

Information Architecture

Databases and Web Applications Laboratory (LBAW)
Bachelor in Informatics Engineering and Computation (L.EIC)

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Outline

- Defining Information Architecture
- Elements
- Process
- Deliverables
- LBAW: "A3. Information Architecture" artifact

Defining Information Architecture

Context

- We live in information societies, where information services and systems are pervasive and abundant in everyday life; and increasingly essential to the operation of multiple businesses.
- A growing volume of information is available to us, which resulted in a problem of managing attention in the face of a decreasing "signal-to-noise" ratio.
- The proliferation of applications and electronic devices, multiplied the number of channels through which we can access the same information. This resulted in a decoupling of information from its container, no longer 1-1.
- Both problems — information overload and the multiplication of access channels — are tackled by the field of information architecture.

Places Made of Information

- Information products and services are perceived by as "places made of information", where people go for different tasks: learn, shop, connect with other people, etc.
- Information products can be found everywhere, not limited to the web, e.g. media, televisions, cars, etc.
- User experience in these places is defined by a familiar vocabulary consisting of labels, menus, descriptions, buttons, links, visual elements, and content.
- Different uses of this language will make them "distinct" places to the user, and will help them (or not!) be more efficient in accomplishing their tasks and goals.

- Information architecture considers these information-rich spaces and its design for maximizing their effectiveness, whatever the users' goal.

Information Architecture

- Multiple definitions, each highlighting a particular aspect.
- Richard Wurman (1996) emphasizes **organization** and **presentation**:
 - (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.*
- Rosenfeld and Morville (2015) introduce **multiple perspectives**:
 - *The structural design of shared information environments.*
 - *The synthesis of organization, labeling, search, and navigation systems within digital, physical, and cross-channel ecosystems.*
 - *The art and science of shaping information products and experience to support usability and findability, and understanding.*
 - *An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.*

Context of Information Architecture

- The evolution of the web and digital products brought many opportunities and challenges to users and designers.
- The pervasiveness of digital spaces in everyday life increasingly blurs the distinction between physical and digital.
- Information Architecture is needed to organize these spaces, specifically:
 - Connecting information objects and intended users;
 - Identify concepts and pathways for access and navigation;
 - Creating tools and systems for people to organize information;
 - Connect various information spaces, applications, platforms, and channels.
- Tackling these challenges requires skills from multiple fields, e.g. usability, design, information.
- User Experience (UX) Design is an umbrella under which these areas converge.

Related Disciplines

- **Usability Engineering**, focus on human computer interaction and how user interfaces can allow the users to accomplish their tasks.
- **Information Science**, a broad interdisciplinary field focused on theories, applications, and technologies related to the creation, organization, retrieval and use of information.
- **Human Factors Engineering**, ergonomics and physical factors in designing products, processes, and work environments.
- **Visual Design**, aesthetics and communication of information, using visual language elements such as colors, shapes, spacing, alignment, etc.
- **Interaction Design**, how a system works in response to user inputs, i.e. the dynamics between the user and the system.

Summary

- Information architecture is a central element in user experience design.
- It deals with the process of planning, designing and building information spaces.
- Its goal is to improve information access, management and use, through the design of meaningful, functional and effective information spaces.
- Is a field of growing importance, as frontiers between physical and information spaces blur.
- Information architecture is relevant for an Informatics Engineer, because:
 - Improves work in the context of multidisciplinary teams, i.e. understand the language and the artefacts;
 - Contributes to the development of better prototypes and products.

Elements of Information Architecture

Elements of Information Architecture

- The main components of an information architecture include:
 - **Organization** systems - how information is categorized;
 - **Labeling** systems - how information is represented;
 - **Navigation** systems - how you can move through the information;
 - **Searching** Systems - how information can be searched for.

Organization Systems

Organizing Information Spaces

- The way things are organized impacts its meaning, i.e. the way they are perceived.
- Well-organized information is easier for people to find and work with.
- Organizing things is hard, it is necessary to deal with ambiguity, heterogeneity, different perspectives, politics, etc.
- An organization scheme defines the shared characteristics of items and the grouping of those items.
- They can either be exact organization schemes or ambiguous organization schemes.

Exact Organization Schemes

- In exact organization schemes, information elements are divided into well-defined and mutually exclusive sections.
- These scheme are relatively easy to design and maintain.
 - **Alphabetical scheme**, where alphabetical ordering is used to layout information items, examples include: person directory, services directories, libraries.
 - **Chronological scheme**, where time-based factors are central in organizing information items, classic examples include: calendars, tasks lists, news (?).
 - **Geographical scheme**, where place is the key factor in organizing information items, examples include: house or rental listings, transportation.

Ambiguous Organization Schemes

- Language and concepts are ambiguous in nature.
- Ambiguous organization schemes are important because people don't always have an exact definition of what they are looking for, but harder to design and maintain.
 - **Categorical schemes**, where topics, themes are the factors considered in organizing information items.
These properties have subjective interpretations, depending on the knowledge, viewpoints, etc of users.
Examples: newspapers, academic courses, books.
 - **Hierarchical schemes**, where information items are organized according to value, from most to least or vice-versa. The key aspect is that it requires value to be assigned to the information. Examples: social networks, search engines.
 - **Audience-specific schemes**, make sense when multiple audiences exist. This can result in breaking an information space into smaller audience-specific sub-spaces, or including more or less information depending on the audience. Examples: intranets, academic services.

Labeling Systems

Labeling Systems

- Labeling is a form of representation.
- Just as words represent concepts and ideas, labels represent parts of information in information spaces. Example: "About" or "Contact Us" are well-established labels.
- Labels can either be textual or iconic (more ambiguous).
- Textual labels include: contextual links, headings, navigation systems choices.
- Labels can be designed looking at existing information environments (what is used in other contexts or by others in similar contexts) or search logs (what language users use for searching).

Navigation Systems

Embedded Navigation Systems

- The purpose of navigation is to help users move around.
- Navigation systems provide context and a sense of control to users as they explore.
- A good navigation system should help the user answer the following questions:
 - Where am I?
 - What can I do?
 - Where can I go from here? (up, down, parallel)

Types of Navigation Systems

- There are various types of navigation systems, three common ones are:
 - **Global navigation systems**, it is intended to be present in every page, often implemented as a navigation bar at the top, allow direct access to key areas of the system. A central element in the overall usability of a space.
 - **Local navigation systems**, complement the global system and allow users to explore and navigate the immediate subsection.
 - **Contextual navigation systems**, support navigation through the association of concepts that exist in the content being presented. Examples include "see also" or link to related items in different areas.

Types of Navigation Systems

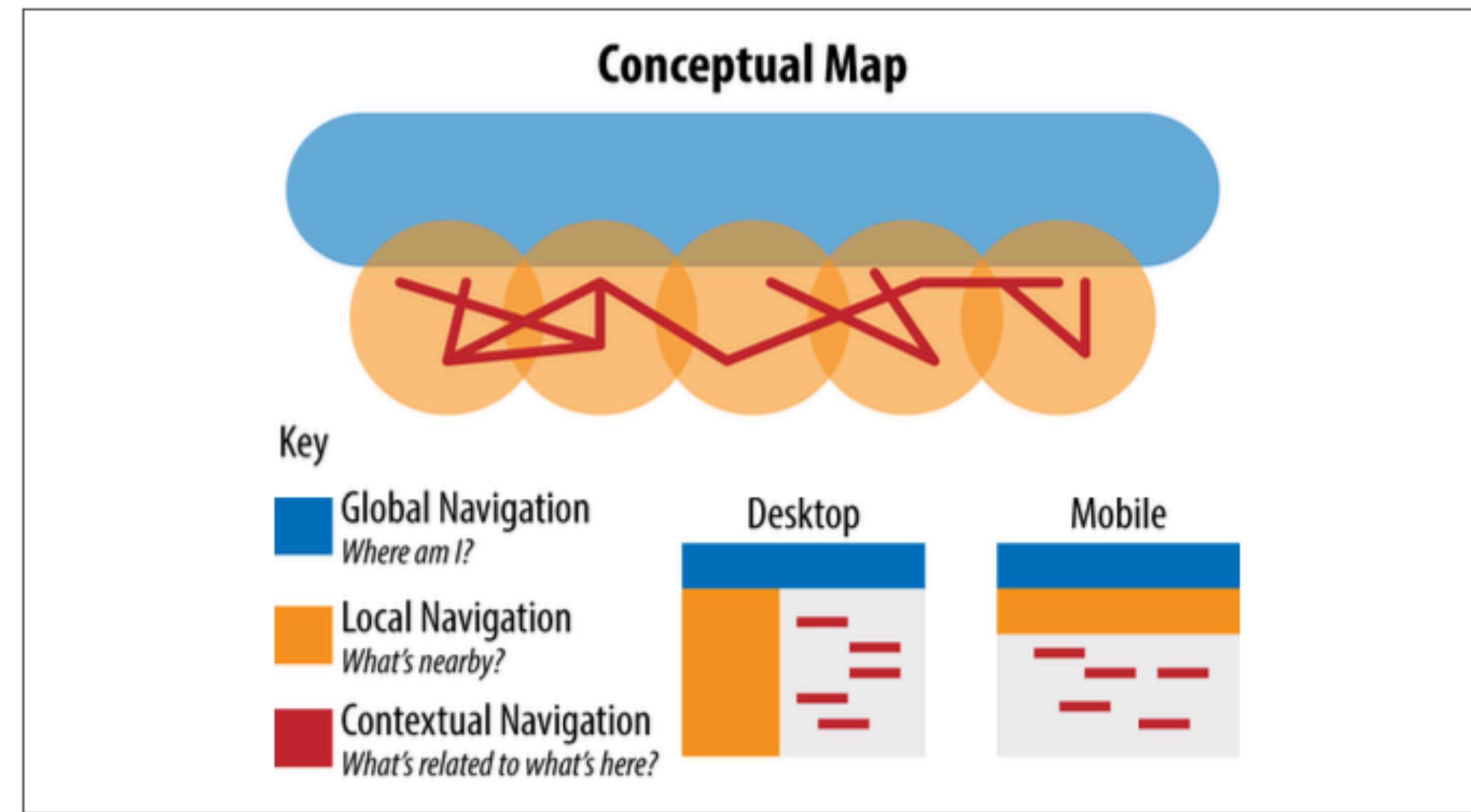


Figure 8-1. Global, local, and contextual embedded navigation systems

Supplemental Navigation Systems

- Supplemental navigation systems are external to the basic hierarchy of a system and provide complementary ways of finding content and completing tasks.
- Examples include: sitemaps, site indexes, breadcrumb trails, FAQs, tutorials, search.
- **Sitemaps** provide a broad view of the content in the system and facilitates random access to individual items.
- **Breadcrumbs** are dynamic and represent the path followed by the user or, alternatively, the location of the content within the hierarchy.
- **Search**, is a central mechanism for navigation, it provides users a direct access to the content they are looking for.

Sitemap

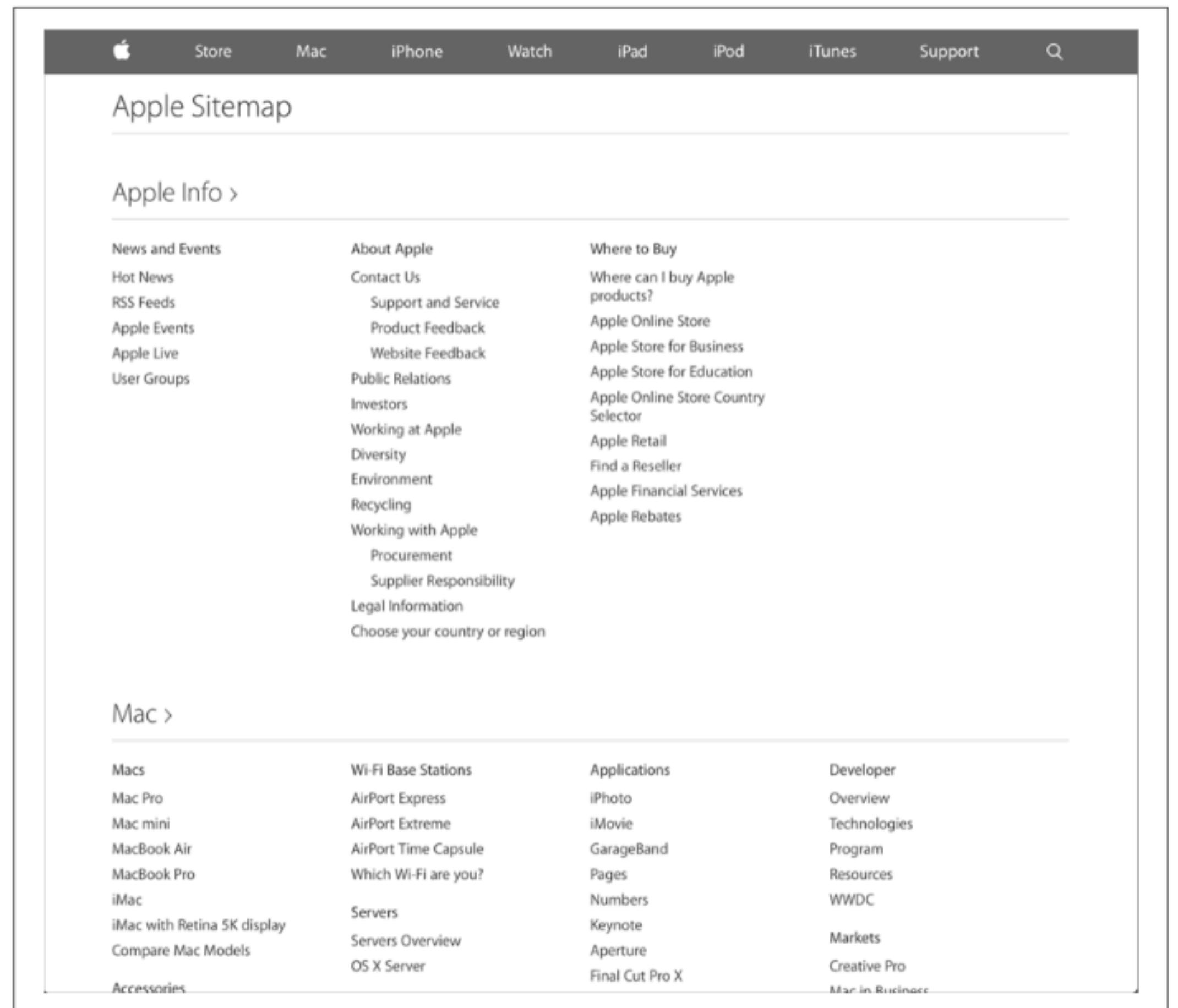


Figure 8-16. Apple's sitemap

Navigation in SIGARRA

Global Navigation

Breadcrumbs

Você está em: Início > LEIC023

Laboratório de Bases de Dados e Aplicações Web

Código: LEIC023 Sigla: LBAW

Áreas Científicas	
Classificação	Área Científica
OFICIAL	Engenharia Informática e Computação

Ocorrência: 2023/2024 - 1S

Ativa? Sim

Unidade Responsável: Departamento de Engenharia Informática

Curso/CE Responsável: Licenciatura em Engenharia Informática e Computação

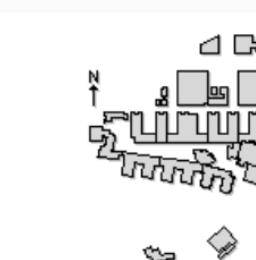
Ciclos de Estudo/Cursos

Sigla	Nº de Estudantes	Plano de Estudos	Anos Curriculares	Créditos UCN	Créditos ECTS	Horas de Contacto	Horas Totais
LEIC	381	Plano Oficial	3	-	6	52	162

Docência - Responsabilidades

Docente	Responsabilidade
Sérgio Sobral Nunes	Regente

Mapa das Instalações



Docência - Horas

Tipo	Docente	Turmas	Horas
Teóricas	Totais	2	4,00
	Sérgio Sobral Nunes		4,00
Práticas Laboratoriais	Totais	15	30,00
	Tiago Boldt Pereira de Sousa		8,00
	Fernando José Cassola Marques		2,00
	João Rafael da Silva Santos		4,00
	Ricardo Jorge Teixeira de Sousa		2,00
Inês Filipa Nunes Teixeira		4,00	

Local Navigation

Contextual Navigation

english | ajuda



Sérgio Nunes



Atalhos

Ver Lista

Adicionar Página

Administração

Conteúdos

Preparar Ficha de UC

Ano letivo corrente

Sumários

Relatório de UC

Preparar Ficha de UC

Avaliação de estudantes

(lançamento de resultados)

E-learning

Integração com plataformas

Gestor de conteúdos

Relatórios A3ES

Ficha Curricular A3ES

Opções

Estudantes

Fotos 4x4

Fotos 6x6

Horário

Outras ocorrências

Escalões ECTS

Imprimir Ficha de UC

Advanced Navigation Solutions

- Advanced solutions for navigation, include:
 - **Personalization**, serve information based on a model of the user, e.g. based on behavior, navigation, profile. Example: personalized recommendations in a shopping website.
 - **Customization**, give the user direct control over content and navigation options, e.g. visible options, preferences. Example: ordering or labels in a webmail application.
 - **Visualization**, provide navigation mechanisms based on visual properties of information items. Example: a visual search engine in a e-commerce website.
 - **Social navigation**, organize content access or navigation based on users' input. Example: ranking content by votes from other users (e.g. Reddit), or using users' tags to provide navigation features (e.g. Stackoverflow).

Search Systems

Search Systems

- Search is an advanced navigation mechanism.
- An apparently simple interface masks a complex system (covered later).
- Opting for a search system requires evaluation considering multiple issues, including:
 - Amount of content in the "information space".
 - Time and know-how to optimize the search system.
- Users expect search: it's a familiar tool, where users control of the vocabulary to find information, and can 'cut across' the existing structure.
- Multiple decisions are required, including which content fields to index, what text processing to perform, which additional filtering criteria to consider.

Search User Interface

- In designing the user interface, it is necessary to decide which information components to include in the search results.
- Complementary sorting options can be provided, e.g: relevance ranking, chronological, alphabetically, popularity, etc.
- Faceted search is an advanced mechanism commonly used in stores and complex information contexts.

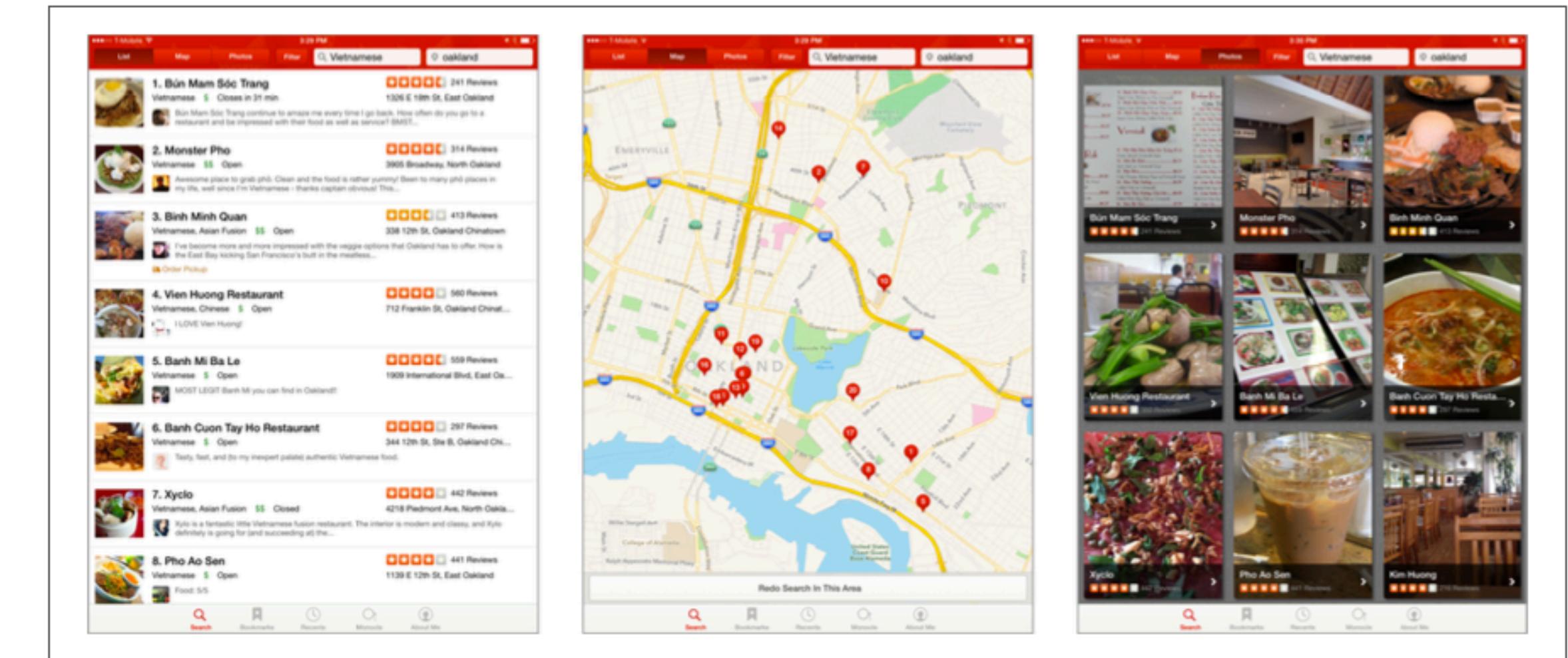


Figure 9-11. The Yelp iPad app allows users to select three different ways of viewing search results: as listings, as locations on a map, or as images

Faceted Search

The screenshot shows the Forrester website's search results page for the query "user experience". The top navigation bar includes links for research & data, analysts, events, consulting, leadership boards, help, log in, and register. The search bar shows the query "user experience". Below the search bar, there are buttons for "Reports" and "Advanced Search". A sidebar on the left provides facets for refining the search results:

- Reports** (2083):
 - Playbooks (29)
 - Blogs (1252)
 - Data Surveys (12)
 - Events (92)
 - Charts & Figures (1892)
 - Everything (5360)
- REFINE YOUR RESULTS**
 - Date Range
 - Past 7 days (7)
 - Past 6 months (229)
 - Past 12 months (397)
 - Past 18 months (520)
 - Primary Role
 - Marketing Leadership (328)
 - eBusiness & Channel Strategy (310)
 - Application Development & Delivery (289)
 - CIO (242)
 - Customer Experience (211)
 - See all
 - Methodology
 - Consumer Technographics (325)
 - Business Technographics (192)
 - Forrester Wave (117)
 - TechRadar (24)
 - Total Economic Impact (TEI) (15)
 - See all

The main content area displays the search results for "user experience" in Reports, sorted by Most Relevant. The results include:

- REPORT: Best Practices For Chinese Mobile User Experience**
December 18, 2014 | Samantha Jaddou
...enormous opportunity to transform customer experiences in China — but only...the quality of US mobile user experiences. We tested...
- REPORT: Case Study: Cornerstone OnDemand Makes End User Experience The Priority For IT Operations**
September 26, 2012 | Eveline Oehrlich
...often struggle with managing customer experience. This report summarizes some of...how service performance is delivered with a consistent end...
- REPORT: Reviewer's Guide: Website Top 10 User Experience Review 8.0**
November 14, 2011 | Adele Budovsky
...how to score a site experience against the 10 questions in Forrester's Website Top 10 User Experience Review and is intended...
- REPORT: Best And Worst Of Website User Experience, 2011: Canadian Banks**
Forrester Applies Its Website Review Methodology To Six Canadian Bank Sites
June 15, 2011 | Ron Rogowski
Forrester evaluated the user experience at the public-facing websites of six leading Canadian banks by assets: Bank of Montreal, CIBC, National...

Figure 9-21. Forrester contextualizes search results for the query “user experience”

Best Practices in Search

- Support autocomplete
- Support query operators
- Provide context
- Allow query reformulation
- Support additional filters
- Support alternative rankings
- Customize snippets
- Highlight matched search terms

The screenshot shows the search results for 'edward snowden' on The New York Times website. The search bar at the top contains the query 'edward snowden'. To the right of the search bar are buttons for 'Go' and 'Most Popular Searches'. On the left, there are filter options: 'Date Range' (set to 'All Since 1851'), 'Sort by' (set to 'Relevance'), and 'Result Type' (set to 'All Types'). Below these filters, the search results are listed:

- Chip Maker to Investigate Claims of Hacking by N.S.A. and British Spy Agencies**
encryption codes. The claims — reported on a website called The Intercept — were based on documents from 2010 provided by Edward J. Snowden, the former N.S.A. contractor. The American and British intelligence
February 21, 2015 - By MARK SCOTT - World - Print Headline: "Chip Maker to Investigate Claims of Hacking by N.S.A. and British Spy Agencies"
- Canada Agency Monitors File-Sharing, Reports Say**
downloaded them — as part of an antiterrorism effort involving the United States and other allies, a document leaked by Edward J. Snowden indicates. The project, to detect possible extremists by monitoring visits
January 29, 2015 - By IAN AUSTEN - World - Print Headline: "Canada Agency Monitors File-Sharing, Reports Say"
- British Court Says Spying on Data Was Illegal**
and American intelligence agencies have used a program known as Prism — first revealed by the former N.S.A. contractor Edward J. Snowden — and others like it to gain access to individuals' Internet
February 07, 2015 - By MARK SCOTT - World - Print Headline: "British Court Says Spying on Data Was Illegal"
- British Spies Seized Emails to Reporters**
from a single intercept — is contained in a cache of British documents that are among the classified trove leaked by Edward J. Snowden, the former contractor for the National Security Agency. There is no
January 20, 2015 - By JAMES GLANZ - World - Print Headline: "British Spies Seized Emails to Reporters"
- F.B.I. Is Broadening Surveillance Role, Report Shows**
declassifications about government surveillance activities in response to leaks by the former intelligence contractor Edward J. Snowden. The report

Figure 9-32. All aspects of the search are restated as part of these search results

Information Architecture Process

Information Architecture Process

- The design of information environments requires interdisciplinary teams, including interaction designers, software developers, content strategists, usability engineers, and other experts.
- An information architecture process is structured in four general activities:
 - **Research**, understands users, content, and context;
 - **Design**, specify the information architecture, creating detailed sitemaps, wireframes, etc;
 - **Implement**, solutions that adhere to the design and specifications produced;
 - **Evaluate**, and improve the system throughout its life cycle.

Research Methods

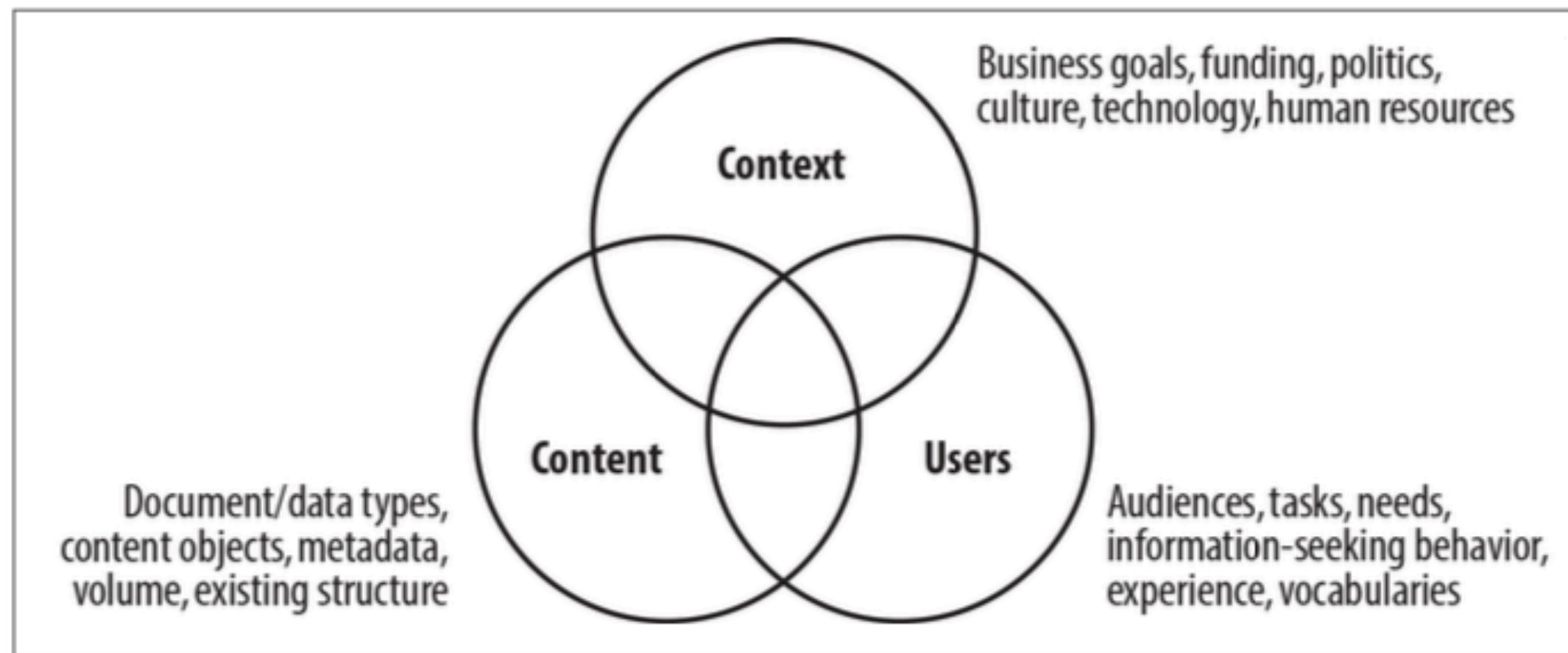


Figure 11-2. A balanced approach to research

Context	Background research	Presentations and meetings	Stakeholder interviews	Technology assessment
Content	Heuristic evaluation	Metadata and content analysis	Content mapping	Benchmarking
Users	Search log and clickstream analysis	Use cases and personas	Contextual inquiry	User interviews and user testing

Figure 11-3. Tools and methods for research

Selected Research Methods

→ Research

- Content Inventories: systematic mapping of existing content.
- Card Sorting: study participants organize content into groups and related concepts.

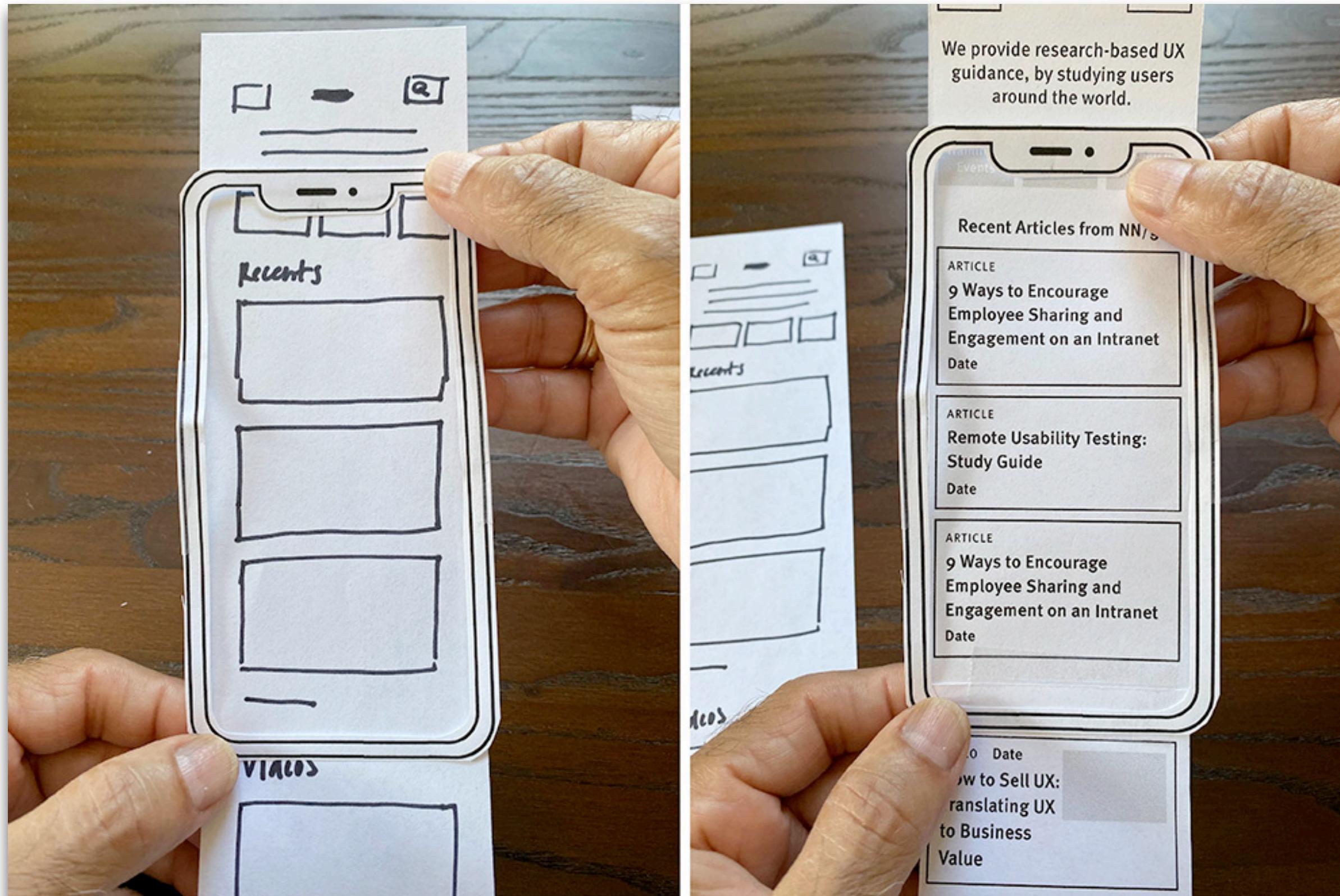
→ Design

- Sitemaps: high-level view of system's information structure and hierarchy.
- Wireframes: define structural organization of content and navigation elements.

→ Implement

- Paper Prototyping: low-cost paper-based prototypes to test interaction.
- Usability Testing: evaluation of prototypes with real users.

Paper Prototyping



A paper prototype of the Mozilla Support website. The top navigation bar includes 'Sign in', 'Create an Account', 'Select a Language', and 'Accessibility'. Below the navigation is a menu bar with links to 'Support Home', 'Mozilla Software Help', 'Hot Topics', 'News', 'Participate', and 'Feedback'. The main content area features a section titled 'Explore a help topic' with six numbered icons: 1. 'Learn the basics: get started with Firefox' (staircase icon), 2. 'Download and install: see what's new' (down arrow icon), 3. 'Privacy and Security' (padlock icon), 4. 'Customize controls, options and preferences and get Add-ons' (gear icon), 5. 'Fix slowness, crashing, error messages, and other problems' (exclamation mark icon), and 6. 'Join the discussion: ask and answer questions in the forum' (speech bubble icon). Below this is a section titled 'Which software do you need help with?' featuring icons for Firefox (laptop, desktop, mobile), Mozilla Persona (person icon), Thunderbird (laptop, desktop), Mozilla Marketplace (suitcase icon), and Firefox Home (house icon). Further down are sections for 'Hot Topics' (with numbered 3), 'News', 'Participate', and 'Feedback'.

Information Architecture Deliverables

Information Architecture Deliverables

- Deliverables are essential for any well-structured process.
- In multidisciplinary contexts, they work as "anchors" between teams and different project phases.
- Visual diagrams contribute to define:
 - Content components, i.e. what constitutes a unit of content, and how these are grouped.
 - Connections between components, i.e. how components are linked.
- Deliverables can provide multiple views, at different levels and for different audiences, over the information architecture of a system.
- Commonly used deliverables are sitemaps and wireframes. Others include wireflows, content inventories, prototypes, design mockups, etc.

Sitemaps

Sitemaps

- Sitemaps show the relationship between information elements, such as pages, and can be used to portray organization, navigation, and labeling systems.
- It can be used to portray the content organization, the navigation system, and the labeling systems. It provides a condensed view for both developers and users.
- High-level sitemaps are usually the result of a top-down design process.
- Sitemaps can be used to map specific areas or parts of a complex information environment.
- Adopt vector based tools that support collaboration.

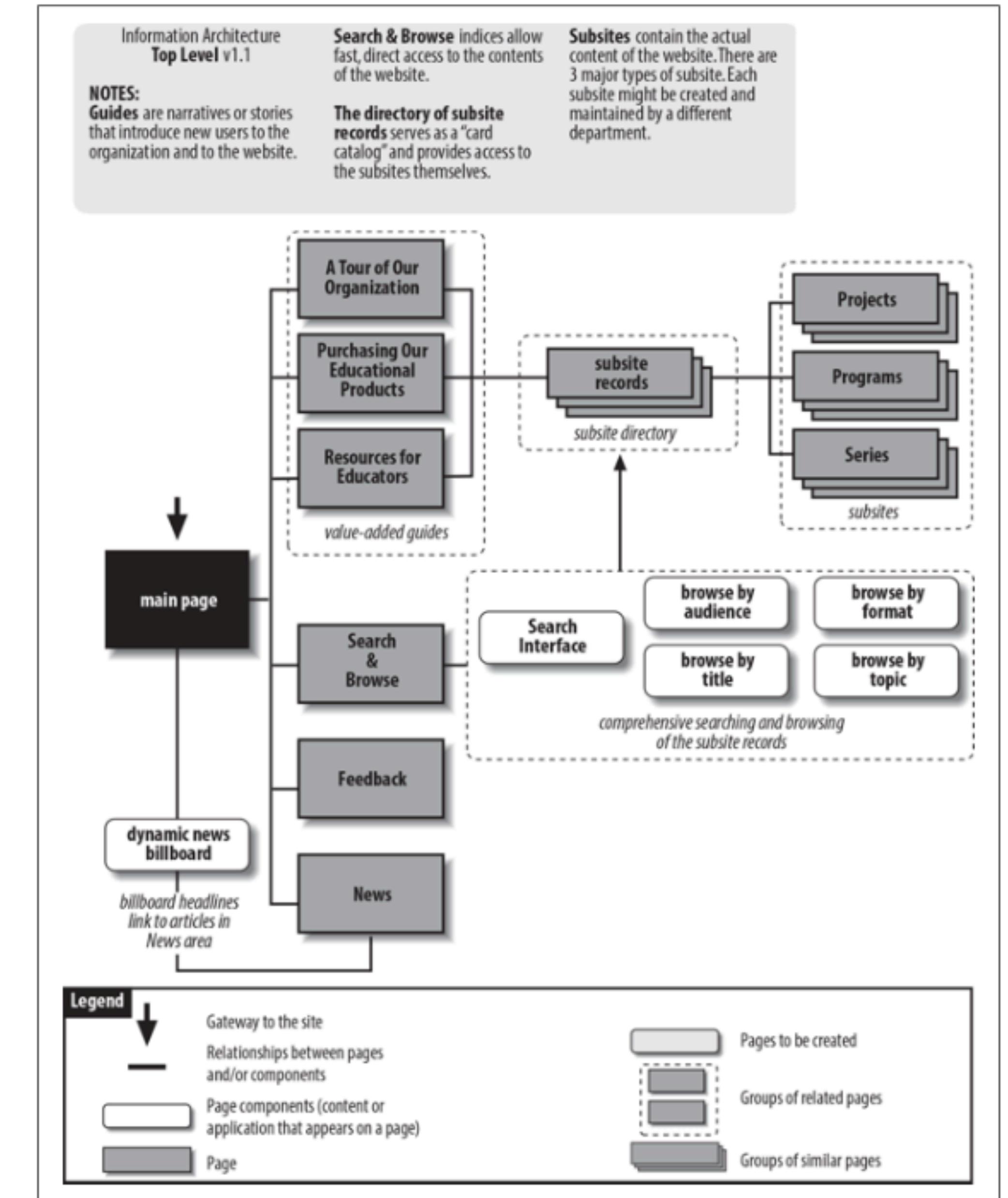


Image from: Rosenfeld et al.
*Information Architecture -
 For the Web and Beyond,*
 O'Reilly (2015)

Figure 13-1. A high-level sitemap

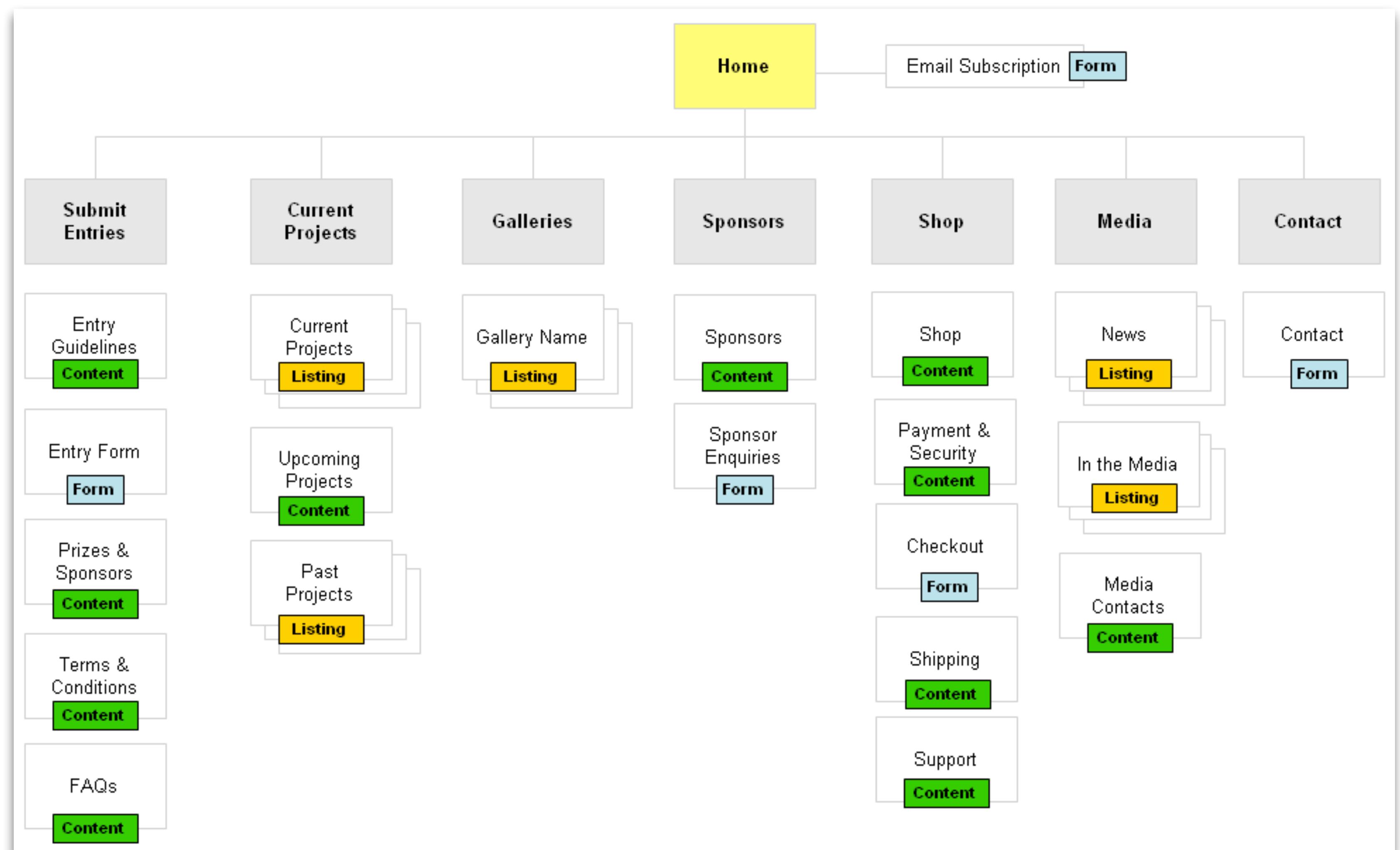


Image from: *Information and Information Architecture: The BIG Picture*, Smashing Magazine (2020)

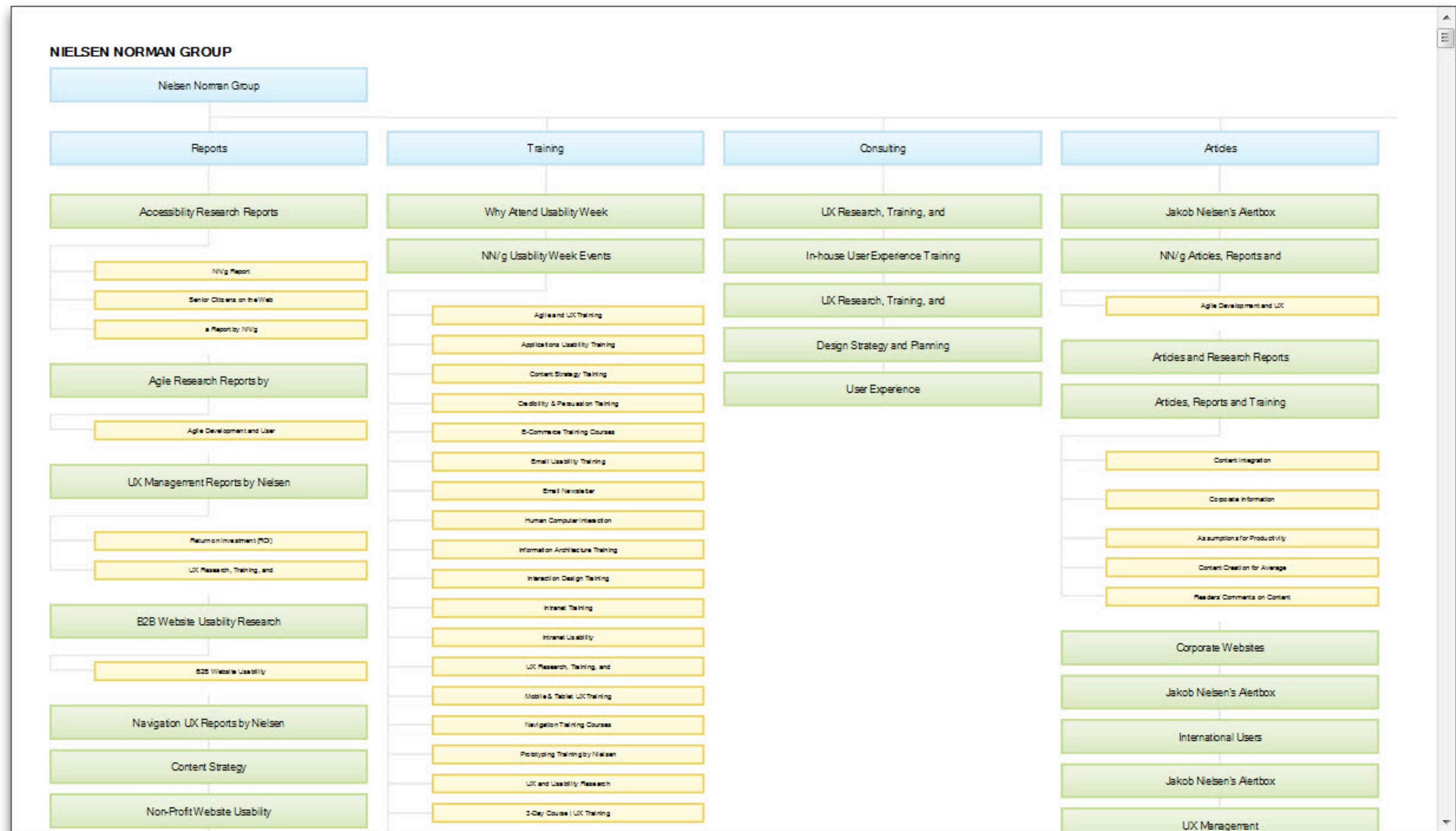
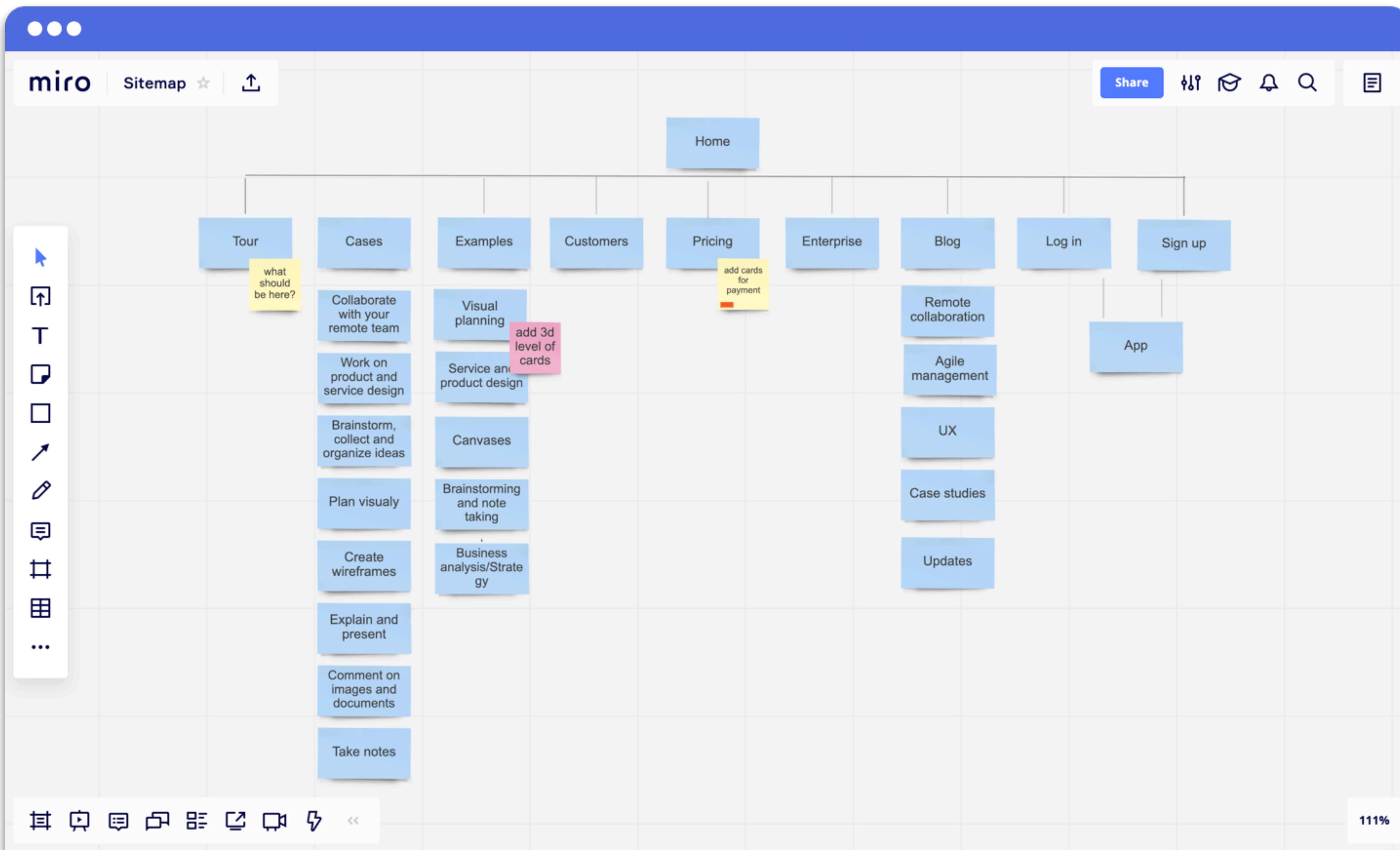
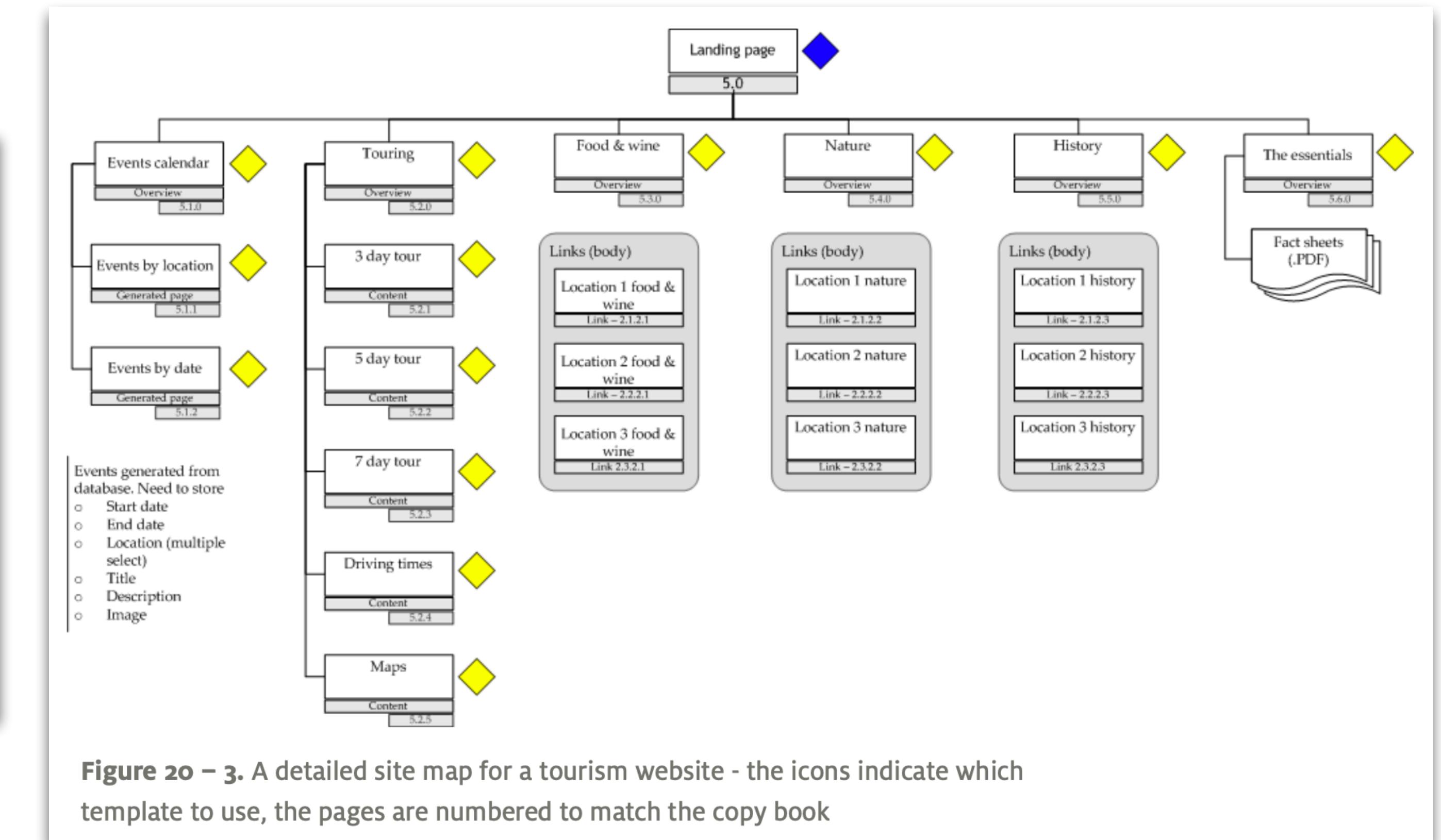
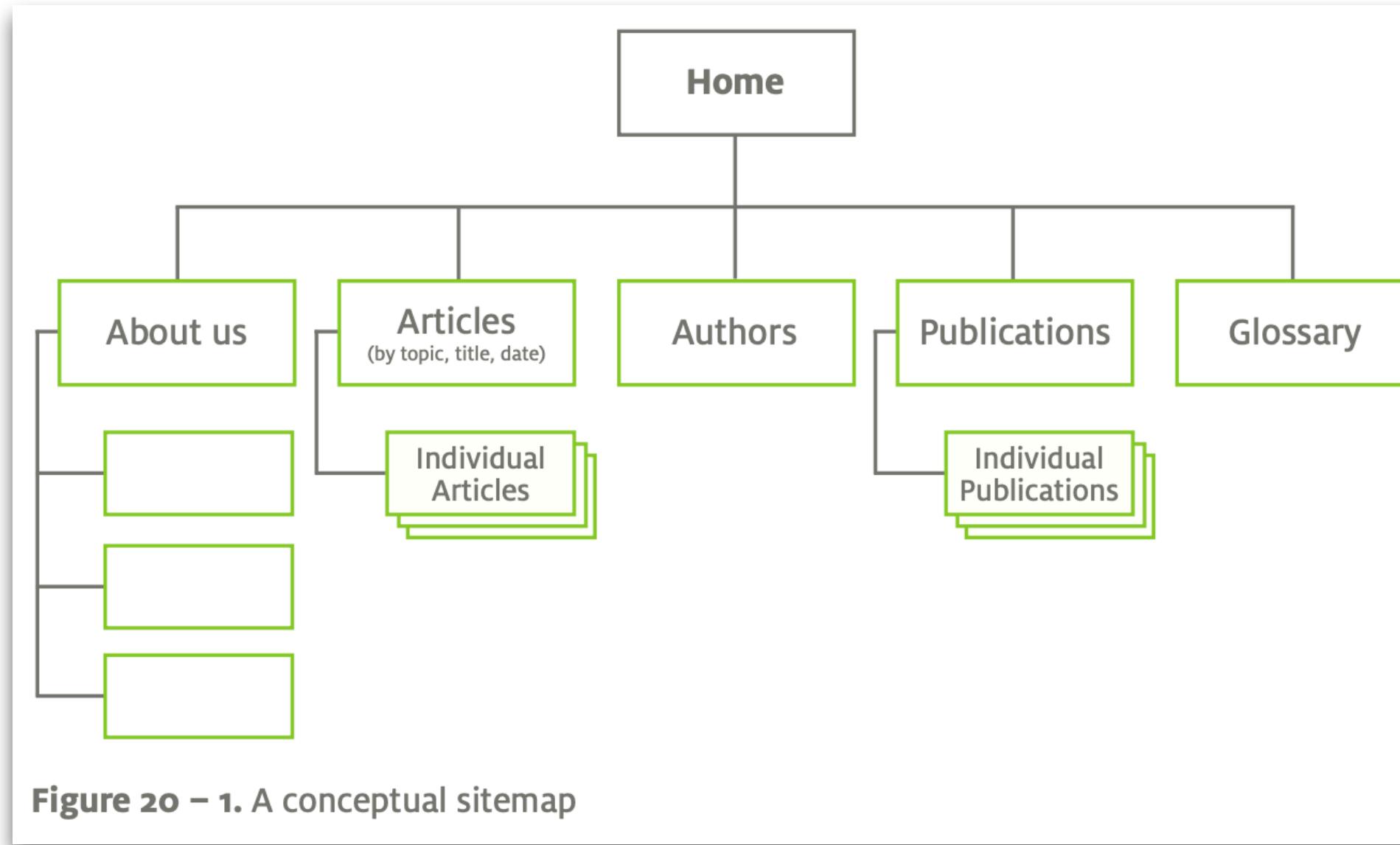


Image from: *Information Architecture vs. Sitemaps: What's the Difference?*, Nielsen Norman Group (2023)





Sitemaps Discussion

- Discuss common scenarios.
- When to use page stacks? (news website, social network, etc)
- How to map the “personal profile” page? Stack or single page?
- How to map tags?
- How to document search?
- Page tabs are new boxes on the sitemap diagram?

Wireframes

Wireframes

- Wireframes depict how an individual page or template should look from a structural and architectural perspective.
- Wireframes forces us to consider issues such as the location of navigation systems, the content hierarchy, content grouping, what to include and what to discard in each view of the system, etc.
- Wireframes are typically created for the system's most important pages or screens.
- They are also used to describe templates that are consistently applied to many pages.
- They are also a good way to explore the impact of different screen sizes on content layout.
- Wireframes can vary in their "level of fidelity", from low-level to high-level, depending on the stage of the development lifecycle.

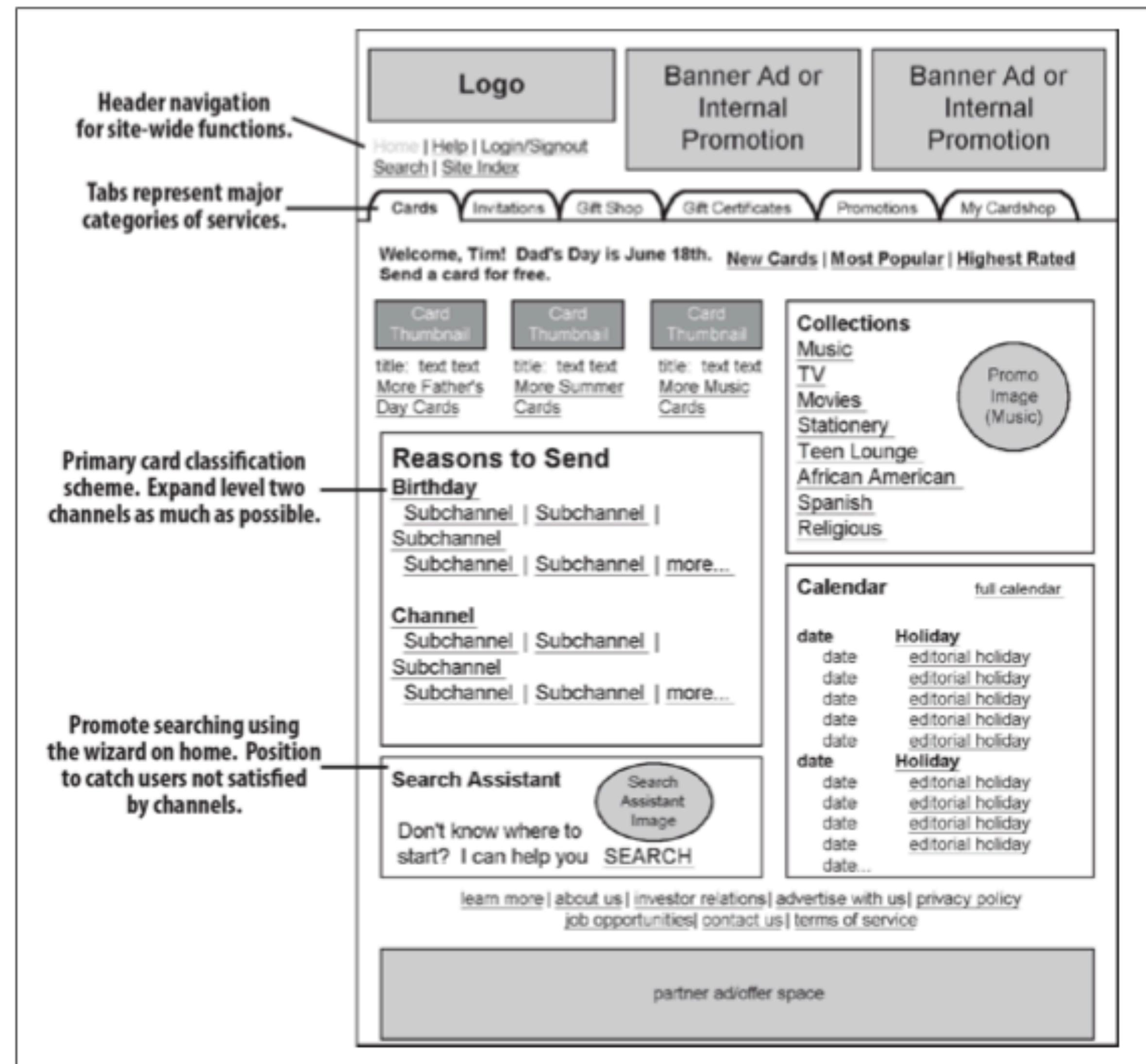


Image from: Rosenfeld et al.
Information Architecture -
For the Web and Beyond,
O'Reilly (2015)

Figure 13-11. A wireframe of the main page of a greeting card site

The Looks

Defaults to look #1. Product thumbnails are shown for products related to the look shown. When user rolls over a product image, the name of the product is revealed. (Either a tooltip or the name is highlighted in the text above.) When user clicks the product thumbnails or the product name in the text, they are taken to the product detail page. Previous and Next arrows allow the user to go to the next/previous look. These cycle in a continuous loop. The user may also click on the partial preview above or below to go to the next look.

Wireframe

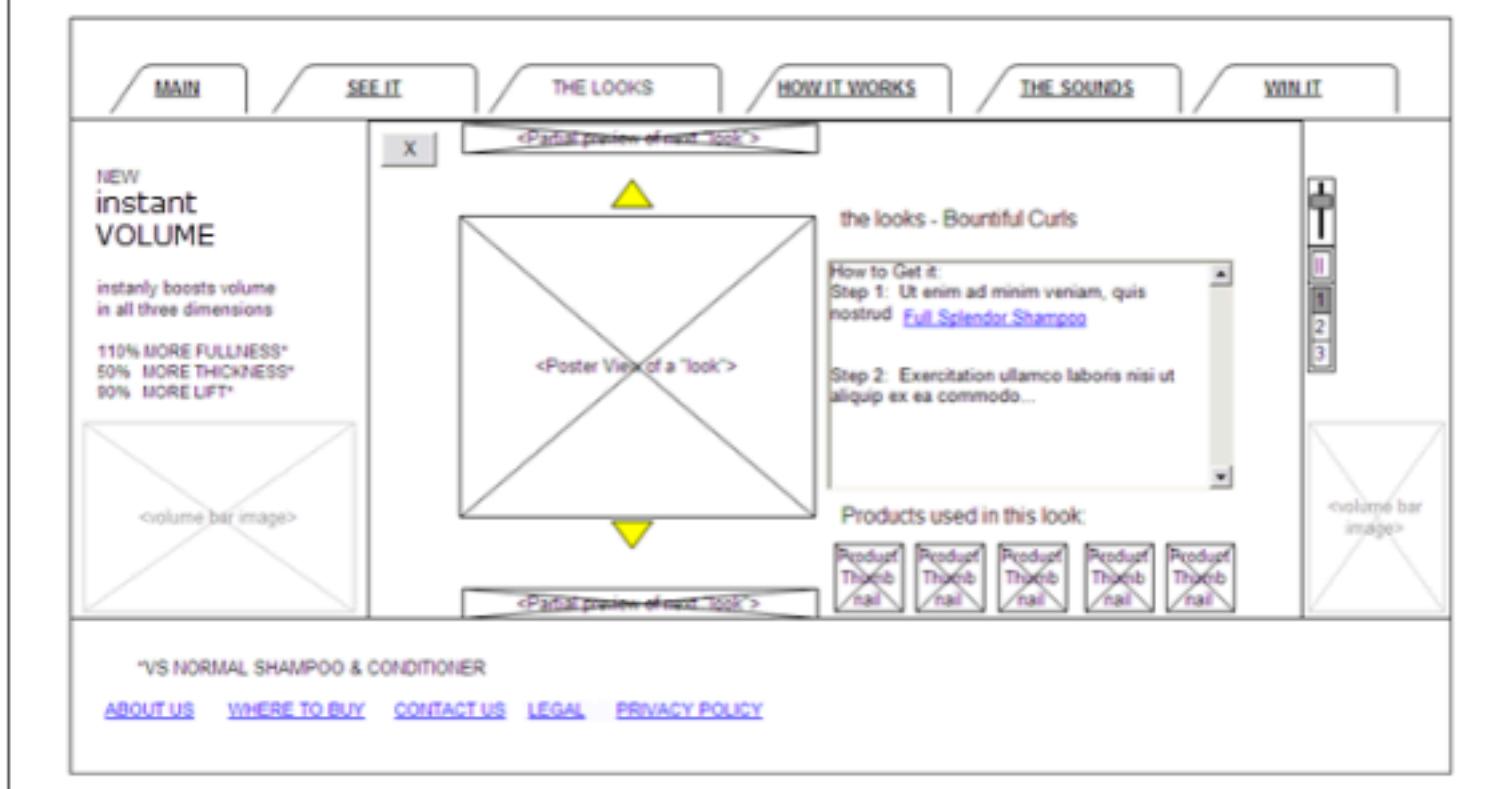


Figure 13-13. A low-fidelity wireframe; note that the focus is on layout of content and visual elements over content accuracy (wireframe developed for ProQuest LLC; reproduced with permission of ProQuest LLC—further reproduction is prohibited without permission)

Figure 13-14. A medium-fidelity wireframe by Chris Farnum and Katherine Root; more detail, more explanation, and more unique content (wireframe developed for ProQuest LLC; reproduced with permission of ProQuest LLC—further reproduction is prohibited without permission)

Figure 13-15. A high-fidelity wireframe (wireframe developed for ProQuest LLC by Chris Farnum; reproduced with permission of ProQuest LLC—further reproduction is prohibited without permission)

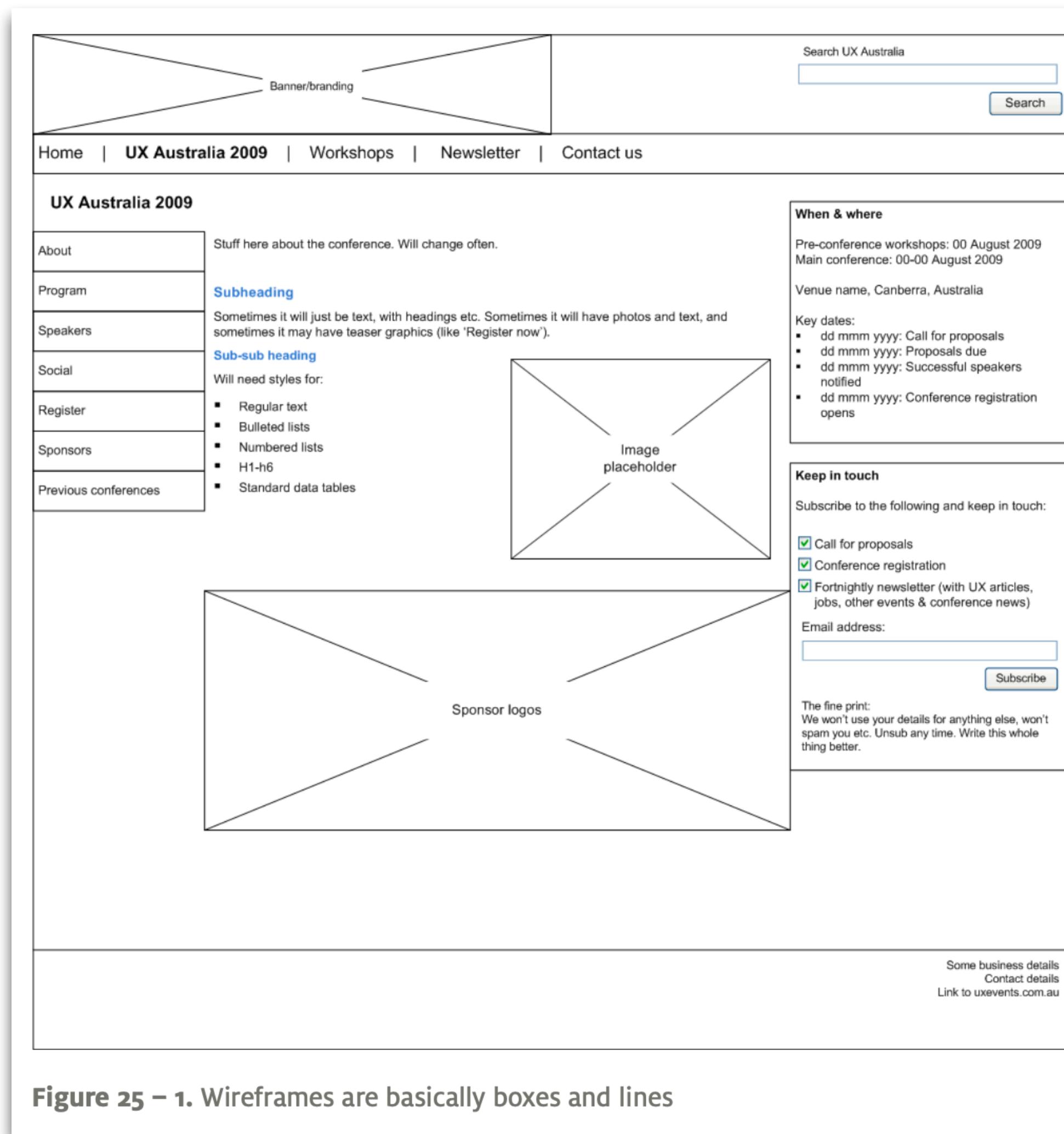
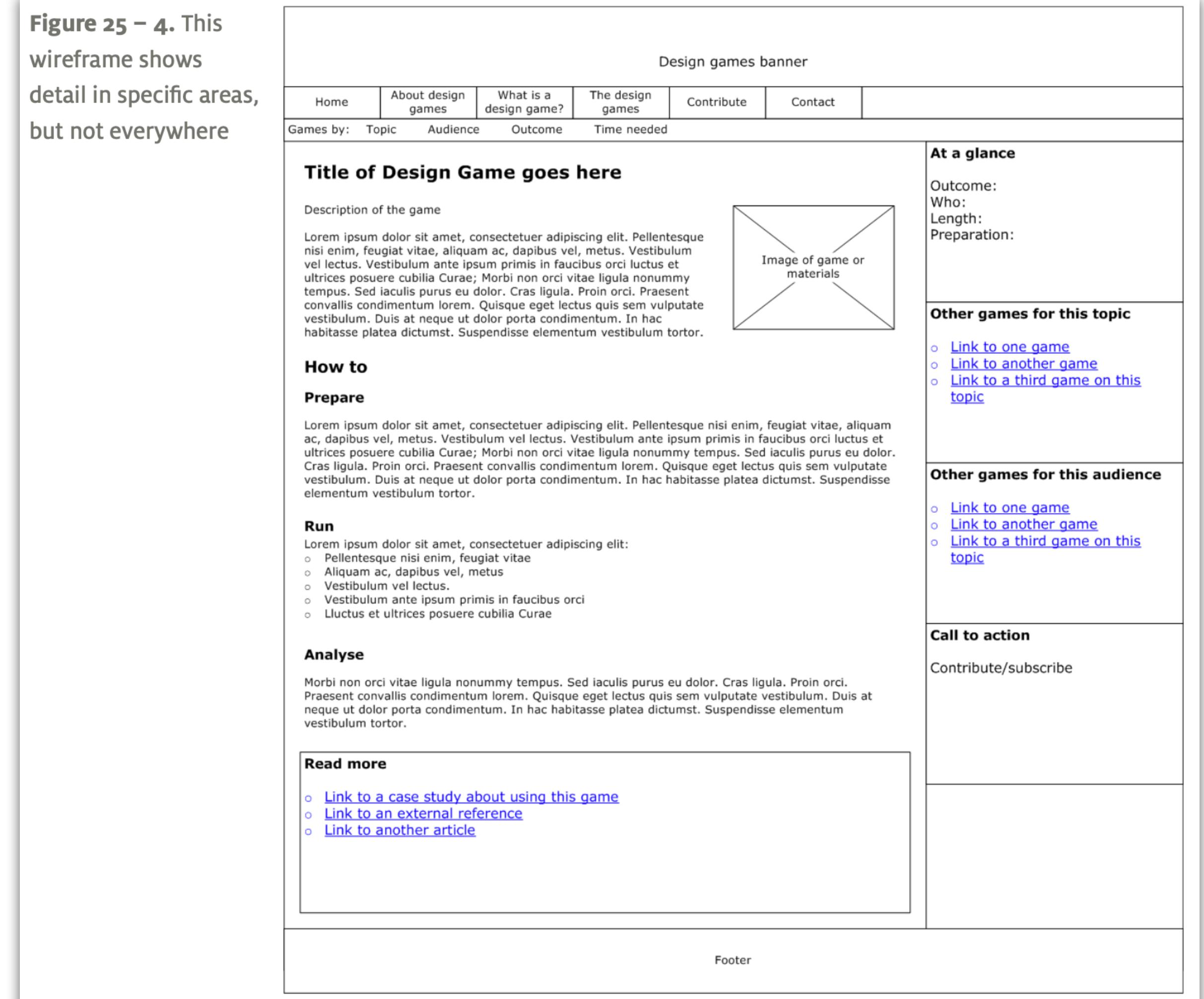


Figure 25 – 1. Wireframes are basically boxes and lines

Figure 25 – 4. This wireframe shows detail in specific areas, but not everywhere



Wireframes Discussion

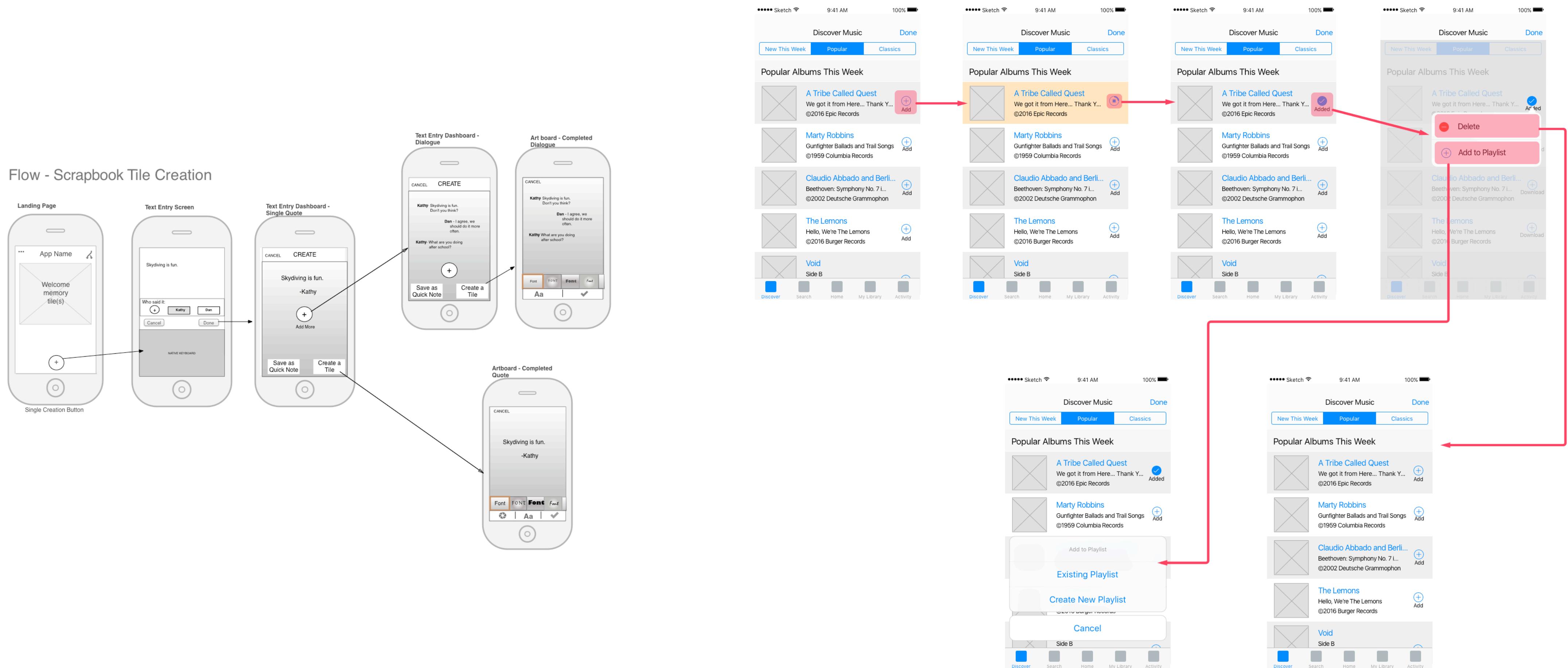
- Discuss common scenarios.
- What are trivial / common pages (not to include)?
- How many wireframes are needed?
- Which pages should be considered for wireframes?
- How to document pages that differ depending on the user?

Wireflows

Wireflows

- Wireflows combine wireframes and flowcharts to provide both a view of page-level layout ideas (structure), and document complex workflows and user tasks (flux).
- Useful when documenting systems with few pages that dynamically change its content and layout based on user interaction. This is an increasingly common pattern, particularly in mobile applications.
- Wireflows document interaction.

Wireflows



Images from: Laubheimer P. Wireflows: A UX Deliverable for Workflow and Apps. Nielsen Norman Group (2015)

A3. Information Architecture

A3. Information Architecture

- The Information Architecture artifact presents a brief overview of the information architecture of the system to be developed, and has the following goals:
 - Help to identify and describe the user requirements, and raise new ones;
 - Preview and empirically test the user interface of the product to be developed;
 - Enable quick and multiple iterations on the design of the user interface.
- This artifact enables a brief exploration of the information architecture of the system to be developed, in particular the identification of the content, how it is organized and made available, and how it is presented.
- Includes two elements: sitemap and wireframes.

A3. Sitemap

→ Overview of the information architecture from the viewpoint of the users.

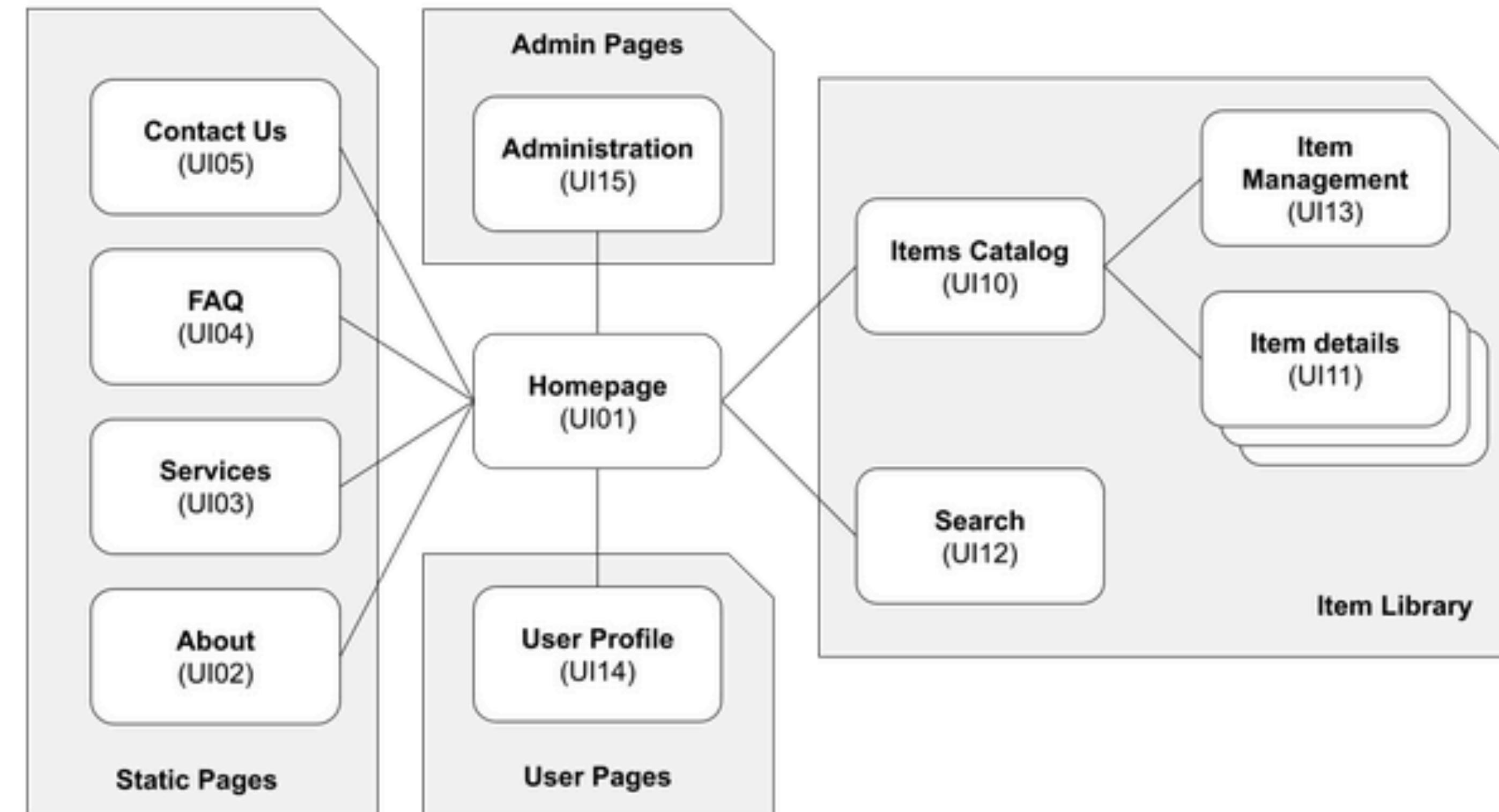


Figure 1: MediaLibrary sitemap.

A3. Wireframes

→ Description and prioritization of the functionality and content of, at least two, main user interfaces.



Figure 2: Item Details (UI11) wireframe.

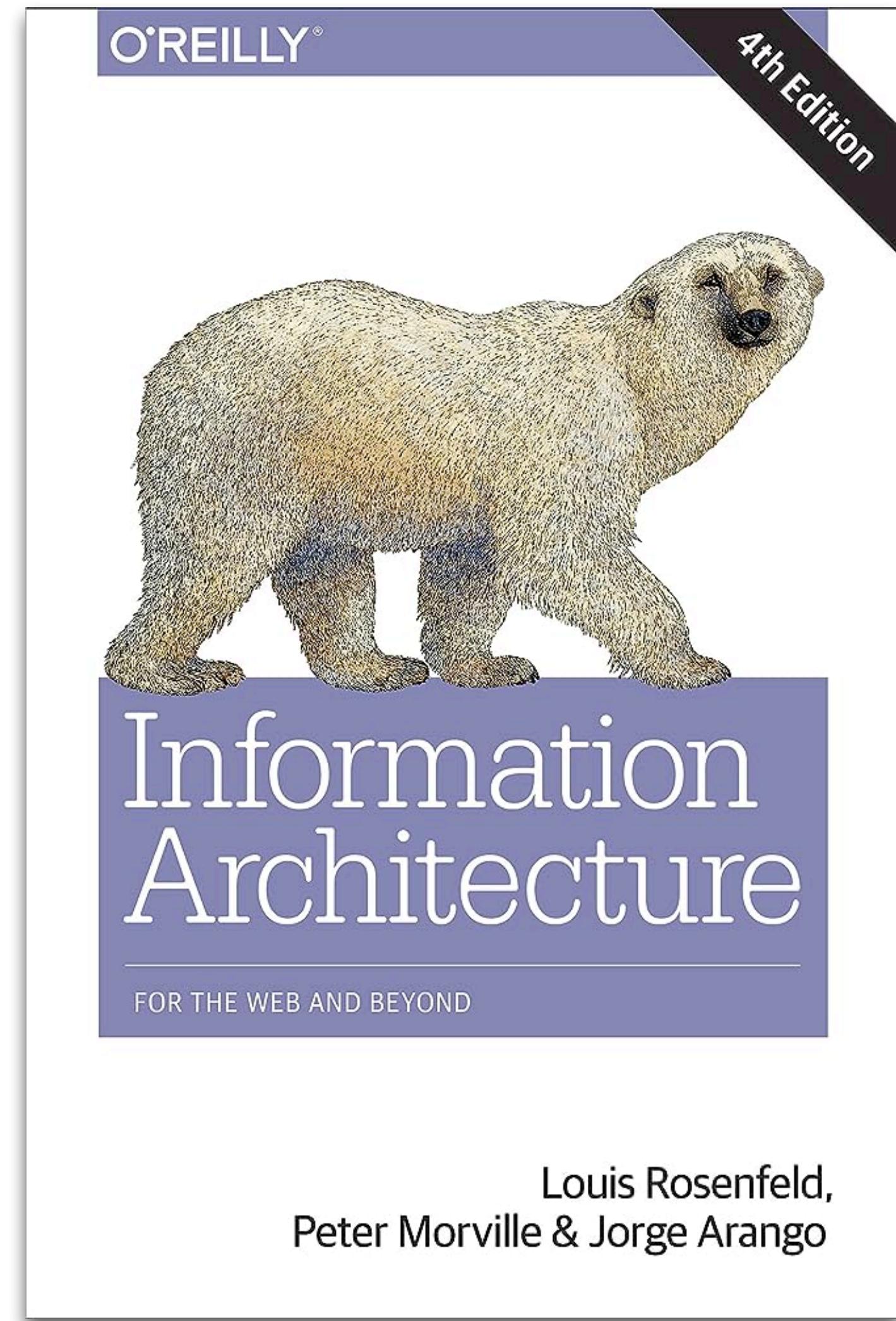
A3. Checklist

A3. Information Architecture	
Artefact	1.1 The artefact reference and name are clear 1.2 The goal of the artefact is briefly presented (1, 2 sentences)
Sitemap	3.1 The sitemap is included 3.2 Standard notation is used (lines, boxes and stacks of boxes) 3.3 The sitemap identifies pages, not functions or features 3.4 Only main links between pages are included 3.5 Home page is at the top / center 3.6 Each page has a unique reference 3.7 Login is presented as a page (may be a page element) 3.8 Search results page is included 3.9 About page is included 3.10 View / Edit own profile is included 3.11 Administration area and pages are included 3.12 View project / View question / View post / etc is included 3.13 View category / View tag / etc is included
	4.1 Wireframes are included 4.2 Basic graphical elements are used (i.e. simple lines, few colors) 4.3 Wireframes are presented for at least two main screens 4.4 For each wireframe, reference zones are identified 4.5 Headers and footers are included 4.6 Navigation structures are included 4.7 Page titles and headings are included

References

The Polar Bear Book

- If you are interested in these topics..
- The Polar Bear Book is a good starting point on the topic of Information Architecture.



Online Resources

- A List Apart, <https://alistapart.com>
- World IA Days, <https://www.worldiday.org>
- Nielsen Normal Group, <https://www.nngroup.com>
 - Information Architecture: Study Guide, NN Group (2022)
- Boxes and Arrows, <https://boxesandarrows.com>
- Smashing Magazine, <https://www.smashingmagazine.com>

Bibliography and Further Reading

- Information Architecture: The Design and Integration of Information Spaces. 2nd Edition. Wei Ding, Xia Lin, and Michael Zarro. Morgan & Claypool, 2017
- Information Architecture: For the Web and Beyond (aka "*Polar Bear*" book) . 4th Edition. Louis Rosenfeld, Peter Morville, and Jorge Arango. O'Reilly Media, 2015
- Everyday Information Architecture. Lisa Maria Martin. A Book Apart, 2019
- Design for Developers. Stephanie Stimac. Manning, 2023