



Design for **Context**

Making software applications and web sites easy to use

# Semantic Web Interface Design: Opportunities and Techniques

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Design for Context

[www.DesignForSemanticWeb.com](http://www.DesignForSemanticWeb.com)

# Today

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- **Perspective**
  - On Design
  - On the role of the Semantic Web
- **Purpose**
  - Solve user problems
  - Be responsive
- **Flexibility: extending the model**
- **Intelligibility: animating the data**
- **Structure: capturing semantic & structured data**
- **Respect: privacy, transparency, humility, provenance**





# Perspective

...on Design

...on the role of the Semantic Web

“ After 10+ years of work into various aspects of the Semantic Web... I am now fully convinced (read: no longer in denial) that most of the remaining challenges to realize the Semantic Web vision have nothing to do with the underlying technologies...

Instead, it all comes down to user interfaces and usability. ”

Ora Lassila, “Semantic Web Soul Searching,” *Wilbur-and-O blog*, March 19, 2007  
[http://www.lassila.org/blog/archive/2007/03/semantic\\_web\\_so\\_1.html](http://www.lassila.org/blog/archive/2007/03/semantic_web_so_1.html)



## What is Usability?

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- Usability is a **quality** attribute that relates to how a product interacts with the person using it

People get things done quickly and productively

The technology does not get in the way

**Efficiency**



They get the info they need, complete work accurately and achieve their goals

They don't make mistakes

**Effectiveness**



They feel confident and pleased; they would come back again

They are not frustrated

**Satisfaction**

—Based on ISO 9241, Part 11



## What impacts a web site's usability?

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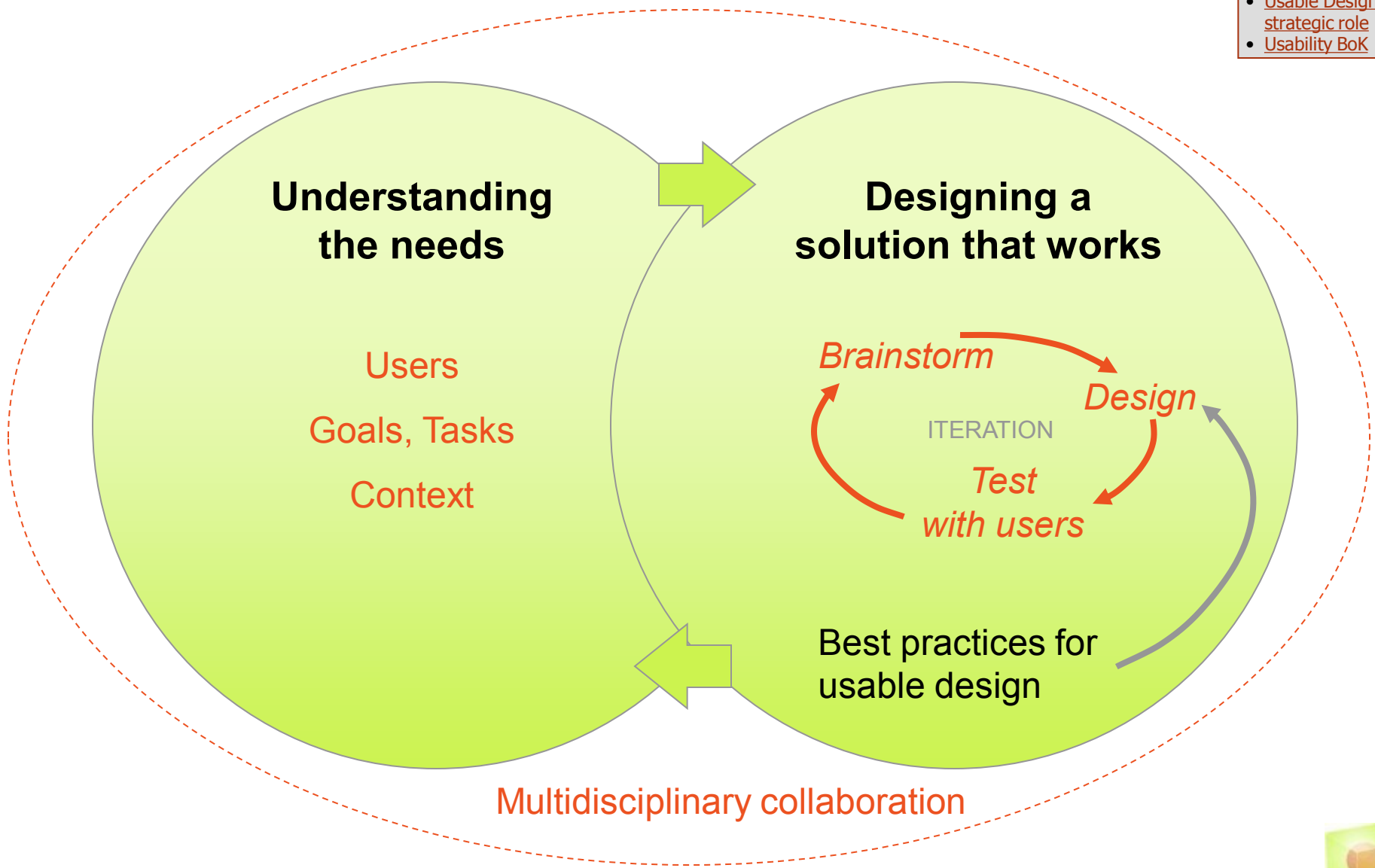
When a site is easy to use, there is a good fit between the site and...

The **users** + Their **tasks and questions** + The **situations** that bring them to the site (**context**)



# The Core of Usable Design

- Usable Design strategic role
- Usability BoK



# Building Usable Design in from the beginning



Involve **real users** early and often

Observe their **actual work**

Work **collaboratively** with a multi-disciplinary team

Follow human factors & usable design **guidelines**

**Design** the user interface deliberately

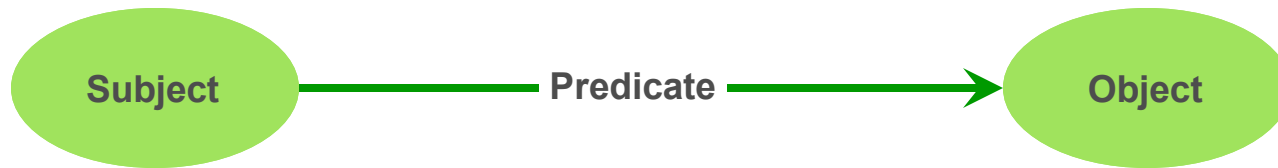
**Iterate** the design with user feedback





# The big difference

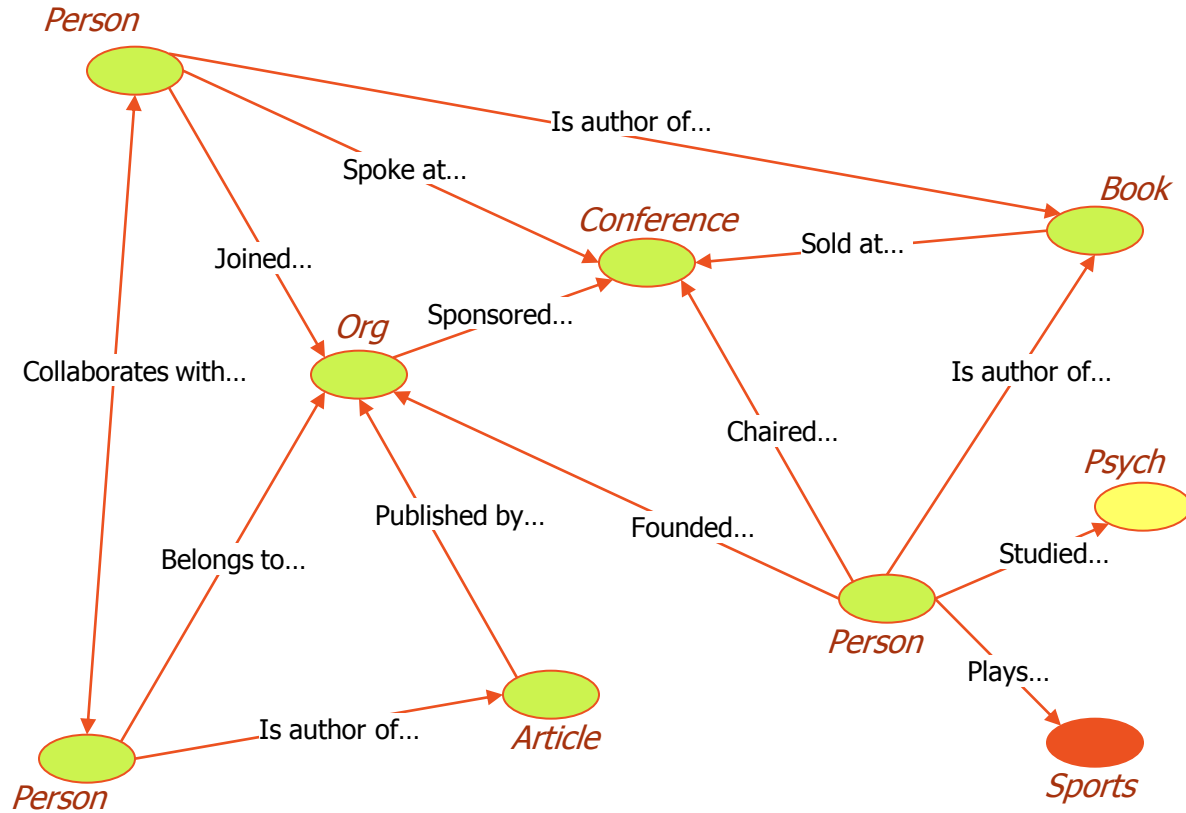
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Naming the lines makes the difference



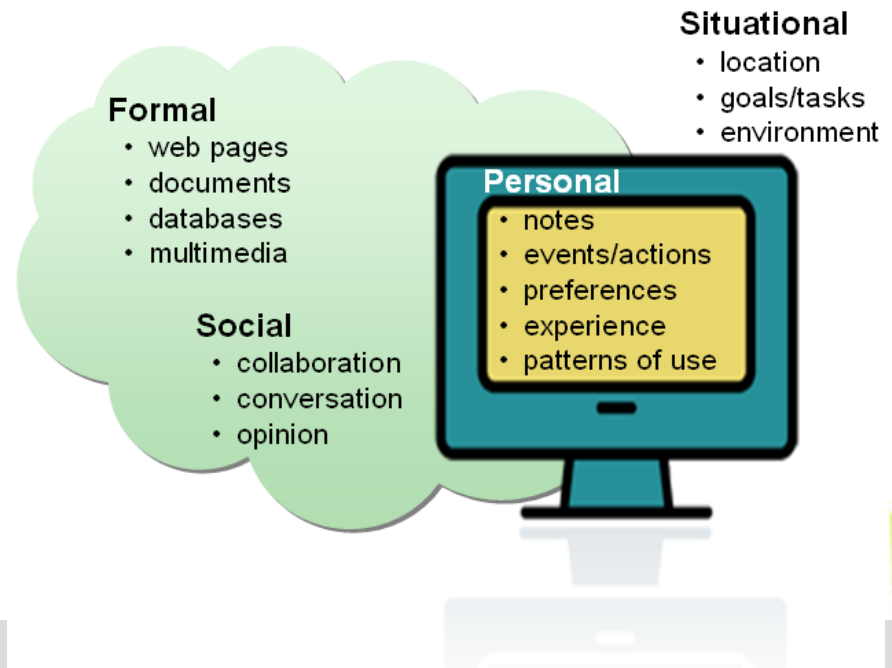
# The big difference... known relationships



## About this "Web 3.0" stuff... is it the Data Web?

- Open Linked Data
  - *Lots* of structured data
  - More common syntax
  - More self-describing
- Models that represent data domains
  - Vocabularies
  - Ontologies
- Increasing number of tools for data display, translation and manipulation
- Plenty of enthusiasm

- Tim Berners-Lee's [2009](#) and [2010](#) TED talks
- [Linked Data](#)
- [Freebase](#)
- [Data.gov](#) and [Data.gov.uk](#)
- City government: [NYC](#), [DC](#), [SF](#)
- [Apps for Democracy](#), example: [Stumble safely](#)
- [NY Times](#) topic data
- [World Bank](#)
- [Amazon's >1Tb](#)
- [DBpedia](#)



## Web 3.0 is about *more than data*

### ➤ The Context Web

- Personal
- Managed and scalable social
- Mobile and location-aware
- Temporal
- Situated – sensors and the "Internet of Things"
- Multi-modal – gesture, voice, haptic, etc.

- Contextual, e.g. [PLUM](#)
- Mobile and location-aware, e.g. [Siri](#), [Wikitude](#), even Google [Search Nearby](#)
- Situated, e.g. [Chumby](#), [Violet](#), [Roomba](#), [Semantic Sensor Web](#), W3C [Semantic Sensor Incubator](#)
- Gestural, e.g. MS Surface or smart phones; see Wikipedia [gesture recognition](#)

### ➤ All these things rely on structured, linked data as an *enabler*





## Purpose

Solve user problems

Be responsive

## Solve real user problems

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- How do you articulate your users' *tasks* and *situations*?
- Do you have methods to understand changing needs over time?
  
- Exercise:
  - Interview each other to identify key user scenarios
    - User profiles
    - Goal / task
    - Situations (triggers)
  - Prioritize key requirements for task support
  
- Examples for discussion
  - Emergency/disaster management
  - Medical information delivered/sent via mobile devices



## Be responsive

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- Context = Value
- How do you identify what needs to be flexible in your design, and what can be more precisely crafted?
- How do you modularize your design, so it can change over time?
- How do you build elements that allow you to:
  - Deploy quickly
  - Share easily
  - Integrate simply and seamlessly
- Examples for discussion
  - Missing persons





# Flexibility

Extending the model



## What is flexibility?

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- The ability to easily manipulate an interface to respond to a user's situation and support user and organizational goals
- Interaction is:
  - Seamless – User goals and tasks are facilitated more easily, no matter what technologies and applications involved
  - Frictionless – Data is free to move between applications and uses as needed
- The underlying model(s) that drive interaction are easily extended and changed – to remain relevant to users



# Examples

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- Facet navigation
  - Refinement
    - *Flamenco*
    - *Solr*
  - Browsing
    - *Parallax*
    - *mSpace & mSpace Mobile*



# Overview

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- There are two types of interaction:
  - **Refinement** is about starting with large sets and narrowing... a *relevance* funnel
  - **Browsing** is about *exploring the structure* of data to find areas of interest
- Add semantic relationships – complexity, yet potential elegance

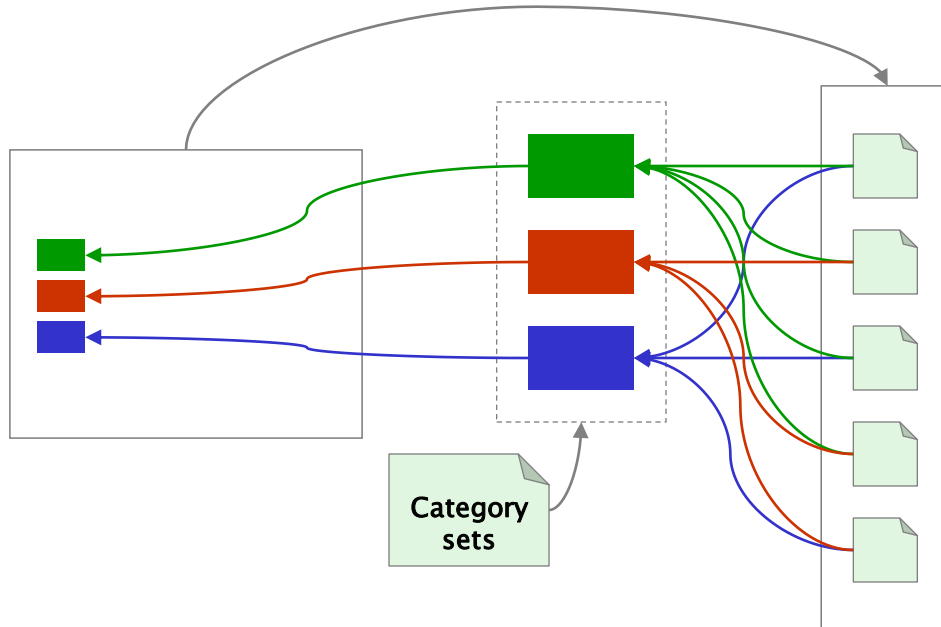
- Daniel Tunkelang: [Faceted Search](#)
- Marti Hearst: [Search User Interfaces](#) and [Flamenco](#)
- Peter Morville and Jeff Callender: [Search Patterns](#)



# Facet Refinement

- Drawn from instance data
- Not often leveraging metadata relationships (if they exist)

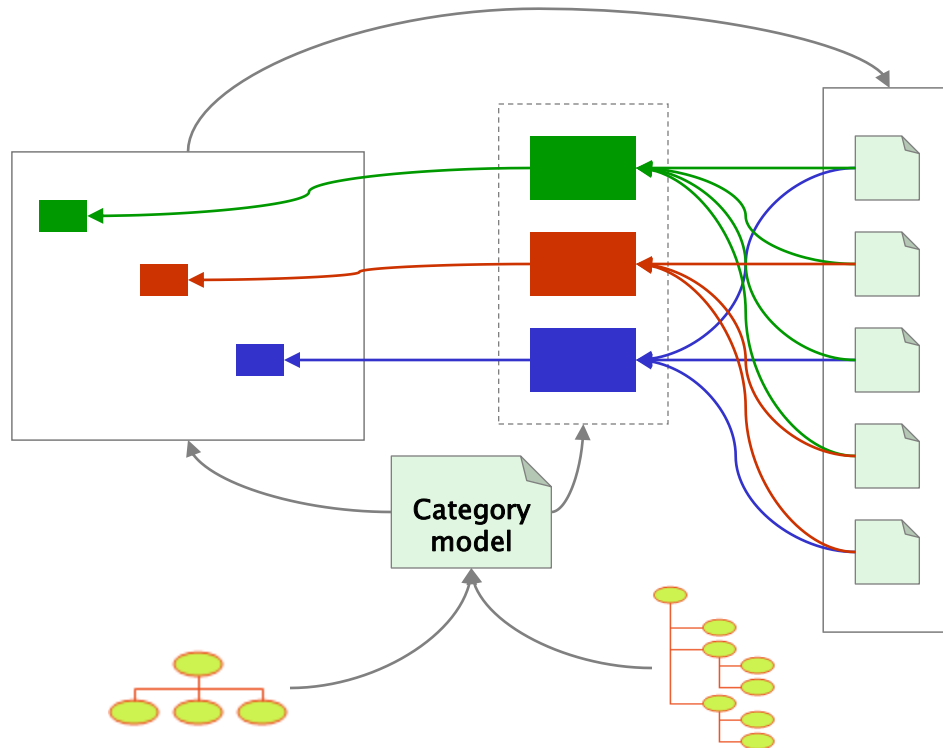
- Zappos (flat, reordering)
- Amazon (hierarchy)
- eBay (layered)
- [Smithsonian](#) (query) based on [Solr](#)
- [Exhibit](#) (lightweight) e.g. Design for Semantic Web [examples page](#)



# Facet Browsing

- Along with refinement, visualize relationships between elements (can be explicit or derived)

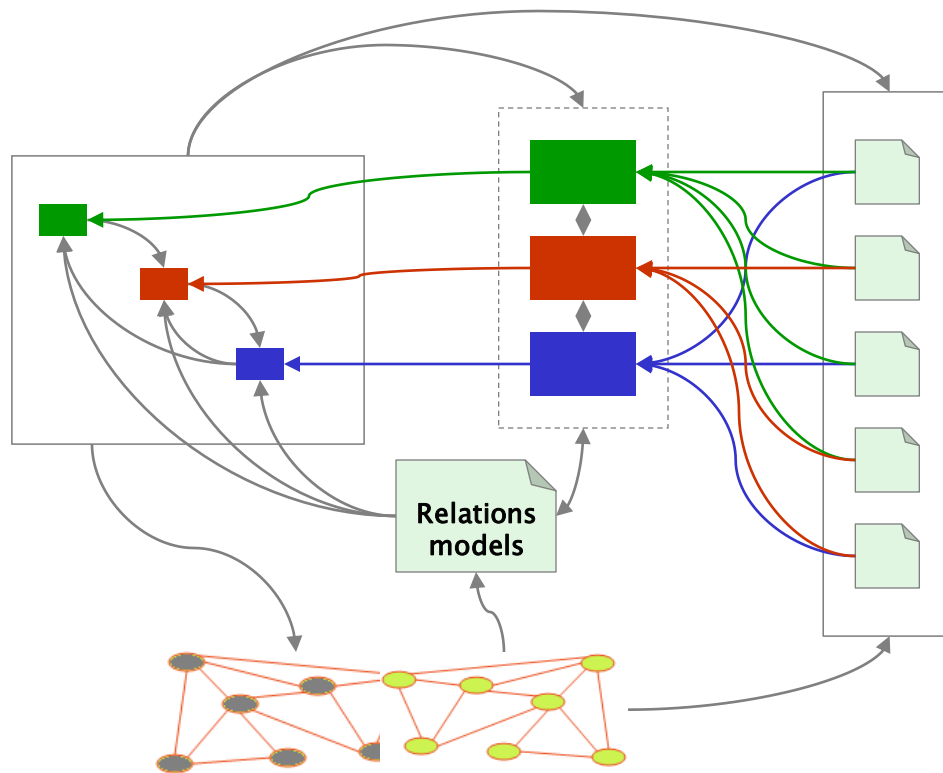
- [Flamenco](#) (flexible, simple)
- [Relation Browser](#) (linear)
- [Aqua Browser](#) (multi-modal), e.g. [Queens Library](#)



# Facet Browsing

- Flexible – add new data types and relationships any time
- Expose relationships for greater user control

- [Parallax](#) browser (path-centered)
- [mSpace](#) (relating) and [mSpace Mobile](#)



## mSpace and the user's mental model

- mSpace and mSpace Mobile

- The path through the data and the sequence of facets are determined (consciously or unconsciously) by the user's goal



*"I'm interested in a particular Bach concerto. What album can I get to hear it?"*



*"I'm looking for a gift for someone who loves Bach. What has rare compositions?"*



*"I love the harpsichord. What modern music still uses that instrument?"*



## Adaptivity and process/application control

- What if the interface could be more adaptive? Responding to:
  - Quantity of data
  - Attributes of data and user's interactions
  - Available and new predicate relationships it could leverage
  - User-provided parameters and structures
  
- **Context**





# Examples

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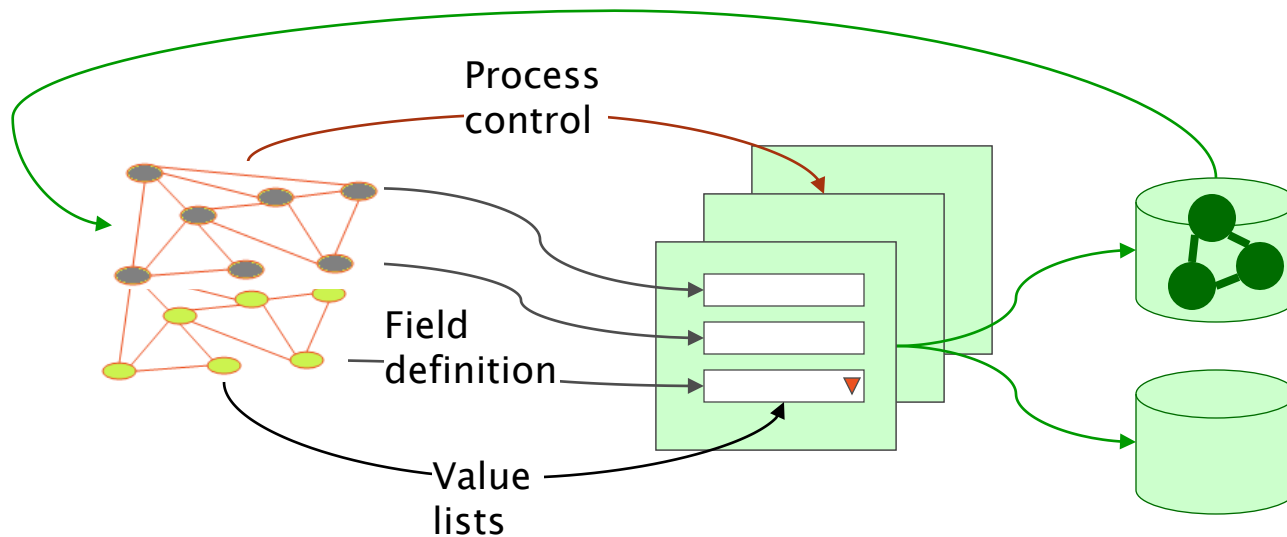
- Facet navigation
  - Refinement
    - *Flamenco*
    - *Solr*
  - Browsing
    - *Parallax*
    - *mSpace & mSpace Mobile*
  
- Extensible forms
  - Ontology-driven forms
    - *PhotoStuff*
    - *LepTree*
    - *CMS integration*
  - Ontology-driven layout
    - *SADle*



# Ontology-driven forms

- [PhotoStuff](#)
- [LepTree](#)

- Defining the fields / data users see
- Providing valid data values
- Managing flow and business rules
  - E.g. initial data entry vs. editing/updating



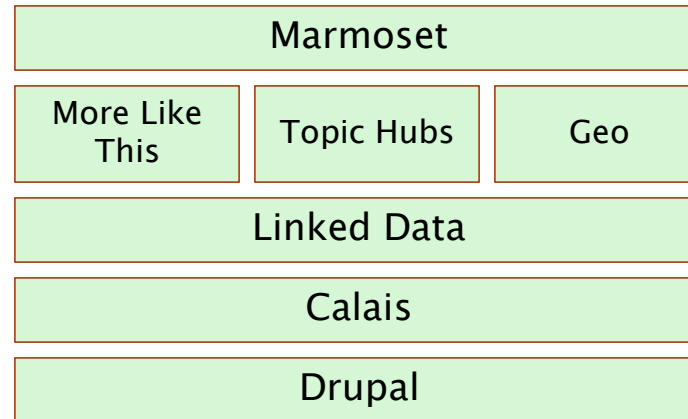
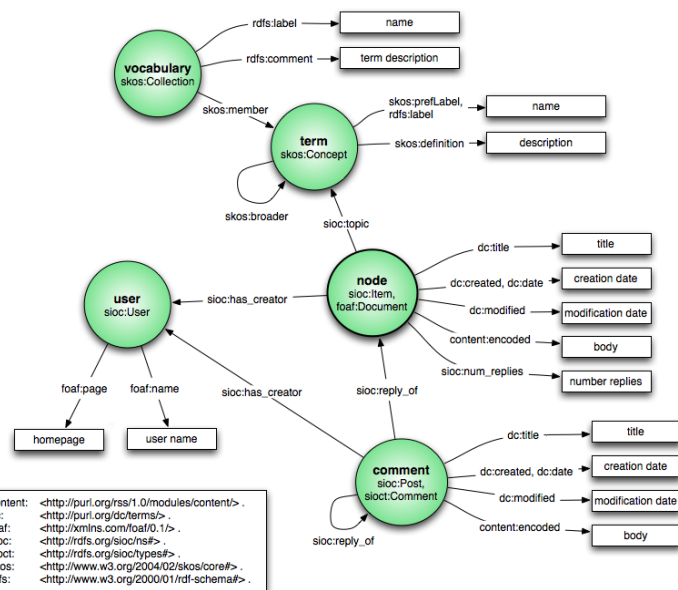
## More integrated architectures

- [OpenPublish / Phase2](#)
- [Drupal RDF](#)
- [Zemanta](#)

### ➤ Capabilities in current CMS tools

- Drupal, WordPress, Joomla, etc.
- Configuration, tagging, UI element selection, cross-referencing, etc.
- Not always “semantic”... but structured

### ➤ Architectural coherence and integration



Microformats / RDFa  
for search engines

Tools for page and  
widget generation

Importing and  
managing linked data

Entity identification  
and tagging

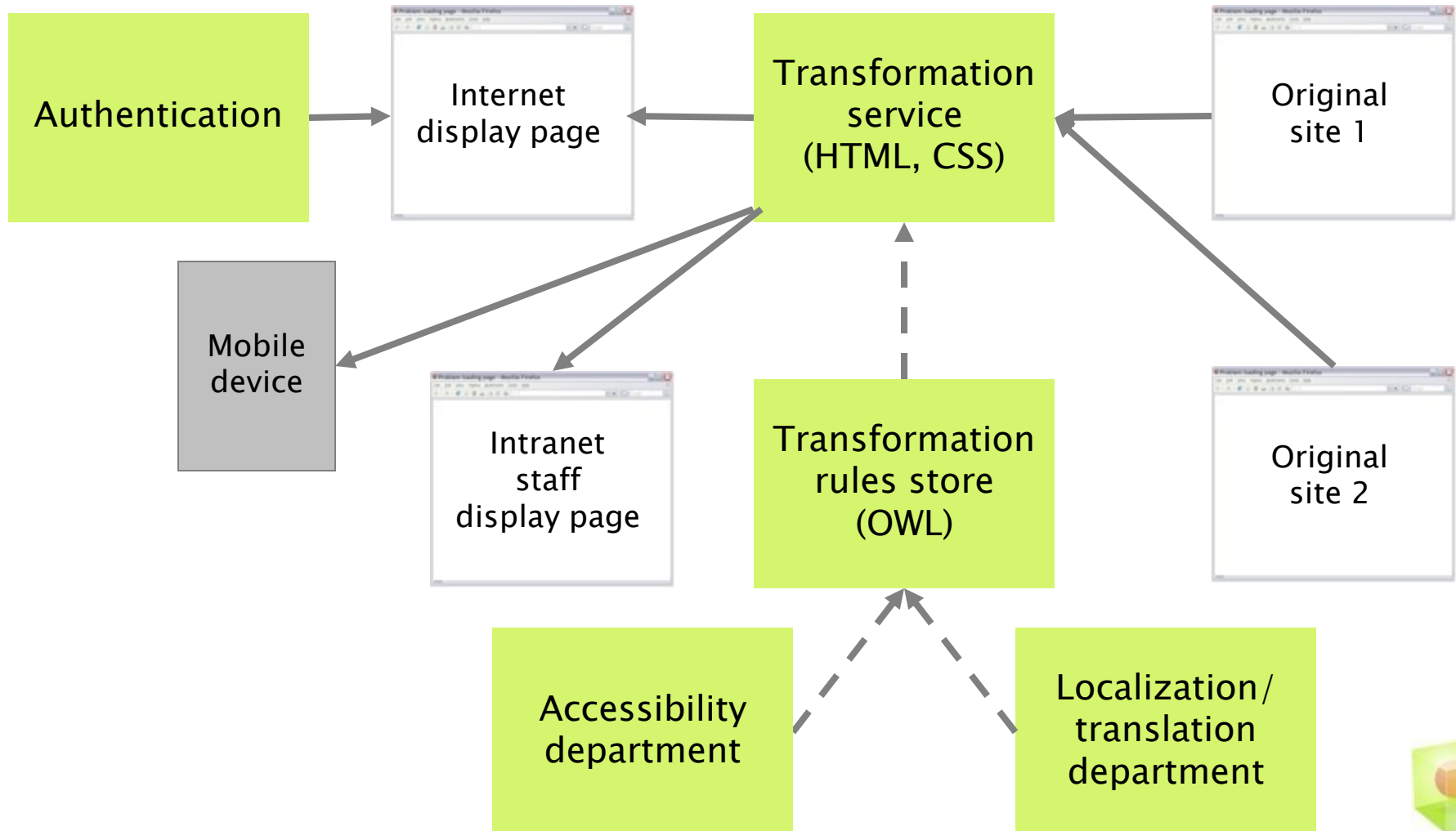
CMS / data engine



# Ontology-driven layouts

- SADIe [site](#) and [demo](#)

- Control the way application UI behaves





# Intelligibility

Animating the data

## What do we mean by “intelligibility”?

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- Making data and relationships easily understandable
- Levels of abstraction
- Bringing out useful aspects
  - Important issues
  - Exceptions that require attention
  - Unexpected insights
- Allowing the user to have some control over the representation
  - Every picture tells a story
  - Does the algorithm or the user control that story?



# Visualization

- Increasing control of visualizations
  - Timelines
  - Filters
    - *HCIL visualizations (e.g. LifeLines)*
    - *GapMinder*
    - *NY Times interactions*
- Linked Data is an engine
- Many styles of visualization interactions, e.g.
  - Flat X : Y charting
  - Scalable / zoomable views
  - Overlays
  - Parameter-filtering views
  - Swappable data parameters (pivoting/turning views)
  - Blending visual representation with textual/list presentation (e.g. side-by-side layouts, panels, pop-ups)
  - Marking key points that link to outside references
- As I watch visualization interfaces mature over time, the main trend is:  
*Expose controls for the user*

- [HCIL](#) (LifeLines, FeatureLens, etc.)
- [MS Pivot](#) (based on SeaDragon), [Gary Flake video](#)
- [IBM Many Eyes](#)
- [GapMinder.org](#) (Hans Rosling's TED talks)
- [RelFinder](#)
- [DebateGraph](#)
- [Google Insights](#)
- [Jonathan Harris](#) (artist/designer, [We Feel Fine](#))
- [ecoResearch](#)
- [Crop Circles](#)



## Exploratory interactions

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- Challenges exploring...
  - Large heterogeneous data sets
  - Large vocabulary sets / ontologies
- Analysis methodology
  - *SII interaction framework* (<http://mspace.fm/sii>)







# Structure

Capturing semantic & structured data

## How do we support structured data creation?

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- Encourage first, enforce second
  
- Make it easy to do
  - Aid data entry with relevant options
  - Interpret natural language
  - Reduce the risk of breaking the structure
  
- Use what we can from existing sources
  - Adopt conventions & metaphors/affordances
  - Adopt standard data and models from vocabularies, ontologies



# Examples

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- Lightweight data entry
  - Supportive info/selection in context
    - Social bookmarking / tagging
  - Text-based interfaces
    - Current social interfaces
    - *PLUM project* (<http://plum.csail.mit.edu/>)



## Tagging and social bookmarking

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- [Faviki](#)
- [ZigTag](#)
- [Zotero](#)
- [SnipIt](#)

- Grouping tags
- Suggestions based on structured data sets, e.g.:
  - Defined terminology database
  - Wikipedia subjects
- Extracting rich data from other sources
- Organizing tags around subjects of interest, as primary navigation



## Micro syntax and mobile

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- [microsyntax.org](http://microsyntax.org)
- [TwitPay](#)
- [TrialX](#) and [mobile](#)

- Temporal "micro-blogging"
  - First it was status, then alerting, now referencing, next...
  - People beginning to use it for more functional actions
  - Structured information, but high cognitive overhead!
- OMHE – delivering health status updates, retrieving information ([microsyntax.org](http://microsyntax.org))
- TwitPay – authorizing payments using PayPal
- TrialX – search for clinical trial information, based on location  
*Semantic Web Challenge winner 2009*

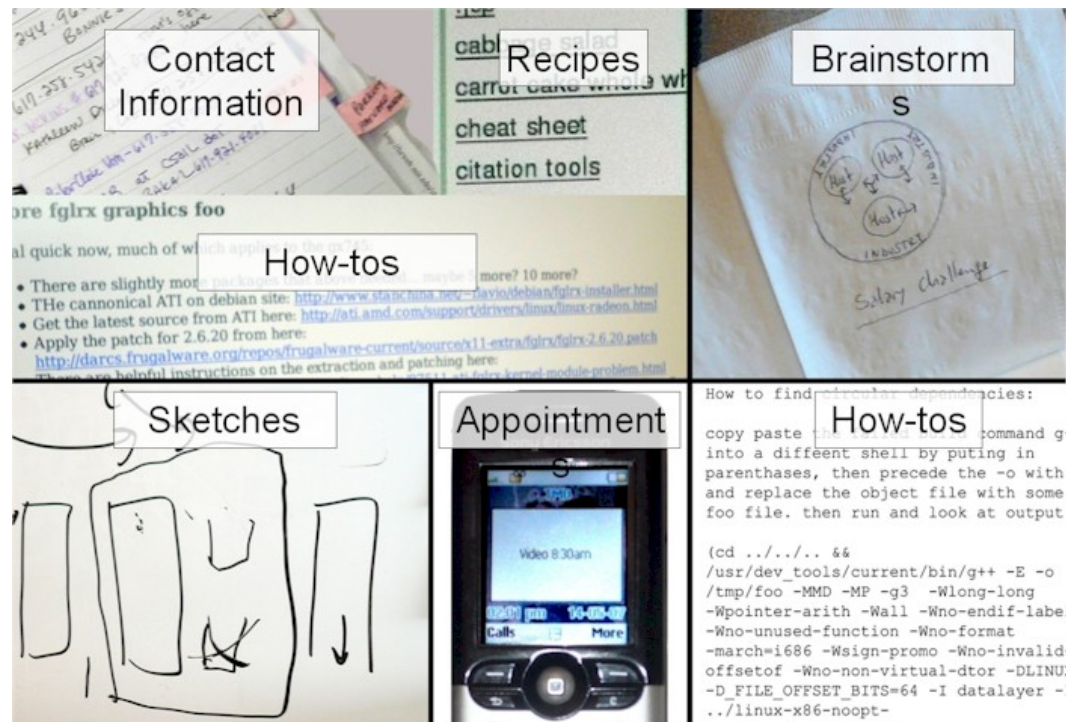


# Personal information “scraps”

## ➤ What are scraps?

- Apps: rich interaction with structured data
- Scraps: lightweight capture of unstructured data with high contextual relevance
- Easy, lightweight, and flexible for different styles
- Jourknow, Inky, and AtomsMasher: exploratory and very interesting!
- Ethnographic process: study of scientists' PostIt notes, desks, notebooks, and computer filing

- [Jourknow project](#)
- [Overview paper](#)
- [Short demo](#) video (YouTube)
- [ListIt](#) Firefox extension and ongoing research project
- [PLUM project](#)



# Personal information “scraps”

- The group is working on a range of small interfaces to facilitate easy and *useful* scrap management. Here are a few examples (but keep your eye on this group, because they refine and improve the work regularly):

- Simple data capture
- Exploring context behind a particular scrap
- Relating scraps to other things

Overview, with rich context:

The screenshot shows a personal information management interface. It features a list of scraps on the left, a detailed view of a scrap in the center, and a data entry form on the right. The list includes items like '@multimodal @lecturer:caln' with sub-points, '@todo email advisor re: NSF funding', and '@todo pick up Dan from daycare Friday'. The detailed view shows a scrap titled 'Today 8:00pm StataCenter' with associated documents and programs. The data entry form has fields for 'When', 'Location', 'With', and 'About'.

Data entry:

Syntax and note-taking:

@class:HCI @lecturer:smith  
@topic:PIM

personal information management  
most popular apps: Outlook, Lotus Notes,  
project planners  
support collaborative work  
reminders  
mobile PIM  
@todo - pick up project 2

@school @urgent  
meet **with** Prof. Karger **at** 3pm **wednesday**  
**in** his office **about** named entity res

@zagat  
:Burger-Vous a :restaurant ; :price :cheap;  
:atmosphere :poor; :rating 4 ;  
:cuisine :nouveau-american.



## Personal information "scraps"

- ListIt project is exploring the patterns people use when making simple, commonplace notes
- The goal is to identify patterns for parsers to tease out structure
- Examples:

- [Jourknow project](#)
- [Overview paper](#)
- [Short demo](#) video (YouTube)
- [ListIt](#) Firefox extension and ongoing research project
- [PLUM project](#)

sloppy pidgin	jane 3pm diesel cafe	"Sloppy parsed" to allow out-of-order matching and recursive nesting of typed templates.
tame pidgin	Meet with Jane phone 617-555-1212 tomorrow at diesel cafe about SWUI submission	Hand-written grammars for common domains, with semi-open SW-KB defined lexicon, and support for nested expressions. Not user-extensible or re-orderable.
clay pidgin	meet 3pm with jane smith about swui	User-defined N3 macro language using "means" templates written by the user. Support for nesting. No re-ordering clauses. Template: "meet <i>when</i> with <i>whom</i> about <i>what</i> " means [ a :Meeting; vcal:start "when"; xcal:attendees "whom"; xcal:description "what"].
n3+res pidgin	swui mtg a Meeting; starts at: 3pm tomorrow; with jane; location Diesel Cafe	N3 with entity and property and value resolution. Uses a colon or dash to delimit multi-word properties from their values, and semicolons to delimit clauses.





# Examples

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- Lightweight data entry
  - Supportive info/selection in context
    - Social bookmarking / tagging
  - Text-based interfaces
    - Current social interfaces
    - *PLUM project*
  
- Blending structured and unstructured
  - The challenge of wikis
    - *Semantic wikis*
    - *Ontology editing*
  - Vocabulary & ontology identification/management



# Wikis

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- [DBpedia](#)
- [OpenEI](#) energy wiki example

- Made for collaborative editing
- Unstructured and lightweight data format – strength and weakness
- Does blending structured and unstructured data require more from the user?
  - More experience
  - More attention to detail
  - More understanding of the model *and* the site goals



# Semantic Wiki: semantic extensions to MediaWiki

- Semantic MediaWiki and HALO extensions

- Builds on the success of MediaWiki (which drives Wikipedia)
- Syntax for relationships between topics as triples
- Not easy for the "average user" -- they've been working on that...
- New interfaces for three tasks:
  - Adding relationship, category and property information to terms in the wiki page
  - Browsing the ontology in the wiki
  - Querying the ontology using structured query syntax to find particular information

Facts panel in wiki page:

The screenshot shows a wiki page for Hydrogen with a 'Facts about Hydrogen' panel on the left and an 'Annotating Hydrogen' interface on the right. The facts panel lists properties like appearance, atomic number, and phase. The annotation interface includes a text area with a red error message: 'This input field must not be empty.' Below the text area are sections for 'Categories' (Chemical elements, Nonmetal), 'Properties' (Can be produced by, Was discovered by, etc.), and 'Annotations & Help'.

The screenshot shows the Semantic Wiki query interface. It features a 'Category Tree' on the left, a 'Main Query' area in the center, and a 'Query Layout Manager' at the bottom. The 'Main Query' area has a search bar with 'Physics' and 'Hydrogen' entered. The 'Query Layout Manager' allows users to format the results (table, list, etc.) and sort them by article title.

## Collaborative ontology editing

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- [Protégé](#) and [Web Protégé](#)
- [Knoodl](#)

- Some growing use of wikis, as well as new elaborations of platforms like Protégé that many of us use
- For users, what's the focus of the work effort?
  - Vocabulary expansion or relationship expansion/refinement?
  - Collaborative creation or review/reference?
  - Ongoing maintenance activities?
- What are roles of traceability, annotation, narrative, explanations?
- How are the *processes* of vocabulary creation managed and captured (e.g. negotiation, variation)?



## Vocabulary & ontologies

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- There is an increasing amount of publicly available, *structured* terminology to use
- There are also economical ways to extract structure from unstructured content
- We still need good tools, to:
  - Create our own domain/organization-specific vocabulary
  - Review and make decisions about external or extracted vocabulary
  - Integrate/merge vocabularies from different sources, to suit our particular purpose
  - Manage vocabulary and tagging over time
- Further thoughts/ideas: *Coming to Terms with Keywords*  
(paper from 2007) [http://www.designforcontext.com/publications/dd\\_keywords\\_userfocus2007.pdf](http://www.designforcontext.com/publications/dd_keywords_userfocus2007.pdf)



# Examples

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  - The challenge of wikis
    - *Semantic wikis*
    - *Ontology editing*
  - Vocabulary & ontology identification/management
  
- Other data entry models
  - Table / grid
  - Scraping



## Other data entry / acquisition models

- [Gridworks](#)
- [Needlebase](#)
- [Yahoo Pipes](#)
- [Babel](#)

- Other approaches trying to handle data entry or management of large amounts of data or data from multiple sources
- Grid – the spreadsheet is still the most-used database format
  - Direct & easy to learn/use
  - ...but not very leveraged
- Scraping – useful, but needs support to reduce development load
- Different types of approaches being explored
  - Tables, staying with spreadsheet representation, but interconnected so web/data dynamic interactions available
  - Visual query and relationship building
  - Guided query building that provides more structure and support to the process
  - Format translator services and tools





# Respect

Humility, transparency, provenance, privacy



## How does a design respect its user?

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- **Humility**
  - Know thy limitations
  - Ask
  
- **Provenance & transparency**
  - Trust as a user interaction challenge
  - Tracing data history... more possible than ever... and more important than ever
  
- **Conscious sharing**
  - Building on the strength of Web 2.0
  - Stronger relationships... between each other... between our data "selves"
  
- **Privacy**
  - Who's in charge?
  - Informed consent: How to we know what we've given permission for?
  - In future, we're not just giving permission for data... we could empower agents with responsibility for *action* on our behalf



# Examples

- [Wolfram|Alpha](#)
- [W3C WAI-ARIA](#)
- [InferenceWeb](#)
- [Tabulator](#)

## ➤ Humility

- *Wolfram/Alpha*
- *ARIA progressive interruption levels*

## ➤ Provenance

- *Wolfram/Alpha, CS AktiveSpace*
- *InferenceWeb*
- *Tabulator*

## ➤ Sharing

- Establishing permissions in preferences
- “Interviewing” users

## ➤ Privacy

- How do users understand the implications of “yes”?
- Informed consent (see Paul Shabajee paper:  
<http://swui.webscience.org/swui06/papers/Shabajee/Shabajee.pdf>)



## For Discussion: Facebook

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- Open Graph and application cross-fertilization
  - Taking on Google?
- Profile topic links
  - Taking on Wikipedia?
- Understanding application behavior
  - Ability to understand underlying algorithms from the interaction?
- Privacy
  - Users' sense of control and predictability?





# Summary

## Summary

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- Design is about:
  - Users, their tasks, and the context of use
  - Iterative design process: goals > structure > communication > appearance
- Purpose in the design of semantic web applications is:
  - Solving users' real world problems
  - Able to be responsive
  - Delivering value
- Flexibility: extending the model
- Intelligibility: animating the data
- Structure: capturing semantic & structured data
- Respect: humility, transparency, provenance , privacy



## How do we make sure the next web is...

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- Even better than the experience we have today
- So easy, anyone can describe themselves/their information semantically
- Able to clearly show what a "good" experience is (complete, understandable, transparent, semantically rich, trustable, not overwhelming), when much of the activity is happening in the background using semantic applications and agents
- Able to grow organically (and with few dependencies), while also moving toward the "web of meaning" idea
- Forgiving of differences in language and meaning, being clear and respectful of semantic "shades of gray"
- A trust-worthy and provable representation of our interests



## Call to action...!

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Usable  
Design  
Now

Duane Degler  
Design for Context  
[www.DesignForSemanticWeb.com](http://www.DesignForSemanticWeb.com)

