketing and project management skills.

CHAPTER 8

Global Information Architecture

While global information architecture covers a lot of topics, in this chapter, we are focusing on the user experience strategy for institutions that need to interact with their users in multiple languages/cultures, from different countries, or in a combination of the both.

People from different cultures and countries have different value systems and cognitive styles, which may lead to different expectations and interpretations of their Web user experience and usability. Companies and businesses with global distributions of services and products need to pay close attention to those factors so that they can design their user interfaces accordingly to best meet the user needs and maximize business profits.

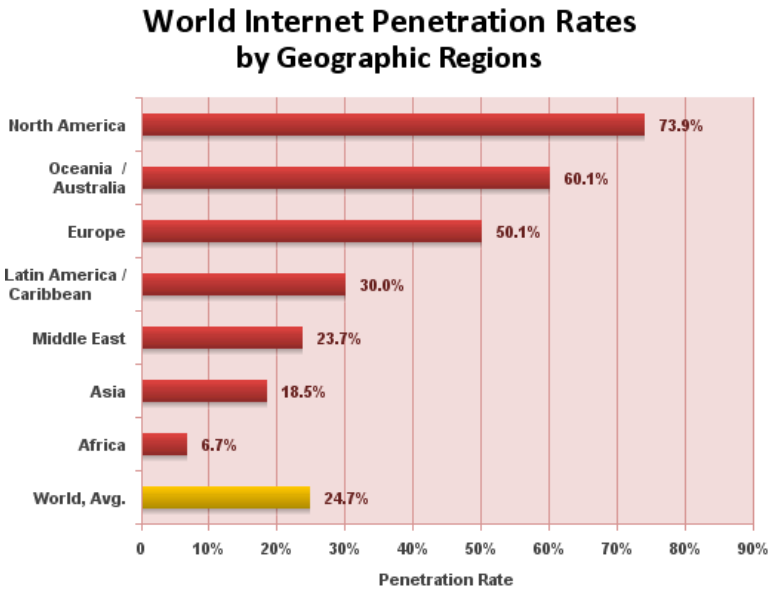
8.1 MAKEUP OF THE WORLD'S INTERNET USERS

Internet was invented in the English world. However, as the economy globalization accelerates, the percentage of non-English speaking users has been growing rapidly. According to the Miniwatts Marketing Group (see Figure 8.1 below), the number of Internet users in Asia (41.2%) has surpassed the sum of North America and Europe (40.3%). From an Internet penetration perspective, Asian and African countries have much greater potential to continue to grow.

8.2 THE NEED FOR INTERNATIONALIZATION AND LOCALIZATION

Globalization makes it possible for companies to gain significantly bigger portions of sales outside of their domestic markets. 70% of Coke Cola's revenue comes from non-US markets [118]. Nike sells its products in 114 countries, and McDonalds is operating in 118 countries. It is key to success for those multinational companies to understand the local markets, and position products and services appropriately. Also, it is equally important to understand and meet the needs of employees in different regions and countries to boost collaboration and improve job productivity. International visitors are three times more likely to explore a website and make a purchase if the website is in their native language [40].

These all lead to the topic of global IA focusing on internationalization and localization for websites, intranets and extranets. While *internationalization* is about designing an application or website so that it can be adapted to various languages and regions without engineering changes, *localization* is the process of adapting the website through language, content and design to reflect local


World Internet Penetration Rates
by Geographic Regions
North America
Oceania / Australia
Europe
Latin America / Caribbean
Middle East
Asia
Africa
World, Avg.
73.9%
60.1%
50.1%
30.0%
23.7%
18.5%
6.7%
24.7%
0
10%
20%
30%
40%
50%
60%
70%
80%
90%
Penetration Rate
Source: Internet World Stats - www.internetworldststs.com/stats.htm
Penetration Rates are based on a world population of 6,767,805,208
and 1,668,870,408 estimated Internet users for June 30, 2009.
Copyright © 2009, Miniwatts Marketing Group

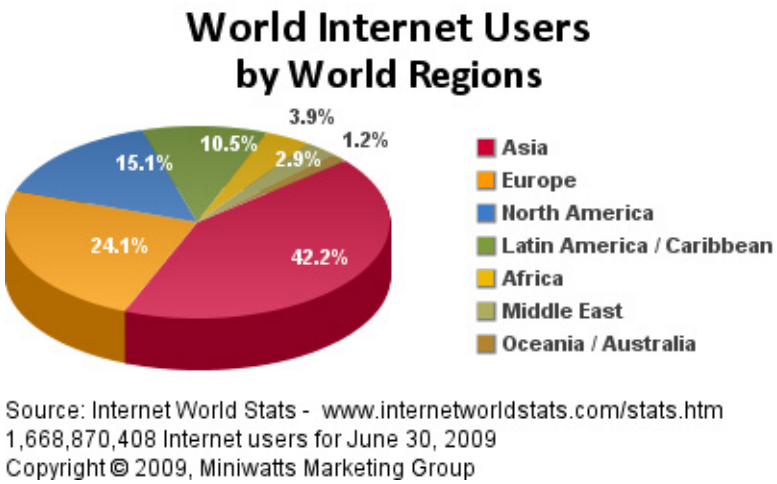

World Internet Users
by World Regions
3.9%
1.2%
10.5%
2.9%
15.1%
24.1%
42.2%
Asia
Europe
North America
Latin America / Caribbean
Africa
Middle East
Oceania / Australia
Source: Internet World Stats - www.internetworldstats.com/stats.htm
1,668,870,408 Internet users for June 30, 2009
Copyright © 2009, Miniwatts Marketing Group

Figure 8.1:

Table 8.1: Top 10 Languages Used on the Web (Number of Internet Users by Language)

Language	# of Users	% of Total Internet Users
English	451,951,053	28.6%
Chinese	321,361,613	20.3%
Spanish	129,251,474	8.2%
Japanese	94,000,000	5.9%
French	72,720,214	4.6%
Portuguese	72,555,800	4.6%
German	65,243,673	4.1%
Arabic	41,396,600	2.6%
Russian	38,000,000	2.4%
Korean	36,794,800	2.3%
Top 10 Languages	1,323,275,227	83.7%
Rest of the languages	258,296,362	16.3%
World Total	1,581,571,589	100%

Source: `http://www.internetworldstats.com/stats7.htm`, as of Dec. 31, 2008.

cultural sensitivities. In short, multinational/ multilingual websites should be functionally intuitive and culturally appropriate for all intended audiences.

It was reported that average websites are localized in 20 languages. Google search is available in 117 languages [108]. However, obviously localization is not just textual translation of the same design. A lot of subtle or significant differences need to be taken into consideration in cultural preferences, language, tradition, religion, etc. The next section introduces how cross-cultural theories help guide the localization of Website designs.

8.3 CROSS-CULTURE THEORIES AND LOCALIZATION

Here, we are introducing two sets of well-known cross-culture theories that can be used to guide the user experience strategies for localization. One is Edward Hall's theory about High Context (HC) vs. Low Context (LC) cultures [33], and the other is Hofstede's Cultural Dimensions framework [37]. In addition, empirical studies also show evidence that people from different culture interpret usability differently. Even the way they organize information is different [24, 59].

8.3.1 HIGH CONTEXT VS. LOW CONTEXT CULTURE TYPES

Hall states that all cultures can be situated in relation to one another through the styles in which they communicate. In Low-Context cultures, such as France, North America, Scandinavian Countries, and German-speaking countries, Low-Context communication occurs predominantly through *explicit* statements in text and speech—the mass of the information is vested in the explicit code. As such, most of the information must be in the transmitted message in order to make up for what is missing in the context.; High-Context cultures, including Japan, Arab Countries, Greece, Spain, Italy and England, involve *implying* a message through that which is not spoken; messages include other communication cues such as body language, eye movement, para-verbal cues, and the use of silence.

The HC communication is identified as indirect, ambiguous, maintaining of harmony, reserved and understated. In contrast, LC communication is identified as direct, precise, dramatic, open, and based on feelings or true intentions.

The HC and LC theory has been applied to guide international website design. By studying McDonald's country-specific websites, Würtz [110] found a set of differences among local websites of the same company. See Table 8.1 for more detailed comparison:

- Websites in HC tend to use more animated effects than those in LC;
- Low-Context websites are expected to be consistent in their layout and color schemes, whereas pages in High-Context websites are expected to be diverse.
- Opening of links in the same browser windows in LC websites is in contrast to the HC Asian websites where new pages would open in new browser windows, giving the visitor a multitude of starting points for further website navigation.

8.3.2 HOFSTEDE'S FIVE CULTURAL DIMENSIONS

8.3.2.1 Overview of the 5 Dimensions

Based on his five year's of intensive research with hundreds of IBM employees in 53 countries, Dutch cultural anthropologist Geert Hofstede identified five cultural dimensions. He rated all the 53 countries on indices for each dimension, normalized to values (usually) of 0 to 100. Table 8.2 lists the scores for 7 of the countries. The five dimensions of culture are the following:

- Power-distance: The extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally.
- Collectivism vs. individualism: Individualism pertains to societies in which the ties between individuals are loose; everyone is expected to look after himself or herself and his/her immediate family. Collectivism pertains to societies in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty.

Table 8.2: Website Differences in HC and LC Cultures (Courtesy of Emily Würtz, 2005)

Parameter:	Tendency in HC Cultures	Tendency in LC Cultures
Animation	High use of animation, especially in connection with images of moving people	Lower use of animation, mainly reserved for highlighting effects e.g., of text
Promotion of values	Images promote values characteristic of collectivist societies	Images promote values characteristic of individualistic societies
Individuals separate or together with the product	Featured images depict products and merchandise in use by individuals	Images portray lifestyles of individuals, with or without a direct emphasis on the use of products or merchandise
Level of transparency	Links promote an exploratory approach to navigation on the website; process-oriented	Clear and redundant cues in connection with navigation on a website; goal-oriented
Linear vs. parallel navigation on the website	Many sidebars and menus, opening of new browser windows for each new page	Few sidebars and menus, constant opening in same browser window

- Femininity vs. masculinity: Masculinity pertains to societies in which social gender roles are clearly distinct; femininity pertains to societies in which social gender roles overlap.
- Uncertainty avoidance (UA): The extent to which people feel anxiety about uncertain or unknown matters. Cultures with high uncertainty avoidance (UA) tend to have more formal rules, and focus on tactical operations rather than strategy. People seem active, emotional, and even aggressive. By contrast, low UA cultures tend to be more informal and focus more on long-range strategic matters than day-to-day operations. These cultures tend to be less expressive and less openly anxious; people behave quietly without showing aggression or strong emotions; people seem easy-going and relaxed.
- Long- vs. short-term orientation: Long-term dimension is also called "Confucian dynamism." Persistence (perseverance), ordering relationships by status and observing this order, thrift and having a sense of shame' are the dominant values. The values of perseverance and thrift are

future oriented and more dynamic while the short-term values are more static, being past and present oriented.

Table 8.3: Cultural dimension scores (courtesy of `ClearlyCultural.com`)

	Power Distance	Uncertainty Avoidance	Individualism	Long-Term vs. Short-Term Orientation	Masculinity
Brazil	69	76	38	65	49
Canada	39	48	80	23	52
China	80	40	20	118 (ranked 1st)	66
France	68	86	71	n/a	43
Germany	35	65	67	31	66
Japan	54	92	46	80 (ranked 4th)	95
USA	40	46	91	29	62

8.3.2.2 Implications of Cultural Dimensions on Website Design

When using cultural dimensions as a framework to analyze websites, researchers [24, 55] reported the following distinctive user experience focuses from different cultures. Note LC cultures tend to have low scores in Power Distance and Uncertainty Avoidance, and more Collectivism oriented; and vice versa. Both LC/HC theory and Uncertainty Avoidance dimension can well explain why Europeans expect compact webpages with a few precise links, while many Asian consumers on high-bandwidth networks expect results as screenfuls of colorful content.

8.3.3 CULTURAL INTERPRETATIONS OF USABILITY

Empirical studies also show that user's cultural background influences their interpretations of usability. Early cross-cultural usability study [11] found while Americans dislike websites with long download times due to heavy graphics, Asians like the graphics, suggesting a difference in preferences for efficiency versus satisfaction. The latest study [24] shows that Chinese participants place more importance on visual appearance, satisfaction and fun than their European counterparts when asked to assess the aspects of usability. The European users report effectiveness, efficiency and the absence of frustration as more important.

Our anecdotal observations also seem to be consistent with the above findings. Simplicity is just not the norm for Chinese websites. Almost all major Chinese websites tend to have very long pages with abundant links, images, and animations. The navigational menu structure tends to be fairly broad and explicitly displayed. Flashy or floating advertisements (going with you as you scroll the page) and animations are also pretty commonly seen, and often embedded in the main content area.

Table 8.4: Implications of the Cultural Dimensions on Website Design

Dimensions	Low Score Culture	High Score Culture
Power Distance	Prefer less-highly structured information. Less focused on expertise, authority, experts, certifications, official stamps, or logos	Users can handle highly structured information. More focused on expertise, authority, experts, certifications, official stamps, or logos
Uncertainty Avoidance (usually linked to **High Context** cultures)	Navigation schemes intended to prevent users from becoming lost. Simplicity, with clear metaphors, limited choices, and restricted amounts of data. Attempts to reveal or forecast the results or implications of action before users act. Mental models and help systems focus on reducing "user errors." Redundant cues (color, typography, sound, etc.) to reduce ambiguity	Less control of navigation (e.g., links to new tabs/windows). Acceptance of wandering and risk, e.g., large number of links on one page. Help systems focus on understanding underlying concepts rather than narrow tasks. Coding of color, typography, and sound to maximize information (multiple links without redundant cueing)
Collectivism vs. **Individualism**	Individualism cultures: Willing to provide personal information. Motivation based on individualism. Emphasis on truth. Emphasis on what is new and unique	Collectivism cultures: Protection of personal data differentiating the individual from the group.Motivation in favor of group achievement. Emphasis on relationships. Emphasis on tradition and history
Masculinity vs. **Femininity**	High-masculinity cultures: Traditional gender/family/age distinctions. Work tasks, roles, and mastery, with quick results for limited tasks. Navigation oriented to exploration and control. Attention gained through games and competitions. Graphics, sound, and animation used for utilitarian purposes	Feminine cultures: Blurring of gender roles. Mutual cooperation, exchange, and support, (rather than mastery and winning). Attention gained through poetry, visual aesthetics, and appeals to unifying values
Long-term vs. **Short-term Orientation**	Content focused on truth and certainty of beliefs. Rules as a source of information and credibility. Desire for immediate results and achievement of goals	Content focused on practice and practical value. Relationships as a source of information and credibility. Patience in achieving results and goals

This type of website style can be partially attributed to the fact that in China the user population is much younger and relatively more computer savvy, but on the other hand, obviously cultural values and orientation serve as another driver. One of the landing pages of `qq.com` (the world's 14th largest website as of April 21, 2009) `http://lady.qq.com/` was so long that it crashed the screen capture software (SnagIt) each time the author tried to capture it. It took 10 clicks of the PgDn button to get to the bottom of the page (with a 1024x768 resolution).

The screenshot on the next page is the homepage of Eachnet, a popular Chinese auction/shopping site (the former Chinese eBay). It shows a much more sophisticated page layout then eBay or any eCommerce site in the Western culture. This page is about four folds long with a large number of images and links, and all links open a new browser tab/window; there are two

User Information Behavior and Design Implications

Figure 8.2: Screenshot of `EachNet.com`.

animated sections on the top of the page above the fold. Toward the end of the page, it showcases all product categories (links). In addition, there is a personalized global status bar, which stays on another layer above the fold. In other words, this status bar does not prevent the page from scrolling while it is always visible. The status bar provides a good summary of user's activities: Favorite items, item browsed, shopping cart, transactions and favorite stores. While this type of page is rarely seen in the Western culture, it is fairly typical among top Chinese websites.

Figure 8.3: Enlarged personalized global status bar on `EachNet.com`.

Even Google's landing page, arguably the most simplistic design, shows some cultural variance on its Chinese version. As shown on the next page, the Chinese site has more links on the page to showcase other Google tools, with a mousetip to further explain what each tool does.

8.4 GUIDELINES FOR GLOBAL IA AND USER EXPERIENCE DESIGN

There are two common ways for companies to localize their websites:

- A surface-level translation of language and jargon to reflect the conventions of the target audience.
- A deeper aesthetic change, altering images, colors, logic, functionality and branding to conform to the target audience on a cultural level [101].

We are going to discuss the specific guidelines for globalization in detail as follows:

8.4.1 PAY ATTENTION TO LANGUAGE DETAILS

Website translation is by no means straightforward because of various cross-language nuances. Sometimes, there is no direct mapping between languages and people in different cultures interpret words/meanings differently. For example, the word 'flat' in Nebraska is not the same as a 'flat' in London. Homonyms in different languages can be tricky, as well. In English, 'gift' is a nice treat, like a fruit basket. In German, 'gift' means poison. Not only do these details need to be considered when creating and naming a navigation schema, they will also impact both intranet site search, as well as findability on the web.

One critical design problem in translating text into various languages is text swell—the difference between the width of text between various languages. Accommodation in design and layout

Figure 8.4: Comparison between the Chinese and English versions of `Google.com`.

needs to be considered during the design process allowing for this occurrence. Typically, German translations require 30% to 40% more space that English. Sometimes, while some English labels or phrases can fit in one line, in German it would require text wrapping. When choosing labels, especially when the text becomes part of the functionality (e.g., labels for a progress bar), Information Architects and Designers need to be aware of the length spectrum in different languages so that the design works for all websites. Although browsers can accommodate some swell depending on monitor resolution, it is much easier to design for the user's lowest common denominator. If, however, you are targeting Asian markets, keep in mind that the text will generally take up less space than English.

In addition, people from different cultures sometimes think differently, which leads to different ways of expressions. A good international website will not only speak the language of the target audience but also use analogies and expressions that the customer is familiar with [40]. For example, recently Marriott was promoting 20% off weekend prices for its hotel rooms globally. When the message was translated into Chinese, instead of saying 20% off, it was stated as 80% offers, which is a more common way of expression in China (See Figures 8.6).

Figure 8.5: The Marriott promotion ad in English.

Figure 8.6: The Marriott promotion ad in Chinese.

8.4.2 DEAL WITH THE COMBINATION OF LANGUAGES AND COUNTRIES

Most countries speak multiple languages and some languages are spoken in multiple countries. Therefore, when creating multilingual and multinational websites, research should be conducted

upfront, and choices need to be carefully thought through and clearly presented to the user. Here, are some useful tips for designers and IA's.

- Do not assume that there is one to one mapping between each country/region and the official language of the country.

When using a flag to represent a language, it may upset the readers from other countries that speak the same language. Furthermore, when a country speaks more than one language, the flag approach will not scale up.

- Language options on the website need to be obvious and easy to find. Otherwise, most people would assume there are no such options.

- Using target language to indicate choices of language so people with little knowledge of English can easily get what they want.

8.4.3 BE CULTURALLY SENSITIVE

A website designed for users with one cultural background will not be equally usable to users with another cultural background. Design and IA teams' sensitivity and savvyness about the local culture is crucial to the success of localization.

Making Connections with the Targeted Audience

People want to feel like you understand them. When they can relate themselves to the information presented on your website, they are more engaged. For example, imagery of the local site should reflect the local people's activities and life styles. There can be local products and promotions as well. FedEx as a global company committed to localization once learned a lesson from their website for Brazil. Although the presence of the local language and the image of Brazilian flag gained values, they were offset by the image of an Asian carrier. The same image was later used on the website for United Arab Emirates site, which caused an even more severe cultural problem—not only an Asian carrier but also a woman with exposed arms—a cultural taboo in the region as seen in Figure 8.7 [8].

Gerber also learned a lesson in Africa. Due to the large amount of people who cannot read in Africa, most products have pictures of what is inside printed on the label. Africans were very confused when Gerber the baby food company release their products. It contains a picture of a baby on the label [105].

Avoid Using Non-Universal Symbols and Iconographies

When picturing people, be sensitive to the customs and practices of other cultures. Nudity in one country may be acceptable but not in others. In some Asian cultures, bare feet or the sole of the foot send an entirely different message than in the United States where the practice is common.

Figure 8.7: A previous FedEx website for Brazil.

Also, hand gestures should be avoided from illustrating a point. They may not be interpreted the same way internationally. For example, the 'okay' sign (index finger and thumb together forming a circle) is considered obscene in Brazil, while the thumbs-up gesture in Iran is highly offensive.

Similarly, icons should be used with caution for communicating concepts. For example, the mailbox and shopping carts are standard in the United States, but they do not carry the same interpretation in other parts of the world.

Colors Have Cultural Significance

Although colors can play a huge role in the aesthetics of your website, they can serve a greater purpose. Colors act as signifiers, which may not be consistent from culture to culture. Therefore, it is imperative that you do your homework before you choose colors for your international website [40].

In North America, for instance, red is often used in operating instructions to signify danger while other cultures often use green or black for the same purpose. In the Chinese culture, red stands for happiness and good luck. Interestingly enough, on stock tracking websites, red is used to show price going up while green for going down.

Black in Western culture is the color of mourning; not so in Asia, where white signifies death.

Understanding Cultural Subtlety

In some cultures, a name is just a name, which does not necessarily carry any actual meaning, while in others that is not the case. In the Chinese culture, almost all names have some meaning, especially for company names or trademarks. Company names are often considered as the equivalent of their brands. International companies entering the Chinese market need to pay special attention to the way their name is translated. A good translation often needs to meet the following criteria: Phonetically similar to its original pronunciation, sounds pretty and elegant, easy to remember, and the associated meaning matches the company's business value. Coke Cola translated into 可口可乐 "ke kou ke le" in Chinese, has been considered one of the most successful brand translations. It resembles the sound of its original name and gives the drink a meaning elegantly—"putting the mouth to rejoice."

Figure 8.8: Financial site of `Baidu.com`.

Beware of Users' Environmental Situations

Various user research methods including ethnographical research are often used to reveal invaluable insights about the intended audience and the targeted markets, which could be eye-opening for researchers and designers from a different cultural background. For example, multiple family members may share one account in collectivism cultures (e.g., in Vietnam) . People may sit side by side to browse the Web together. Under these circumstances, system features like shared accounts and co-browsing should be taken into consideration.

In some countries, more people browse the Web using public Internet Café instead of personally owned computers; in other countries, especially some emerging economies, more people are using mobile device than PCs for Web browsing. Interestingly enough, in India, people even use IM agent as the primary tool for web browsing instead of web browsers. These scenarios stay at the two ends of the spectrum of users information access environment, which can significantly impact users' perspective of personalization and information collaboration.

8.4.4 SUPPORTING GLOBAL ECOMMERCE

eCommerce website design involves many nitty gritty details from client information, address formats, time, payment methods, currency calculation, weights, measures, shipping costs, exchange/return policies to customer support. Without paying attention to these details, customers can easily get alienated or frustrated. This requires the eCommerce design and development teams to step out of their cultural boundaries and plan for people who might not perceive information the way they do.

It is important to set up the right default settings best suitable for the specific situation of each country/culture. At the same time, companies and designers need to stay on top of the latest trends on the emerging markets and position themselves strategically.

In North America, the standard purchase method has been credit cards. However, that is not the case in some European or Asian countries. In Germany, people prefer to pay by cash or money order. Many restaurants and smaller hotels in the German-speaking world do not accept credit cards of any kind. In China, the domestic online payment was primarily based on the debit card system with 11% of credit card penetration at the end of 2008 [80].

8.5 SUMMARY

Designing a global product is challenging, but when faced with the time constraints of a product roadmap, sometimes textual translation is deemed enough "localization" for all countries. Often, the expenses and additional time required to conduct user research for each country before releasing a product seem too daunting for a company to invest in. However, the teams need to assess the risks of neglecting user research and bring creativity and flexibility to help mitigate them. One option would be, based on the business priorities, to identify representative user groups and key local markets where they can focus on their user research efforts. This approach often proves to be cost effective and realistic in discovering fundamental technological flaws or cultural faux pas towards optimal user experiences.

CHAPTER 9

Mobile Information Architecture

USER EXPERIENCE DESIGN BEYOND DESKTOP COMPUTERS

This chapter discusses challenges and opportunities for user experience design in the mobile Web territory. Starting with unique characteristics and use cases of mobile devices, we then discuss usability best practices based on today's mobile technologies and introduce a vision of the future mobile user experience.

9.1 MOBILE TRENDS AND USAGE DATA

While it is arguable, the consensus among many is that today's mobile Web is in its booming period just like the traditional Web in the late 90s. According to the Tomi Ahonen's Almanac 2009, the total number of mobile Internet users reached 1.05 billion world wide, which in 2008 for the first time surpassed the total number of PC Web users (1 billion) [111].

IDC forecast by 2012, the number of devices accessing the Internet will double to more than 3 billion, half of which will be mobile devices. "The mobile web is the most cost-effective way to reach half the planet" [32].

In the US, as of first quarter of 2008, there were [64]:

- 254 million mobile phone subscribers;
- 57% of them (144 million) were mobile data subscribers;
- 16% (40 million) of them were active users (accessing the Internet at least once a month).
- 14% of the Top 1000 U.S. Brands had optimized mobile sites in 2008, up 75 % over 2007 [83].

9.1.1 WHAT DO USERS DO WITH MOBILE DEVICES?

There have been many empirical studies about mobile user needs, behavior, and intention. Church and Smith [2] found that time, location, activity and conversation were all key contextual factors in prompting the mobile information needs. Below is a summary of the major categories of user needs:

- Local Services 24.2% – requests for opening times of local businesses were also found in this category.

Table 9.1: Leading Industries with Optimized Sites Mobile

Industry	% of US Brands having mobile site
Travel	36%
Entertainment	28%
Internet, ISP and Telecommunications	25%
Insurance	23%
Banks and Financial Institutions	22%

- Travel and Commuting 20.2% – requests for information about flights, accommodation, maps and directions, bus schedules, and traffic reports, etc.

- General Information 15.6% – requests for factual information, e.g., "Does a Nintendo DS need batteries? If so what type of batteries?"

- Entertainment 12.8% – information on TV show time, movie theatre schedule, etc.

Cui and Roto [12] categorize the user activities on the mobile web into three types: Information seeking, communication, and data handling. Nielsen Mobile's large-scaled user survey [64] reveals that the world's top mobile web categories are: Portals, email, weather, news, search and city guides/maps, and sports. This means mobile browsing are both utilitarian (find a specific piece of information) and hedonic (entertainment while waiting), and it is important to balance the two.

Taylor et. al [102] proposed a framework to help understand the mobile web behavior and motivations. The motivations are listed in the table below and these motivations can be fulfilled via a combination of different behaviors (Table 9.2).

9.1.2 CHARACTERISTICS OF MOBILE DEVICES—ACCESS ANYWHERE ANYTIME

Mobile devices are not simply small screened computers. Mobile phones differ from computers in many aspects. The mobile phone is the following:

- Small. Users are unlikely to carry large devices, the primary screen will stay small, although some flavor of projection can be used as a backup screen. Some mobile applications can come really handy. For example, the Lonely Planet iPhone Audio Phrasebook allows the foreign traveler to "speak" in local language. See Figure 9.1 the translation from English to Mandarin.

- Multi-purposed and ubiquitous. Since users will not carry a variety of single-purpose devices full time, mobile devices are carried and used in a wide range of environments, including at home, at work, on the street, while driving a car or using public transportation, in restaurants or other public settings.

Table 9.2: One or More User Behaviors Below Are the Actions Taken by the User to Satisfy the Motivations Mentioned Above

Awareness:	The desire to stay current, to keep oneself informed in general. Examples: Scanning email and checking news sites
Time Management:	The desire to be efficient, to manage projects, or get things done.Examples: Looking up an address; checking traffic maps; looking for supplies/ jobs/ roommates; getting instructions for a class assignment
Curiosity:	The interest in an unfamiliar topic, often based on a tip or chance encounter. Examples: Looking up information about a country of interest; looking up information to settle a friendly bet in a bar
Diversion:	The desire to kill time or alleviate boredom. Examples: Browsing favorite sites; checking social networking sites
Social Connection:	The desire to engage with other people. Examples: Arranging to get together; sending email; posting to social networking sites; seeking information as a group
Status Checking:	Checking a specific piece of non-static information. Examples: Weather; news; sports and scores (during a game)
Browsing:	Trolling for new information of interest without any apparent goal
Information Gathering:	Looking up information about a particular topic. Examples: Searching multiple sources about a band, or finding information about a news topic or a country
Fact Checking:	Checking or validating a specific piece of static information. Examples: Business address or phone number
In-the-Moment:	Seeking information to aid the immediate course of action. Examples: Looking up the driving directions for a business to run the next errand
Planning:	Seeking information to aid events beyond the immediate course of action. Examples: Checking the weather for a weekend trip; collectively planning a social event with others
Transaction:	Exchanging information with another person or an institution for financial resources, goods, or services. Examples: An e-commerce purchase or bank transfer
Communication:	Engaging in a two-way sharing of information with another person or group. Examples: Email or responding to others' posts

- Personal, as an always-carried device is always carried by one person. The device is not shared, except in some emerging markets. It is possible to receive notifications or promotions in the right context (location) based on the users' preferences and previous behavior. It is also a statement of personal style with a potential to be a highly personalized computer and used as the user's unique identity.

- Always on, always connected. Instead of being turned on only for use, mobile phones are turned off only to preclude interruption for various temporary reasons (unless there are dead spots for the wireless network. Literally, they are on from the moment people wake up to the moment they go to sleep. This allows significant opportunity for ongoing event-driven user interaction.

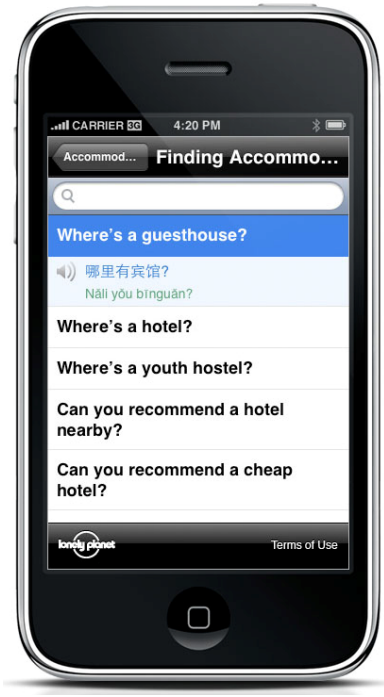


Figure 9.1: Lonely planet iPhone audio phrasebook.

- Simple authentication procedure: Mobile telecommunication devices function with an electronic chip called SIM (Subscriber Identity Module). The SIM is registered with the network operator and the owner is thus unambiguously identifiable.

- Battery powered with relatively slow speed. (The actual average speed of 3G network is only 25% as the Wi-Fi network [22]).

Correspondingly, mobile devices are also found to have different contexts of use than regular PCs, which makes mobile devices advantageous and more suited in the following situations:

- Location specific. Mobile devices allow people to access and interact with location-specific and context-specific info at the moment on the go to aid the immediate course of action. For example, finding a store or a restaurant nearby.

- Immediacy. Mobile phone also provides the convenience to do things in unprepared situation or in the last minute. The same-day hotel booking makes up 90% of the overall bookings on the mobile site of `Marriott.com`.

- Monitoring real-time information or checking dynamic information repeatedly. Mobile phones are also well suited for quick status checking, which does not take complex actions or long time and sometimes can be time-filers, such as getting alerts about real-time stock quotes or presence-awareness of family members or friends, price changes, and checking emails, news, weather or traffic information. According to TNS Global, 74% of the world's digital messages were sent through a mobile device in January 2009. In emerging markets, the trend is even more dramatic; nine out of 10 messages are sent via mobile.

- More convenient and flexible than PCs for certain tasks. Because mobile devices are small, light, easy to carry, and easy to turn on, many users prefer to use them over regular computers. A recent survey shows that 70% of mobile Internet use actually takes place in the home. People reported reasons of using mobile phones for these tasks were because they did not have to turn on the computer (avoid waiting time), go downstairs to the office, or leave the couch during the TV commercial time. A diary study of Internet access from cell phones by Nylander, Lundquist, and Brännström [74] reported 51% of the occurrences of cell phone Internet access took place in locations where participants had access to a computer but still chose a cell phone, and that the most frequent location for mobile Internet access was the home. This suggests the mobile world extends well into the home and that the cell phone has its own role as a device for accessing the Internet. In other words, mobile phone is not a mere backup solution for when there is no computer available, but a tool that often provides quicker and more convenient service than a computer.

9.1.3 DIMENSIONS OF THE MOBILE USER EXPERIENCE

The mobile user experience are relying on a set of factors including the user needs, use context, and the system structure as shown in Figure 9.2 [88].

9.2 DESIGNING FOR MOBILE DEVICES

The uses of mobile devices are in several layers: Voice services, short messaging services (SMS), multimedia messaging services (MMS), emails and Web browsing. The focus in this chapter is on Web browsing.

9.2.1 DESIGN CHALLENGES

Unlike PCs, nearly 90% of them run windows operation systems, with a few dominant browsers and universally standard keyboard and mouse, there are a big variety of different mobile devices including phones and PDAs running different operating systems and web browsers. Rendering inconsistency on mobile browsers is much more challenging than on desktop browsers. Variation in device input (keys, buttons, stick, dial-wheel, touch screen) and output (screen size) create dramatic UI problems. Local carrier hegemony is one of the major contributors to this problem. Regional patterns of use develop based upon the network capability, handset manufacturer, and content formats most popular

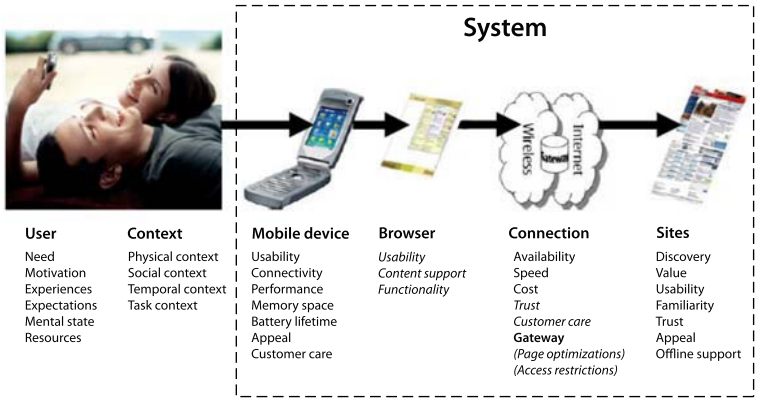


Figure 9.2: Mobile user experience factors. (Courtesy of Dr. V. Roto.)

in any area. These differences seem to continue diverging, turning much of the design process into a maddening branching problem.

Forrester [2] suggests that reaching 80% of the US audience using mobile browsers means developing websites for approximately 60 different handsets and 13 different browsers. Reaching 90% of the same population requires a solution for nearly 150 handsets.

9.2.2 GUIDELINES AND BEST PRACTICES FOR MOBILE EXPERIENCE DESIGN

Mobile site design is not about shrinking Web pages to fit a cell phone or PDA. Instead, designers need to understand the mobile experience context, users' desire and need, in order to offer mobile services that create value and generate revenues. While the mobile user experience is a different use context from the traditional website, many Web-based design and usability guidelines are still applicable and become even more important. At the same time, additional guidelines are needed to harness the unique strengths and attributes of the mobile device while negating the limitations of size, memory, speed and processing power.

Do you Need a Mobile Site?

Do all companies need a mobile site? It depends on who the mobile audience is for the company. Forrester's survey [63] showed that different generations see the necessity of having mobile access differently. If a large percent of your users are younger generations, business travelers, and early adopters, it could be a sign to call for a mobile site. Most websites are now able to automatically detect the browser type and redirect the users to the mobile site. However, you need to understand how your users get to your mobile site: Do they go there directly with an explicit url, go to your

full site or go through a search engine? You can then adopt corresponding solutions to make your mobile site more visible and findable (to be discussed in detail in a later subsection).

What Mobile Devices to Design for?

As mentioned earlier, mobile devices differ from one another dramatically in terms of screen sizes, resolutions, input/output mechanisms, and styles, which can profoundly affect how people interact with your mobile site or application. Therefore, it is important to keep in mind as many variances of mobile devices as possible during the design process. While it is impossible to make the design accommodate every single mobile device, you need to look into your user profiles, key user tasks, nature of your site, and industry statistics by region to help prioritize the targeted devices. Nielsen Mobile's 2008 Q1 data [64] show that in the US, top mobile internet devices were Motorola RAZR/RAZR2, iPhone, Blackberry while in Europe, the top devices were Nokia followed by Motorola and Sony Ericcson.

A more recent study in the US by Net Applications shows that iPhone is the most popular web browsing platform, which takes 65% of the market share, followed by Android (9%), JavaME (8%), Symbian (7%), Windows mobile (6%), and Blackberry (3%).

Make your Site Findable

According to the Nielsen Mobile survey [64], people get to mobile site via different means:

- 40% of them find the sites through search engines,
- 22% type in the URL directly (underscoring the importance of mobile optimized or redirected sites,
- 18% through their favorite links, and
- 17% through their device carrier's portal.

Here, are the suggestions to make your mobile site more findable [65]:

- Use standard domain names/urls, and reserve urls as appropriate to make sure `m.site.com`, `mobile.site/com`, `site.mobi`, `www.site.com/mobile` all point to your site.
- Use SEO to increase the visibility of your mobile site. Mobile sites generally have lower page rank, which means sometimes users may not get to it without a SEO strategy.
- Provide A link from the full site to the mobile site.
- Include the word "mobile" in the title of your mobile site.

Mobile Application vs. Mobile Website

Organizations often run into this question: Should they develop a mobile website and/or mobile application(s) for specific devices, such as iPhone apps or Blackberry apps? They each have pros and cons as displayed below. Decisions need to be made based on the user needs and business objectives. If you need both, the general recommendation is first to build the mobile site and then focus on device specific applications.

Table 9.3: Mobile Site vs. Phone Applications

	Mobile Website	Mobile Phone Application
Platform independence	Yes. Everyone can access the site with different devices. Helps gain mobile presence	No. Platform specific. You would need to develop applications for different platforms separately (e.g., for iPhone, Blackberry, etc.). The app can be optimized for the mobile device
Personalization	To some degree	Highly personalized. Login can be minimized
Performance	May not be optimal	Application installed on the device. Only updated information needs to be retrieved each time the application is used, which supports fast access and improves performance
Integration with phone features/other apps	N/A	Can take advantage of the features built into the mobile device (e.g., iPhone) itself, such as motion detection, voice detection, camera and GPS
Offline mode	Availability dependent on Internet access	Data always available when phone is online or offline
Downloads and updates required	No	Yes

Focus on the Mobile Context and Avoid Feature Creep

Should the mobile site mirror the regular website? The answer is NO for good reasons. Given the constraints of mobile devices (e.g., small sizes, limited input mechanism and slower network

connections) and unique use contexts (e.g., time pressure, convenience, multi-tasking, and location-awareness), rather than numerous offerings, the mobile sites should offer a small number of relevant features or most common functionalities, plus possibly additional features that are particularly suitable for mobile devices (such as location aware features). The Nielsen Norman Group usability tested a set of full websites and their mobile counterparts with mobile users. The results showed that for the same user tasks, mobile sites gained 70% of success rates compared to 43% for the full site. Designers should find out what the user actually needs in phones rather than putting in as much functionality as possible. Just like any software development, the focus should be on implementing a nice balance of features that are easy to use while not bloating the site with stuff not needed.

At the same time, the user should be able to easily switch between the mobile site and the full site just in case the user is willing to take extra time to do something that is only available on the full site.

As far as applications are concerned, one needs to understand the cost-benefit bottom line. Recent study shows that the vast majority of apps downloaded from the App Store are in use by less than 5% of users after one month has passed since the download [94].

Minimizing the Need for Text Entry

Minimizing user free-form text entry to avoid unnecessary errors has been one of the classical usability best practices all along. However, it becomes so critical with the mobile user experience. Entering text on a mobile phone can be painfully slow and error-prone especially on the typical 12-button mobile keypad, given the user is often in a mobile or multitasking mode. Mobile users are more likely to make mistakes (due to misspelling or mistyping) or take shortcuts. The touch phone presents a soft keyboard only when the user needs to input information. It helps decrease user errors and provides contextual shortcuts, but due to the finger size constraints and lack of physical boundaries between neighboring soft keys, mistyping sometimes is still unavoidable.

Whenever is appropriate, Allowing users to input information by making selections instead of entering. Auto-complete or auto-suggest feature is very useful for mobile devices; spelling corrections and allowing abbreviations can help increase error tolerance; whenever possible, the site or the mobile application should provide the following as well: Smart default value based on location (such as zip code), user preferences or history; easy deletion of field values; saving input values from previous sessions or other programs on the mobile phone.

Voice mobile applications (e.g., the Google app) can help solve the input problem via voice input; the 2D barcode technology also allows the user to scan the barcode with a camera mobile phone, which will then automatically load the website or the product information. This approach eliminates manual entering altogether and saves user's time.

Only Show Essential Information

Because of the limited screen size and resolution of mobile devices, making best use of the screen real estate becomes so critical. Compared to the full site, the navigation, widgets and page layout

need to be presented more succinctly on the page for ease of use. For example, global navigation may not be repeated on every page but on the homepage since it can easily push important content off screen. It is commonly seen on many mobile sites that the homepage is more dedicated as a primary navigation page. The number of levels of navigation, links and buttons on the page should be minimized. Non-essential information such as global header links may need to be prioritized and repositioned accordingly. Also, the text need to be short and direct, and displayed prominently so users don't have to read too many words to find what they're looking for or to figure out what to do next. Phone numbers should be made links when appropriate so that the user can directly click to call.

Similar to the conventional website design, the most frequently used (usually higher level) information should be near the top, where it is most visible and accessible. As the user scans the screen from top to bottom, the information displayed should progress from general to specific and from high level to low level.

Long Pages vs. Short Pages

As discussed in Chapter 5, whether to have long pages or short pages depends on many factors, such as page types, use contexts, and even the distribution of your mobile users' device types. The Nielsen Norman Group's mobile research [65] found that *interactive pages* need to be relatively short, but *informational* (view only) pages can be much longer. Participants were pleased to have enough of content on the target page after all the effort they made to get there. Over-done pagination can bring unnecessary pain to users whose devices can load large amount of content on page. The *navigational pages* in between have to be short and without big images, since the user wants to proceed from these pages as quickly as possible.

Other Mobile Usability Best Practices

Since the cursor control and positioning mechanism for mobile phones are different, there are additional interesting design challenges. For phones that rely on the trackball, the scroll wheel, or direction buttons for scrolling and pointing, it is important to clearly highlight what's being selected (e.g., links and buttons) as the page scrolls, especially given the low resolution of the phones; for touch phones, actionable buttons and controls need to have good spacing between each other, say each selectable target should at least take some fingertip sizes. If the controls stay too close together, users must spend extra time and attention being careful where they tap, and they are more likely to tap the wrong element. A simple, easy-to-use user interface should sufficiently space controls and other user-interaction elements so that users can tap accurately with a minimum of effort.

In addition, many efforts in improving web accessibility can also benefit mobile usability [112]. Limitations of mobile devices make regular users somewhat disabled. For example, practices like increasing link target areas for those with mobility impairments, or facilitating font size adjustment for those with vision impairments, also provide obvious benefits to those using mobile devices.

Zooming in features on mobile devices is an equivalent of screen magnifier for visually impaired users on regular websites.

Finally, whenever appropriate, it is helpful to maintain the consistency between the fullsite, the mobile site and mobile application. That way, the user can easily apply what s/he learned from one channel to another without unnecessary relearning or confusion.

9.3 THE CONTINUED EVOLUTION OF MOBILE USER EXPERIENCE

Nielsen [65] observes that 2009's mobile Web is like the desktop Web in 1998. Although the mobile Web has made impressive progress reaching the critical mass, providing useful functionalities, and starting to generate revenues, there is still a huge potential for the mobile Web to revolutionize the way people gather and interact with information and impact our life more widely and deeply in the years ahead.

Many studies have shown [88, 92, 102] that costs, screen limitations, and network speed are the primary reasons that hold up many people from using the mobile Web. As the network quality continues to improve, the mobile data subscription price goes down, and the usability of mobile devices, mobile browsers, applications and websites get enhanced, there will be more companies creating their mobile presence (mobile sites and mobile applications) to support the most commonly used functionalities on the full website.

Meanwhile, there will be more functionalities integrated into a single mobile device to better support portability, ubiquitous connectivity, location-based services, and personalization. We can expect to see more technology, security breakthroughs and user experience improvements in the following areas.

Mobile Device as the User's Identity and Wallet

Because of the built-in SIM mechanism in each mobile device, the user/owner can be uniquely identified, which makes mobile device a possible candidate as the owner's identity or credit card. This opens the door for many exciting opportunities to explore mobile devices to their full potential, such as mobile ticketing, mobile payment, and mobile loyalty.

Mobile ticketing is a new form of m-Commerce enabling customers to purchase, order, receive and check tickets any time and anywhere. It makes the mobile phone the ticket. Possible mobile ticketing applications can be used for events, facilities, public transportation and flights. Mobile ticketing for airports, ballparks, and train stations, for example, will not only streamline unexpected metropolitan traffic surges, but also help users remotely secure parking spots (even while in their vehicles) and greatly facilitate mass surveillance at transport hubs; using mobile devices as the key to secure areas such as hotel rooms and cruise cabins is also being explored by the travel industry.

As Gotomedia predicts, if currently the cell phone is the one thing other than the wallet you don't leave the house without, soon it may just be the only thing you don't leave the house without.

Similarly, the mobile device can serve as a customer loyalty card. Whenever the services are used, the payment can be made by the mobile phone and loyalty points will be accumulated accordingly.

Mobile Shopping

By taking advantage of the ubiquity of mobile devices, mobile shopping will enable customers to bridge and merge the physical space and cyberspace more seamlessly and create brand new user shopping experiences. Imagine you are standing in a supermarket trying to buy something, instead of having to call somebody at home to go online to cross-check the prices for you, on the spot, you use the mobile phone to compare prices from different stores and read product reviews in real time!

Some mobile applications have shown promising signs toward that direction. With ShopSavvy's personal shopping assistant application, consumers can hold their mobile phone camera up to a product's UPC; the camera scans the bars and pings ShopSavvy servers to find the best prices—both locally and on the Web. The application also captures product reviews and information, such as allergen alerts or ingredient lists. It even allows users to set price alerts for various items and create wish lists and registries that can be shared on Facebook or MySpace. In addition, the customer will be able to scan an item and find out whether or not a coupon exists. If it does, with one click, the customer can receive the coupon via the mobile device and use it immediately.

While the consumer enjoys the convenience and efficiency of mobile shopping, the retail stores can easily capture rich data about their consumers, such as who they are, how long since they've been in the stores and what they do when they get there. Accordingly, the store can then offer the customer relevant products with more competitive prices. At the same time, consumer behavior and buying patterns can be tracked over time.

Mobile Marketing

Couponing is currently the most commonly seen mobile marketing technique. Couponing can be done via a "push" or "pull" method. The former usually sends out the coupon via SMS or MMS alerts based on the specific location of the user, the previous purchase history and profile preferences. The alert needs to be highly relevant and target users need to be chosen judiciously. Meanwhile, businesses should fully leverage mobile devices' characteristics to attract customers to services that are time-critical and demand a fast reaction.

In addition, the consumer can buy goods and services as, and when, he feels the need. The immediacy of transaction by mobile phones helps to capture consumers at the moment of intention so that sale is not lost in the discrepancy between the point of intention and that of the actual purchase.

The second couponing approach is more passive. The user needs to launch the application in order to look for relevant coupons. It allows you to find out what around you has coupons for you to save money on. It is location specific. The mobile device containing the coupon can then be scanned and discounts can be applied correspondingly.

Mobile Social Networking

Mobile social networks allow families members, friends, or community members to create and share information with each other via emails, short messages, and the Internet, including pictures, videos, blogs, products or services reviews, gas prices, traffic updates, and even driving shortcuts. This means that your mobile phone can serve as your omnipresent microphone to the world. As people from every corner of the planet are covering their experiences in real time, a new world emerges dynamically.

Another popular mobile feature is presence awareness. For example, Google Lattitude allows friends to share location information with each other. This feature can be very useful in certain scenarios such as for parents to track their children's whereabouts, and for friends to coordinate activities in real time during big events or vacation time.

Mobile Device for Better Personalization

Mobile devices are naturally suitable for personal information management (PIM) such as address book, emails, short messages, and calendar. Future development of mobile PIM features will be more context or location sensitive. For example, if the user has "buy textbook from bookstore" in his/her to-do list, when s/he goes/drives by the bookstore, the mobile phone will display a reminder about the book. Another scenario is about a business traveler on a trip. When s/he pays a restaurant bill with the mobile device, there can be a prompt from the expense management system to ask whether the user wants to capture it for future travel expense reimbursement.

More importantly, the mobile device will get smarter, patiently monitoring your personalized preferences, and delivering only the information you desire based on the particular situation you are in. One very useful scenario: Your phone knows that you are heading downtown for a concert, and alerts you of transit conditions or the best places to park.

Mobile Phone as a Sensing Device

As the mobile phone is being transformed into a sensing device capable of assessing and contributing information about the real world, mobile applications can serve to augment the reality with relevant location-based information. In addition to LBS (location-based services), most of the capabilities mentioned above rely on the sensing capabilities: The mobile devices can have a built-in electronic component called accelerometer that measures tilt, motion, and gestures. Additional LBS and accelerometer based mobile services include:

Point-based search: By pointing the mobile phone to a building, the user can get its history information, event schedule within the building, or user reviews about its services.

Mobile device as a universal remote control: Mobile device can also turn into a universal remote control for TV, other multimedia devices and even for controlling room settings (e.g., heater/cooler, lighting, etc). Some companies are trying new services that allow the user to download info directly from digital TV by pointing their phone to the television screen.

Currently the ZipCar iphone app allows the user to make the horn honk and unlock the borrowed car.

Privacy and Security Issues Need to be Addressed

As the mobile adoption rate continues to grow, privacy and security concerns must be addressed accordingly. They are currently one of the top barriers that prevent many people from making mobile purchases and mobile payments [2]. For example, social network applications or sites must let users control their online presence information and thus prevent others from locating them as desired. While there will be enormous amount of personal mobile usage data captured by mobile operators and service providers, consumer data protection will become a critical and urgent topic to be taken care of collaboratively via legal, technological and legislative venues.

In summary, mobile devices are a highly personal extension of the individual, and have unique sociological and technological attributes—they are location aware, temporally situated, and socially connected. The successful user experience design will need to take advantage of these factors to bring value to both the user and the business.

CHAPTER 10

The Future of Information Architecture

We have discussed IA research methods and tools, IA design and design implications, and IA applications in enterprises, mobile devices, and in the global setting. Coming to this closing chapter, let's take one more look at IA itself, with a particular curiosity of its future in mind. What brings the IA community together and where will it lead us to? What are the future trends in IA design? What are the relationships between IA practice and IA research? In this chapter, we will discuss these questions and look beyond horizons for the future of information architecture.

10.1 THE IA COMMUNITY

Will IA be established as a new field, a new professional, or a new way of thinking? Despite its short history and lack of an academic research home base, the IA community is steadily growing. One of the premier gathering places for the IA community is the IA Summit conference held each year since 2000 (`http://iasubmit.org/`). Information architects, user experience professionals, researchers and thinkers each year gather together to share their experience and define the emerging field. Figure 10.1 shows a list of IA Summit themes since its inception.

The trend in the list is clear: In the past 10 years, IA has moved from defining itself, to defining its practices and knowledge base, and to enriching and expanding IA as a discipline. The IA community has been very conscientious about selling IA, strengthening the discipline, and widening the scope of IA. Figure 10.2 shows the number of attendance each year for the conference. It shows clearly that, after hitting a low point in 2002, the IA community has come all the way up in terms of IA Summit attendance. This curve more or less represents the growth of the IA field as a whole—after a step backward initially, the field of IA now enjoys steady growth.

In addition to the Summit, the IA community also supports by a number of IA institutions, thinking tanks, and resource hubs. They provide the sharing and collaborating space for information architects. Here, is a brief list of major IA related organizations and resource hubs.

The Information Architecture Institute

`http://www.iainstitute.org/`

> "The information Architecture Institute supports individuals and organizations specializing in the design and construction of shared information environments."

Conference Themes for IA Summits, 2000-2008

2000 -- Defining Information Architecture – What is IA?
2001 -- Practicing Information Architecture– A conference devoted to how we actually do IA.
2002 -- Refining our craft – Meeting, discussing and sharing with other IAs our experiences.
2003 -- Making Connections – Finding ways to make connections between fields within the umbrella of information architecture.
2004 -- Breaking New Ground -- Strengthening the foundation of the discipline and widening the scope of IA practice.
2005 -- Crossing Boundaries – Energizing connections across geographic, academic, and cross-disciplinary boundaries in order to drive best practices and innovation in all of our IA endeavors.
2006 -- Learning, Doing, Selling – Learning all aspects of information architecture by discussing theory and practice, sharing how we do it and how to sell it internally and externally.
2007 -- Enriching IA —Rich information, Rich interaction, and Rich relationships
2008 -- Experiencing Information – shifting the focus back to users.

Figure 10.1: IA Summit conference themes.

Boxes and Arrows Magazine

`http://www.boxesandarrows.com/`

"Boxes and Arrows is devoted to the practice, innovation, and discussion of design; including graphic design, interaction design, information architecture and the design of business."

Adaptive Path Ideas

`http://www.adaptivepath.com/ideas/`

"Our mission is to deliver great experiences that improve people's lives, while sharing our advances in the field with our clients, partners, and peers."

NN/g—Nielsen Norman Group

`http://www.nngroup.com/`

This is an absolute thought leader in the field of HCI, usability, user experience design, and information architecture. The IA community benefit greatly from this groups research and publications.

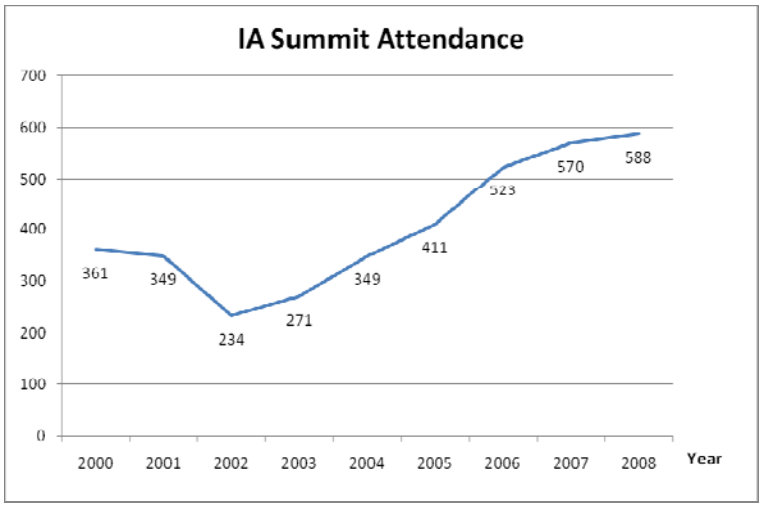


Figure 10.2: Attendance of IA Summits, 2000–2008.

UXmatters

`http://www.uxmatters.com/topics/information-architecture/`

> "Become a trusted information source that consistently meets the needs of the expanding community of UX professionals, advances disciplines relating to the design of user experiences, encourages high standards of practice among UX professionals."

InfoDesign: Understanding by Design

`http://www.informationdesign/org/`

> " 'InfoDesign: Understanding by Design' is dedicated to the growth and improvement of the information and experience industries through the provision of a centralized online resource that serves all interested audiences."

IxDA: The Interaction Design Association

`http://www.ixda.org/`

> "IxDA intends to improve the human condition by advancing the discipline of Interaction Design. To do this, we foster a community of people that choose to come together to support this intention. IxDA relies on individual initiative, contribution, sharing and self-organization as the primary means for us to achieve our goals."

ASIS&T: The American Society for Information Science and Technology

`http://www.asis.org/`

> "Finally, the organization that hosts the IA Summit. ASIS&T is a much broader organization with a mission "to advance the information sciences and related applications of information technology by providing focus, opportunity, and support to information professionals and organizations." IA is one of the areas it supports. Information architects will benefit greatly from interacting with its members in many IA-related research areas that the organization supports."

10.2 CHALLENGES FOR INFORMATION ARCHITECTS

The information environment has constantly changed over the last decade. While information architecture emerged more than 10 years ago as a result of need to create more usable websites, information architects are now no longer just website designers. They are also information designers, interaction designers, navigation designers, usability designers, user experience designers, content strategists, and information strategy designers, just name a few. This expansion of the role of information architects brings new opportunities as well as new responsibilities and challenges that come with the opportunities. In the following, we briefly discuss five of the new challenges.

10.2.1 CHALLENGE OF IA—FINDABILITY AND RE-FINDABILITY

Findability has long been established as an essential task for IA [58]. Re-findability is a part of it, but the unique aspects of the re-findability needs special attention. People are interacting with so much information every day. Helping them make better use of information they found before will significantly improve their information experience and efficiency. Information architects will need to come up with new solutions that will create and maintain the connections between information consumers and the information that users have found and used before. Part of this is the personalization issue, and part of it is the user experience issue and content organization issue. In any event, this will be essential in order to maintain the long term usability of Web sites and other information products.

10.2.2 CHALLENGE OF IA—DESIGN PATTERNS AND THEORIES

Design has always been a challenge of IA. After years of practice, many information architects are now seeking answers to the question whether IA design patterns can be extracted from their practice and weather the patterns can be stored, organized and re-used. This is both a practical issue and a theoretical one. On the practical side, Yahoo! has played a leading role and made available to the public a popular "Design Pattern Library" (`http://developer.yahoo.com/ypatterns/`) for various interface and interaction design. Other sites that provide well-organized design patterns include UIPatterns (`http://ui-patterns.com/`) and Pattern Browser (`http://patternbrowser.org/`). While these patterns are not exclusively created and used by information architects, they have become a

good resource and useful tool for the architects. What has been missing is the research that documents how these patterns work and the experimental studies that compare which patterns would be useful or more efficient in what kind of information environment. We hope to see more this kind of research and experimental studies that would advance IA practice and research significantly.

10.2.3 CHALLENGE OF IA—CONTENT REPRESENTATION

Content representation traditionally focuses on designing content organization systems based on semantic relationships of terms and concepts. As if this is not hard enough, for information architecture, content representation is hardly single-dimensional based on semantics only. The social networks, the linked data that come from different sources, and the content semantics are often intertwined to challenge the design skills of information architects. Many unsolved problems related to content representation, such as automatic metadata generation, controlled vocabularies and user's tagging integration, and using semantic networks for access and navigation, are very difficult challenges both for research and for implementations.

10.2.4 CHALLENGE OF IA—UBIQUITOUS INFORMATION ACCESS

As the previous chapter shows, the need for well-designed information products increases dramatically when information access becomes more ubiquitous through the Web, the mobile devices and other medias. All the design issues are magnified in the mobile and ubiquitous environment. See Chapter 9 for the detailed discussions of design challenges in the mobile environment.

10.2.5 CHALLENGE OF IA—DIGITAL PRESERVATION

Should information architects be responsible for the web sites built 5 or 10 years ago? That seems to be a difference between digital space architects and physical space architects. In the physical space, things are expected to last. If a building collapses 100 years after it is built, people will trace back to the original architects to check if the collapse was due to a faulty design. On the digital space, things are much more dynamic. As websites come and go, people may not have access to the digital content available a few years ago.

But this will come to change very soon. When more and more organizations and companies rely on the digital space for their business, preserving content over a longer period of time becomes a must. Digital preservation is challenging information architects to come up with the architecture that will maintain long-term persistence and will keep the content available even after the current technology is obsolete.

10.3 IA AND RESEARCH

IA is often defined as both art and science (e.g., "The art and science of shaping information products and experience to support usability and findability" [62]). As art, IA needs to be learned through practice. There are many IA books, conferences, blogs and various publications that focus on IA

practice. Through sharing design experience, case studies and learns learned, the IA community enrich the IA process, methodology and skill sets.

The science part of IA is less developed. IA in general depends on related domains' theories and methods to guide its practice although there have been constant calls for research in the IA community. Peter Morville, in 2004, posted a blog entry [57] that includes a research agenda and a suggested list of readings for IA research in the areas of information seeking behaviors, structures and organization, navigation, and search. All the readings come from research literature in related fields such as library and information science, human-computer interaction (HCI), information retrieval, etc. Later, Van Dijck [107] added to the agenda with readings from cognitive science, business theory, and social science and anthropology. A more significant event is a panel discussion on "Information Architecture Research Agenda" in IA Summit 2006 [21, 41]. Four panelists all discussed their proposed research agenda and favored to encourage more exchanges between IA practitioners and researchers.

We believe that it is important to gradually develop an IA research community to conduct IA-specific research. The research community will help document "what works and what does not work" when we adopt knowledge from other fields to IA. It will also help to understand design issues and prevent "re-inventing the wheel" when IA practitioners face similar problems again and again. More importantly, the field of IA needs new ideas that can only be established through rigorous research and through the dialogs between researchers and practitioners.

Recently, the first issue of the Journal of Information Architecture just came out in Spring 2009. The journal will be a peer-reviewed scholarly journal aiming "to facilitate the systematic development of the scientific body of knowledge in the field of information architecture" [47]. The success of this journal will be a huge step for IA research.

10.4 IA AND BEYOND

Before we end this journey in the land of information architecture, let us revisit our description of information architects given in Chapter 1:

> *"Information architects not only design individual information spaces (e.g., websites, software, applications), but tackle strategic aggregation and integration of multiple information spaces including different channels, modalities, and platforms. They not only organize information, but also simplify information for better understanding. Finally, the goal of IA design is to support people not only to find information, but also to manage and use information."*

We hope that it becomes clearer now that the point we emphasize throughout the book is that IA is not just about website design or information findability. More importantly, it is about helping users make use of information and make information works for them. Like real architects who deal with *site*, *space*, and *place* and whose goal is to convert a site into a place where space can be experienced, information architects' ultimate mission is to convert information site (websites or

other information products) into place where users can experience the digital information space and where information will be utilized to support people's daily activities.

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