Three key issues:

1. **Content.**
   What content is available?
   Content Objects? Data Structures?

2. **Composition.**
   What views on that content do we wish to provide users?

3. **Navigation.**
   How do the users gain access to those views?
Information Design: Concepts

Information Architecture (IA)

The overall strategy for information design usually combines both bottom-up and top-down approaches:

- **Bottom-up**: Commonly used for small WebApps; Build pages and progressively link them into the structure.

- **Top-down**: Considers overall organization – the realm of the Information Architect.
Structuring the Information Space of Web Systems

The information structures (IAs) that are created during information design can be classified in various ways.

- What application domains do you think are suited to each of these structures?

### IA: Hints on Hierarchical Structure

**Short navigational routes**

- Avoid scrolling (vertical & horizontal)!
- Design for efficient access to information (as few taps as possible!)
- However, lean towards deeper hierarchies rather than long scrolling pages
- Use indexes instead

Too shallow

Too chaotic

Too deep

M = menu
C = content
**IA: Hints on Hierarchical Structure**

Instead, provide direct access to content

*Users prefer:*

- Info available in the fewest possible steps (via good info organization)
- Presentation of CONSISTENT menus (5-7 links)
- A few dense screens of choices (NOT many layers of simplified menus)
- Short computing time (4 second rule)
- Feedback, feedback, feedback!

**IA: Levels of Details**

- **Option A:**
  As simple as a site map that represents the basic WebApp navigational structure

- **Option B:**
  May be a detailed model that provides a comprehensive overview of the approach for structuring, managing, and accessing information within a WebApp
Example of IA – Option B: Detailed GUI Hierarchical Structure

Examples of IA – option B: Detailed description of Webster System’s IA (for example, GUI components)

System Level
(Webster System)

Level of Subsystems (Domains)
(Databases, GUI, Security, HELP, etc.)

Level of Elements or Components
(menu items, dialog boxes, check boxes, messages, radio buttons, etc.)

Level of Sub-elements, Details
(for ex., attributes)
(Font type, size, appearance, ...)
Information Architecture: Main Approaches to Be Used

- **Separation of content and information.**
  1. Content is the collection of data sources that are available for use.
  2. Information is what is useful to the users of the WebApp.

- **Separation of information and application (or, functionality).**
  A WebApp IA should differentiate between
  a) the information that a user would find meaningful, and
  b) the structural ways in which this information might be arranged and accessed.

- **Separation of application and presentation (to increase usability).**
  If we separate the presentation mechanisms from the application, then the
  portability and genericity (commonality) of applications (ability to be applied to
  other applications or problems with minimal change) will be
  substantially enhanced.

- **Separation of context for links and link semantics.**
  The ability to control the presentation depending upon which links are followed.

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Information Design:

Navigation Mechanisms
Accessing Information: Navigational Mechanisms and Characteristics

A number of other factors affect the ability of users to achieve their goals: generally relate to navigational mechanisms and characteristics:

- **WebApp mechanisms** that allow users to understand what navigation options are available at any given time (e.g. menus, textboxes, etc.)

- **Interface mechanisms** that provide users with an indication of where they are and what they are currently seeing (e.g. breadcrumbs on site map)

  On a Web site, a breadcrumb trail is a navigation tool that allows a user to see where the current page is in relation to the Web site’s hierarchy. The term breadcrumb trail comes from the story of Hansel and Gretel, who left a trail of breadcrumbs as they walked through the forest so they could trace their way back home.

- **Navigation mechanisms** that allow users to travel within the information structure (e.g. searching)

  Each must be considered as part of the information design.
Interface Mechanisms: Breadcrumbs

Types of Breadcrumbs

There are three main types of breadcrumbs:

Location-based
Location-based breadcrumbs show the user where they are in the website’s hierarchy. They are typically used for navigation schemes that have multiple levels (usually more than two levels). In the example below from [Smashing](http://www.smashingmagazine.com/2009/03/17/breadcrumbs-in-web-design-examples-and-best-practices-2/), each text link is for a page that is one level higher than the one on its right.

Attribute-based
Attribute-based breadcrumb trails display the attributes of a particular page. For example, in [Smashing](http://www.smashingmagazine.com/2009/03/17/breadcrumbs-in-web-design-examples-and-best-practices-2/), breadcrumb trails show the attributes of the items displayed on a particular page:

WebE: Searching Mechanisms

- Allows a user to bypass the imposed navigational structure and jump directly to specific locations within the WebApp.
- A search engine can often be used more profitably by constraining its scope.
- Pages on the right of the figure (representing unstructured information) are less amenable to prescribed navigation and therefore become the focus of the search function.
Navigation Mechanisms: Search Engines
Yahoo vs Google

The Relationship Management Methodology (RMM) [Isa95] is an early navigation design approach – useful for illustrating concepts.

ER Modeling defines the information domain of the application by identifying content (data) objects, attributes, relationships, and various type indicators that comprise the WebApp information space.

Slice Design Model determines detailed information structure and access mechanisms by grouping content from the domain (captured in the ER model) into collections (clusters) that can or should be presented together in order to be useful and meaningful.

Navigation Design Model establishes the links between the various slices and creates the information units that have interest for various user categories.

Ultimately, these information units are aggregated and are transformed into Web pages. The navigation design links these pages by selecting all slices that are the target of a link derived from an ER diagram.
Information Design: Tools

A Concept of Blueprints

Basic notation
Show how the various content objects map into a specific information structure

A blueprint might also discuss:
- Whether content is dynamic or static
- Whether content is personalized for individual users (and in what ways)
- What content objects are mapped to which Web pages
- What navigational paths will address given tasks

Allow you to visualize how a WebApp might fit together and, hence, how users might respond to it
Tools to Model and Develop WebApp GUI

Microsoft Expression Studio

Microsoft Expression Changes

The proliferation of rich interactive applications across the cloud and mobile devices continues to create new opportunities for creative design and development as newer technologies evolve. Microsoft is committed to providing best-in-class tools for building rich applications. In support of these emerging platforms, this month we are introducing improvements to Windows and Windows Phone, as well as for our customers.

- Blend will continue to ship as a standalone tool with Visual Studio 2012, as part of a consolidated designers/developer offering. Those who Visual Studio 2012 primarily to create designs and then automatically generate code from those designs will appreciate this change. In addition, the ARM developers have also been added to Blend. The ARM support is available today as a preview and will be released in Visual Studio 2013 Update 2.
- Expression Studio 4 Windows and Expression Studio 4 OS X are no longer available for sale. For customers who previously purchased these products, all components will continue to be supported through this release.
- Expression Blend 4 and Expression Web 4 are now available for purchase. The support for these free versions will be discontinued.
- Expression Blend 4 Pro will be available for purchase through 2013. Expression Blend 4 remains available for download at no charge.

Expression Blend

With Visual Studio 2012 we introduced Blend for Visual Studio, providing designers with a complete design development environment. Blend for Visual Studio now supports Windows Phone 8, and Visual Studio Personal and Professional.

Additionally, a free version of Blend for Visual Studio 2013 that supports Windows and OS X is available. This desktop version is now developed and supported by Microsoft.

We are excited to release a production-ready version of Blend that supports these platforms in the upcoming Visual Studio 2013 Update 3, and includes features that can help designers and developers alike.

Expression Web

The web is now about applications as well as traditional web sites, and the tools to design and develop need to reflect this. Microsoft is helping to develop a unified approach to design and development tools in the Microsoft Visual Studio.

As part of this collaboration, Microsoft Visual Studio 2012 provides the multiplatform development tools that enable richer design, rendering, and mobile websites and web applications. Visual Studio 2012 makes it easy to select a web template, write your code, and then deploy your work with Visual Studio Web Developer.

Expression Web is no longer available as a free download from the Microsoft Download Center, and has been replaced with Expression Blend. Customers who previously purchased Expression Blend will receive support through the developer community. Additional information about Expression Web can be found at the Blend blog, which is located at the Microsoft blog.

If you are unsure about which version is best for your projects, please visit the Microsoft and Expression site for the latest blog updates.
Information Architecture (IA): Tools

- **CardZort** - Jorge A. Toro. "CardZort is a computer application that runs card sorting exercises. Its main purpose is to offer a complete computer-aided system that allows the fast creation and execution of card sorting exercises, and the analysis of the resulting groups via cluster analysis." It is free for academic purposes but runs only on the Windows platform.

- **OMGIraffle** - omnigroup.com. Bundled with the latest Macs, OmniGraffle is a diagramming and charting tool that is simple, elegant, and easy to use. A good tool for information architecture chores.
  - **IA Stencils for OmniGraffle** - paperplane.net. "These stencils are free for download and use have been created for use with OmniGraffle. They're optimized for version 3.0 and up, but will also work with version 2.0 onwards - just replace the '.gstencil' in the filename with '.graffle'"
  - **OmniGraffle Stencils** - Userfocus "Designed for use with Omnigroup visual communication software for Mac OS/X, these two OmniGraffle stencils were created to help communicate user-centered design activities and proposals to clients and development teams."

- **OptimalSort** - "OptimalSort is card sorting done online."

- **swipr** - "a toolset that allows information architects to create an integrated and interactive deliverable from standard Visio files."

- **tree.pl sitemap script** - "tree.pl walks through a directory and builds a HTML list of all files. The files' title tags are taken as the linked text, and if there is no title tag, the filename is used."

- **The Pencil Project** - Duong Thanh. Firefox 3 wireframing tool extension.

- **WebCAT** - National Institute of Standards and Technology (NIST).

http://www.d.umn.edu/itss/support/Training/Online/webdesign/tools.html

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<table>
<thead>
<tr>
<th>#</th>
<th>Tool's Name</th>
<th>Tool's Brief Description</th>
<th>Tool's Main Functions</th>
<th>Web Address to Download this tool</th>
<th>Required Technical Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WX Form Builder</td>
<td>RAD tool for wxWidgets GUI design.</td>
<td>GUI development</td>
<td><a href="http://wxwidgets.org">http://wxwidgets.org</a></td>
<td>C, C++, Python</td>
</tr>
<tr>
<td>2</td>
<td>Code Designer</td>
<td>Code Designer is a free and open-source RAD tool suitable for easy creation of various diagrams describing applications/structure and logic (class diagrams, state charts, ...) and for generation of production-ready source code from them.</td>
<td>State Diagram and class diagram code generation</td>
<td><a href="http://www.novell.com">http://www.novell.com</a></td>
<td>C, C++, Python</td>
</tr>
<tr>
<td>3</td>
<td>3D-RAD</td>
<td>With 3D RAD - the hottest free 3D game maker available – learn how to make a 3D game in a fraction of the time it would take with other tools.</td>
<td>GUI for 3D Gaming</td>
<td><a href="http://www.adobe.com">http://www.adobe.com</a></td>
<td>Mechanics</td>
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<tr>
<td>6</td>
<td>Dataweb Project</td>
<td>Creates a rapid development tool for applications oriented to the manipulations of database. The applications created with this tool are immediately usable in net.</td>
<td>Database Applications</td>
<td><a href="http://www.004m.org/">http://www.004m.org/</a></td>
<td>Basic SQL, queries and Table relations</td>
</tr>
</tbody>
</table>

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</thead>
<tbody>
<tr>
<td>7</td>
<td>Radria</td>
<td>Radria (Rapid Development of Rich Internet Applications) is a collection of RAD tools, 100% web based, to build web applications faster.</td>
<td>Drag, drop, PHP and Javascript Database driven web app or mashup.</td>
<td><a href="http://radria.sourceforge.net/download.php">http://radria.sourceforge.net/download.php</a></td>
<td>Ajax, Mashup</td>
</tr>
<tr>
<td>8</td>
<td>PFP Studio</td>
<td>PHP Studio is a visual programming system for rapid application development (RAD) of Web based forms using PHP and Javascript. The frontend runs in a browser.</td>
<td>Database form generator</td>
<td><a href="http://sourceforge.net/projects/pfp-studio/files/">http://sourceforge.net/projects/pfp-studio/files/</a></td>
<td>PHP, HTML, Javascript</td>
</tr>
</tbody>
</table>
WxForm Builder

1. WxFormBuilder aims to be an application that enables visual development and generating the corresponding code.
2. This way the application’s code is simplified while at the same time providing a simple mechanism for adding components.
3. The code generation makes use of a series of “templates” defined in the document of the class information, which are processed to generate the corresponding code.
4. Provides plug-ins for advanced functionality.
**Code Designer**

- CodeDesigner is free and open-source RAD tool suitable for easy creation of various diagrams describing applications' structure and logic (class diagrams, state charts, ...) and for generation of production-ready source code from them.
- The application is available for MS Windows, Linux and OS X and can be used as a free alternative to Enterprise Architect ($135 - $599) or IAR Visual State commercial tools.
- In contrast to other similar CASE tools the Code Designer is aimed to generation of production-ready source code from supported diagrams.
- It means that not only application skeleton can be generated from diagrams but complete full-featured application including its entry point (main function) can be produced by a one click.
- Algorithms Supported: GOTO algorithm (C, C++), Loop Case algorithm (C, C++), Else-If algorithm (C, C++, Python).

**3D-RAD Game Designer**

- Ready-to-use resources! 3D RAD addons are resources that don't require neither coding nor modeling. Users can just add them to their projects, configure them and go!
- Whatever you create with 3D RAD can be exported as an addon that others can use in their projects, in a very productive way.
- Best part is the add on is available to the user without additional modeling or scripting.
- You can enable collision detection and realistic physics for your 3d models by simply importing them to your 3D RAD project (no coding!).
- These 'bodies' can then be combined visually with working joints, wheels, springs, forces and even airfoils, to create any sort of system.
Advantages of these 3 tools over other tools

**Wx Form Builder:**
1. Drag and Drop
2. Code Generation in C++, Python and XRC
3. Do not use a different platform/framework as other RAD tools.
4. Simple and quick development.

**Code Designer:**
1. Drag and Drop to generate state diagram and class Diagram.
2. Add functions, data type and variables in the diagram and it generates the code accordingly.
3. A bit complicated but better than other tools

**3D RAD game builder**
1. You can bring life to your 3d models and
2. Learn how to make a 3d game in a fraction of the time it would take with other tools

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Advantages & Disadvantages of RAD GUI tools

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quick to build a product due to shorter life cycles.</td>
<td>1. Short iteration may not add enough functionality, leading to significant delays in final iterations.</td>
</tr>
<tr>
<td>2. Require less people to work on and consumes less time hence saves time and Money.</td>
<td>2. Programmers are required to work in pairs (which may be difficult for some developers).</td>
</tr>
<tr>
<td>3. Iterative process and user involvement may reduce the possibility of failure of the product.</td>
<td>3. The client may create an unrealistic product, leading the team to over- or under-develop functionality.</td>
</tr>
<tr>
<td>4. Greatly reduced manual coding.</td>
<td>4. Product may lose its competitive edge because of insufficient core functionality and may exhibit poor overall quality.</td>
</tr>
<tr>
<td>5. Flexibility in using automated tools.</td>
<td>5. Cost of integrated toolset and hardware to run it may be high.</td>
</tr>
<tr>
<td>6. Loss of scientific precision</td>
<td></td>
</tr>
</tbody>
</table>
Additional Models

Other Approaches

- A more recently developed and rich approach - Web Modeling Language (WebML)
  - incorporates robust support for aspects such as workflow modeling, presentation and content adaptation, personalization, and design patterns

- Web Application Extension for UML (WAE) is a design approach that links the informational perspective with functional WebApp components.
  - indicates how functional components generate and/or provide information and how the information (through aspects such as link activation or form submission) triggers functional components.
  - models the connection between client-side content and behavior, and server-side functionality.
Wireframe Models for Webpage Layouts

- Conceptual layout of pages
- Captures core information and navigational elements.
- Supports both information design and interaction design.

[Diagram of wireframe models for webpage layouts]
Information Design: Summary

The formality of the design process should be tuned to the characteristics of the WebApp

- **Application scale.** As size grows, we need to be able to assess the quality of the design before construction begins.
- **Information volatility (instability).** As content becomes more dynamic a clear architecture becomes more important, but detailed models could inappropriately constrain the WebApp evolution.
- **Application volatility (instability).** If overall requirements change frequently then focus on those aspects that are known to be stable.
- **User heterogeneity (difference in users’ profiles).** As end-user diversity increases it becomes more difficult to ensure that there is overall consistency in the information structures and information access paths. Consequently, the blueprint increases in importance.
- **Application criticality.** WebApp quality becomes the central focus when a WebApp is mission critical. Reviews that focus on design work products are a useful tool.

The decision about the appropriate depth of modeling for a specific WebApp project should be made early during the design process and not left to an ad hoc decision driven by time pressures.

Information Architecture: Main Characteristics

1. **Composition with multiple, dynamic data.**
   
   The model must support the ability to group different information items into a presentation and the expression of constraints among these items.

2. **Higher-level presentation specification.**
   
   The model should be able to specify constraints across multiple information items.

3. **Temporal relations.**
   
   Certain information items may have time-based relationships, which can be important to their presentation (e.g., a link to information about an event might only be relevant up until that event is held).
What Makes a “Good” Information Structure

**Selection criteria:**

1. Meets the information needs of the users and is easy to navigate!

2. The breadth and depth of the information structure can have a strong impact on how much effort it takes a user to navigate to information that is needed

3. *The appropriate fan-out of the hierarchical structure should relate to the complexity of the WebApp options and how distinct the choices are*
   - Fan-out is a measure of the width of the navigation structure below a single node.

4. Hierarchies based on exact values and clear categorizations will typically not be ambiguous.
Accessibility Tools

- **Accessibele Tools**
  - The Accessible Web site is an online resource for and accessible web design. It provides tools and resources for creating accessible web pages.
  - **WAVE**
    - **Web Accessibility Evaluation Tool**
    - **Web Accessibility Testing Lab**
    - **Web Accessibility Project**
  - **Tech Tools**
    - **Screen Reader**
    - **Screen Magnifier**
    - **Text-to-Speech**
    - **Voice Recognition**
  - **Resources**
    - **Web Accessibility Guidelines**
    - **Web Accessibility Best Practices**

- **Web Design References**
  - **Tools**
    - **Site Map**
      - **Web Design Site Map**
      - **Web Design Reference Guide**
  - **Accessibility**
    - **Accessibility Tools**
      - **Color Tools**
      - **CSS Tools**
      - **HTML Validation Tools**
      - **Web Accessibility Guidelines**
  - **Web Design Resources**
    - **Web Design Books**
      - **Web Design Journals**
      - **Web Design Magazines**

- **Web Design Tools**
  - **Web Design Software**
    - **Adobe Dreamweaver**
    - **Microsoft Expression Web**
  - **Web Design Plugins**
    - **WordPress Plugins**
    - **Drupal Plugins**

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Moving through the Info Structure

An information architect should:
- tune navigational support to the specific characteristics of the IA
- design search mechanisms that lead the user to desired information while filtering out extraneous content.
- help experienced users achieve their navigational goals more quickly
- provide inexperienced users with additional navigational support

Accomplished with:
- **Global links.** These links are provided on every Web page and point to commonly visited WebApp locations or functions.
- **Shortcuts.** These are ways of bypassing the normal navigational route and jumping over intermediate steps straight to a particular location within the information space
- **Breadcrumbs and trails.** We have already noted that breadcrumbs are useful for helping users to locate themselves.