Projects for the HCC Foundation Course

Projects:

- selection: first come – first serve
- work in groups of 2-6 students

Overview of Projects:

Timetable

- Selection of Project and Initial Rationale: due: Tuesday, October 5
- Progress Report-1 due: Tuesday, October 26
- Progress Report-2 due: Tuesday, November 16
- Final Report due: Thursday, December 9
- Presentation of Projects during Exam Time: Saturday, December 11, 10:30 – 1:00pm

Project-1: Warehouses with Interactive Content

How to design a comprehensive environment for exploring, contributing to "programs/animations/simulations" in a warehouse as opposed to static models

Unlike the Google 3D warehouse where static models are the only inhabitants, a new generation of warehouses that contain programs, visualizations, animations, etc. will provide a more complex set of challenges for designers. Not only will users need to quickly scan and explore these new more complex models but they will also need a simple way to contribute to them.

Examples:

- **Netflix and YouTube:**
  - Netflix provides users with a large selection of dynamic video material. It invested a large amount of money to make its content personalizable, quickly searchable, and it also employs many techniques to help users quickly preview content including but not limited to: personalized rating system, statistics about each video, summaries of content, user reviews, and when available trailers. → But Netflix only has to incorporate professional content into its repository!
  - YouTube is a participatory, video sharing website.

Objectives:

Explore and try to answer:

1. Is YouTube successful in allowing people to explore, find, add to content quickly?
2. What metrics does it provide to help users preview content?
3. What are problems, strengths, weaknesses, and requirements for 'dynamic' repositories?

Starting Points in addition to the example above:: Study and explore

- the Scratch environment at: http://scratch.mit.edu/
- the 3D Warehouse at: http://sketchup.google.com/3dwarehouse/

Sponsor: Jane Meyers (jane.meyers@colorado.edu) and Holger Dick

Project-2: Identification and Analysis of Existing Meta-Design Environments

In this project you will be working to define the concept of meta-design, identify existing meta-design environments, and provide an objective analysis of their features, success, and failures. Success/failure in these cases can be measured many ways from the number of people that utilize meta-design features to the skill level required to participate.

Objectives:

Once you have selected and analyzed environments try to answer the following questions:

1. In what ways do these environments support meta-design?
2. Are they more successful or less successful than the other environments you analyzed, why?
3. Finally, taking all of the above into account, what design guidelines or principals would you employ when building your own meta-design environment?

Starting Points:

Start by researching existing literature. What are the core properties of a meta-design environment? What differentiates meta-design environments from design environments?

Possible examples: Yahoo Pipes, Microsoft Macros

Table 1: Related Work—Selected Web 2.0 Environments with Unique Features

Site	Objectives	Interesting Unique Aspects
iTunes U	distribute digital lessons by faculty members from "certified institutions"	*control via input filters*; material can not be remixed and altered by consumers; support for mobile learning
YouTube	video sharing website	*weak input filters*; extensive support for rating
Encyclopedia of Life (EoL)	document the 1.8 million living species known to science	development of an *extensive curator network*; partnership between the scientific community and the general public
Google-Maps	maps and task-related directions	evolution of commercially developed mapping information with *users' additions*
Google-SketchUp and 3D Warehouse	model the whole world in 3D	*very large repository* of 3D models created by volunteers; the 3D Warehouse is organized in collections by curators
Scratch	programming environment and support for sharing creations	socio-technical environment to build *communities in education* for creativity; the Scratch Warehouse hosts 1.2 Mio projects
PatientsLikeMe	enables patients who suffer from life-changing diseases to converse	site based of contributions from patients complementing sites created by health experts and organizations
Crisis Informatics	explores the synthesis between broadcast news and information provided by involved people	technology-mediated support for public participation & assistance in mass emergencies & disasters
Stepgreen	collaborative constructed library of energy saving actions	shared repository of tips and recommendations by citizen contributors for saving money and being environmentally responsible

Sponsors: Jane Meyers (jane.meyers@colorado.edu) and Gerhard Fischer

Project-3: *Representing and Visualizing Energy Use*

Background

An issue with changing behaviors surrounding energy use is the sense that most aspects of our energy sources and consumption are invisible, except for the bills we receive at the end of the month.

Efforts such as smart-meters, ubiquitous point-of-use sensors [kill-a-watt, tweet-a-watt, patel], and intelligent appliances [GE] are beginning to make more information available, but abstract units like kwh do not mean much to most people and the monetary equivalents are miniscule. How can we make sure that the provided information is meaningful to people?

Starting Points

Sites such as Google Powermeter, Microsoft Hohm, and Gridpoint tend to utilize more "scientific" style of presentation using graphs, charts, and tables, whereas other approaches [Holmes, Abeles, Ford-hybrid-leaves] have worked to utilize more artistic and emotion-based approaches to get encourage understanding. Still others utilize "fun" [piano-stairs] as encouragement for behavior change.

The field of information visualization is an active field within computer science (e.g. [Shneiderman]) aiming to create an understanding how to represent information in an easy digestible fashion.

But what representations really make a difference in terms of energy savings? Initial studies [Dick] using Amazon Mechanical Turk indicate that representing energy use as measures of coal had a greater impact than monetary units or a very basic 'eco visualization' (tree offsets).

How should we develop new representations and validate their impact? What is the role of exploration and simulation in this area?

Objectives

- Develop new ideas for new visualizations/representations. Support this idea with a theory or model of how why your representation **should** be effective. You can make use of technologies such as tweet-a-watt, web 2.0 environments, mobile devices (android/iPad).
- Implement a demo/prototype of your new representation
- Develop ways to test your representation; you could use:
    - AMTurk,
    - User Studies, or
    - Other methods
- Perform initial assessments and present results
- (potential further work: independent study, create more robust implementation and evaluate in after-school activities)

Resources

- Holmes, T. (2007) "Eco-Visualization: Combining Art and Technology to Reduce Energy Consumption" In Proceedings of Creativity & Cognition, ACM, Washington, DC, June, pp. 153-162.
- [Abeles] http://www.artscenecal.com/articles/553-kim-abeles
- [Patel] http://www.technologyreview.com/tr35/profile.aspx?cand=t&trid=814
- [Ford-hybrid-leaves] http://jalopnik.com/5070371/ford-smartgauge-lcd-instrument-panel-brings-futuristic-look-green-leaves-to-2010-hybrids
- [GE] http://www.fastcompany.com/blog/ariel-schwartz/sustainability/ge-shows-smart-grid-enabled-appliances
- [piano-stairs] http://www.thefuntheory.com/piano-staircase
- [Shneiderman] http://encore.colorado.edu/iii/encore/record/C%7CRb3537602%7CSshneiderman%7CP0,4%7COrightresult%7CX4?lang=eng&suite=pearl],

Sponsors: Holger Dick and Hal Eden

Project-4: Wikipedia versus KNOL: Different Approaches to Create Interesting Encyclopdias

Site	Objectives	Interesting Unique Aspects
Wikipedia	web-based collaborative multilingual encyclopedia	single, collaborative, and verifiable article on every topic; *consensus emerges*
KNOL	a library of articles by recognized experts in specific domains	authors take credit for their writing, provide credentials, and elicit peer reviews and comments ; readers can provide feedback and comments; *authority rests primarily with the author*

Objectives:

- Study these different environments and determine their strengths and weaknesses (a starting point is the table show below).
- Consider the different viewpoints – for example for contributors, for readers, as a process, as a product.
- reflect and assess from criteria such as:
    - trust
    - being up to date
    - coverage
    - amount of irrelevant information
- Try to
    - Modify / Extend — or even better: create a new one — article in Wikipedia and follow what happens to it
    - Find articles about the same subject in KNOL and Wikipedia and analyze how they evolved over time (in KNOL not so much within one article but from article to article)

Starting Points:

1) some aspects for comparison

Wikipedia	KNOL
collaborative work (consisting of several pages, all created collaboratively)	a collection of individual works
All participants edit for themselves	*can* have multiple authors, but it is originally created by an individual
homogenization effect of Wikipedia (variant opinions tend to get flattened together into a single consensus)	very strong point-of-view; show the space of possible interpretations on a given topic
Trust: Nobody checks the authorship list of articles nor do people really check on the edit history	Trust: written by known authors; trust-basis for credibility assessments.
one article per topic	multiple perspective on a topic (e.g. evolution: evolutionary biologists, radical Christian evangelicals, old-school Darwinists

2) comparing Wikipedia and KNOL to Encyclopedia Britannica and Encarta

Site	Objectives	Interesting Unique Aspects
Encyclopedia Britannica	regarded as the most scholarly of encyclopaedias; written by about 100 full-time editors and more than 4,000 expert contributors	The online Britannica won the 2005 Codie award for "Best Online Consumer Information Service"; The Britannica has received criticism, especially as editions become outdated
Encarta	to encourage learning and to respect the role of parents in their children's education	Discontinued in March 2009 by Microsoft

Sponsors: Holger Dick and Gerhard Fischer

Project-5: Using a Location-Based Service to Influence Personal Energy Usage

Topics: Front-end Development, Back-end Development, API Integration

Abstract: As portable devices become more powerful and ubiquitous, businesses will need to leverage these devices in order to stand out from their competitors. Any service that utilizes the location of a person's device is referred to as a Location-Based Service, or LBS. One such LBS is Foursquare, a location-based social networking application that allows its users to "check-in" to the locations they visit. While Foursquare is mainly used for social networking purposes, can it be used for other purposes, such as to help people become more aware of their energy usage when traveling?

A basic framework has been completed for Footprint, an application that utilizes the existing travel data captured by Foursquare in an effort to help Foursquare users understand how their travels affect their carbon footprint. By utilizing existing data, Footprint minimizes user effort required to create and interact with travel information, thus increasing the likelihood of user participation within Footprint.

The goal of this project is to extend Footprint by exploring human-centered computing concepts such as user interface design and system usability. There are a wide range of possible areas of work, such as concepting/prototyping, front-end programming, and back-end programming.

Current State: Here is a screenshot of Footprint in its current state:

Footprint

How you get to where you go affects the environment

Total Miles: **78.91**
Self-powered Miles: **35.29**
Mass Transit Miles: **0**
Driving Miles: **43.62**

In the past 14 days, you've racked up **35.29** miles on foot, which is **##** more than your previous 14 day total. Nice work!

Number of new stops: 10

Destination	Check In Date	Start Point	Mileage	Mode of Transportation	Last Stop?	Ignore Check In?	
Walnut Street Mini Park	Sep 26, 2010	select start point...	0	select transportation...	☐	☐	update
Flatirons Crossfit	Sep 26, 2010	select start point...	0	select transportation...	☐	☐	update
UPS/FedEx/USPS Dropoff	Sep 26, 2010	select start point...	0	select transportation...	☐	☐	update
24 Hour Fitness	Sep 25, 2010	select start point...	0	select transportation...	☐	☐	update
Walnut Street Mini Park	Sep 25, 2010	select start point...	0	select transportation...	☐	☐	update
Sunflower Market Boulder	Sep 25, 2010	select start point...	0	select transportation...	☐	☐	update
McGuckin Hardware	Sep 25, 2010	select start point...	0	select transportation...	☐	☐	update
Brewing Market - McGuckins	Sep 25, 2010	select start point...	0	select transportation...	☐	☐	update

The components of Footprint are:

Header:

Footprint

How you get to where you go affects the environment

Total Miles: **78.91**
Self-powered Miles: **35.29**
Mass Transit Miles: **0**
Driving Miles: **43.62**

In the past 14 days, you've racked up **35.29** miles on foot, which is **##** more than your previous 14 day total. Nice work!

Number of new stops: 10

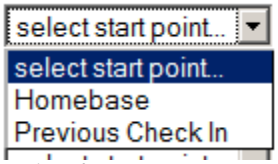
The header shows the total mileage a person has associated with their Foursquare check-ins. This total is then broken down into self-powered miles (e.g., walking, biking), mass transit miles (e.g., bus, subway), and driving miles. Adjacent to the mileage totals is an area that will be used to show accomplishments that a person has achieved based on the changes they've made to their travel habits. In the example above, the user is being congratulated for biking over 35 miles within the previous 2 weeks.

Destination Table:

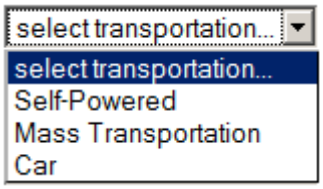
Destination	Check In Date	Start Point	Mileage	Mode of Transportation	Last Stop?	Ignore Check In?	
Walnut Street Mini Park	Sep 26, 2010	select start point...	0	select transportation...	☐	☐	update
Flatirons Crossfit	Sep 26, 2010	select start point...	0	select transportation...	☐	☐	update
UPS/FedEx/USPS Dropoff	Sep 26, 2010	select start point...	0	select transportation...	☐	☐	update

The destination table is a list of each check-in a person has made via Foursquare. The table columns are:

- Destination: The name of the destination, as found in Foursquare. The link takes the user to the Foursquare page for that venue.
- Check-In Date: The date of the check-in
- Start Point: The start point represents where the user was before arriving at the current destination. A person's 'homebase' will be specified before the user can interact with the Destination Table



- Mode of Transportation: Currently the user can choose one of the three options shown below.



- Last Stop: If the destination is the last stop, the system assumes that the user returned to their homebase immediately afterward (and calculates the additional mileage accordingly).
- Ignore Check-In: If the user doesn't want the data associated with the current check-in to affect their Footprint totals, they can select this checkbox.
- Update: Clicking the Update button updates the database with changes made to the current destination's travel data. This update is performed asynchronously without reloading the web page.

System Architecture:

- Front-end: HTML/CSS + jQuery
- Back-end: PHP + MySQL

Objectives: Since only the basic framework of Footprint has been built, there are a number of areas that can be improved upon, including:

- **User Account Management**: Before it can be consumed by the general public, Footprint will need a complete user management workflow (creating an account, password change, log in/log out, et cetera)

- **Google Maps API Integration**: Footprint current calculates mileage traveled by using the straight-line distance between two points. A more accurate way to perform this calculation would be to utilize the Google Maps API instead. Taking this a step further, an interface could be built that allows the user (if they choose) to map their travel path using the Google Maps interface.
- **UI Refinement**: The current Footprint interface is essentially a "working wireframe", i.e., black and white with moving parts. There is opportunity to modify the UI significantly, both in appearance as well as functionality.

The size of the group working on this project will determine the scope of deliverables. If this project appeals to you but there is another area not listed here that you would like to work on, please contact me and we can discuss your ideas.

Additional Reading:

- http://en.wikipedia.org/wiki/Location-based_service
- http://foursquare.com
- http://groups.google.com/group/foursquare-api/web/api-documentation
- http://www.joesiewert.com/2010/04/how-to-use-the-foursquare-api-with-oauth-and-php/
- http://gowalla.com/ (One of Foursquare's competitors)

Sponsor: Jason Zietz (jizietz@vt.edu)

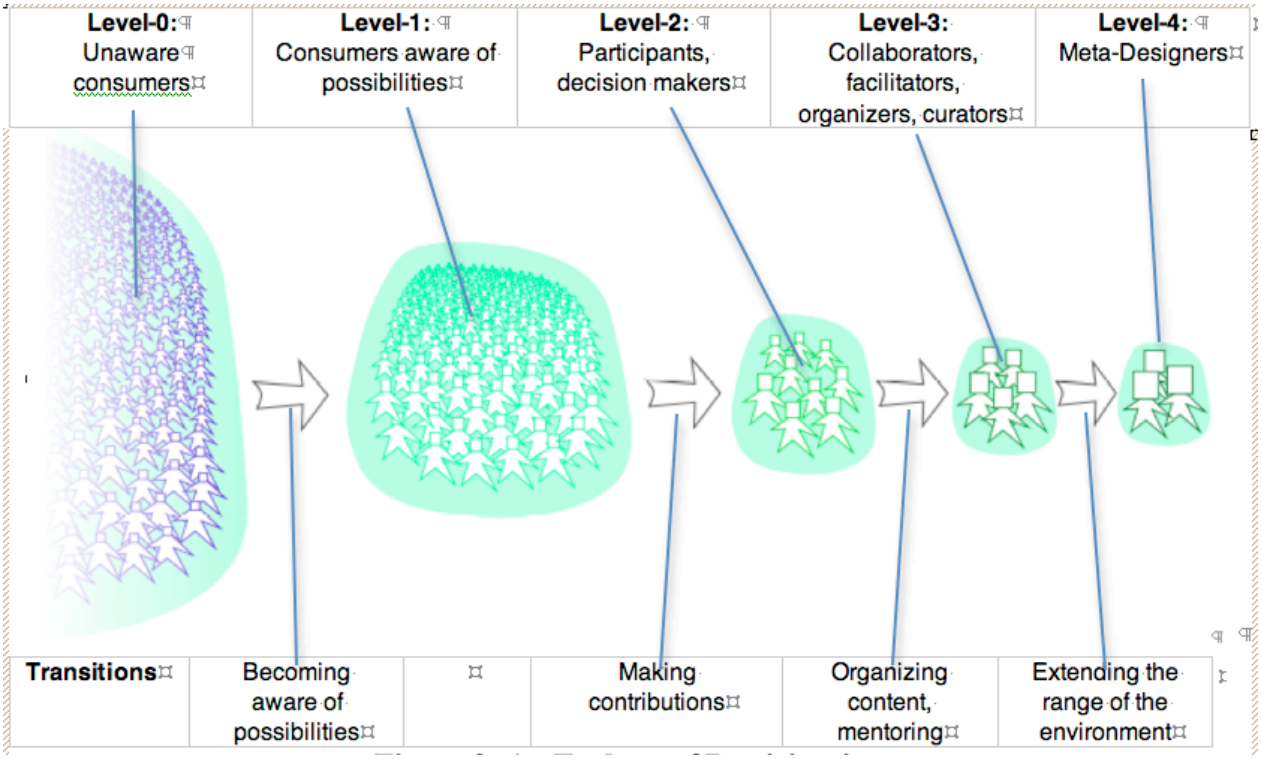
Project-6: Richer Ecologies of Participants

The traditional notions of developer and user are unable to reflect the fact that many software systems nowadays are developed with the participation of many people of different interests and capabilities. The sharp distinction between users and developers gets blurred. Many researchers have used different concepts such as end-user developer, power user, local developer, prosumer, professional amateur (pro-am), commentators, raters, people engaged in tagging, …. to describe new roles.

Objectives:

- develop a conceptual framework for characterizing these different roles of people involved in using and developing software systems
- study migration paths between different roles
- analyze the funnel effect in existing environments
- design methods to reduce the funnel effect
- compare the engagement in different environments — e.g. assess the following claim: *commenting/tagging books in Amazon is much more elaborate than in YouTube.*

Starting Point: An Diagram Illustrating Richer Ecologies of Participants



relevant literature:

1. Preece, J., & Shneiderman, B. (2009) "The Reader-to-Leader Framework: Motivating Technology-Mediated Social Participation," AIS Transactions on Human-Computer Interaction, 1(1), pp. 13-32.
2. Fischer, G., A. Piccinno, and Y. Ye (2008): "The Ecology of Participants in Co-Evolving Socio-Technical Environments", In Proceedings of 2nd Conference on Human-Centered Software

Engineering (HCSE 2008) http://l3d.cs.colorado.edu/~gerhard/papers/HCSE-2009.pdf
3. Ye, Y. and Fischer, G. (2007): "Designing for Participation in Socio-Technical Software Systems", In Stephanidis, C. (Ed.) Proceedings of 4th International Conference on Universal Access in Human-Computer Interaction, Part I. Heidelberg, Springer, pp. 312-321. http://l3d.cs.colorado.edu/~gerhard/papers/hcii-2007.pdf

Sponsor: Hal Eden and Gerhard Fischer

Project-7: A Framework for "What Motivates People to Participate?"

Human beings are, and always have been, diversely motivated beings. We act instrumentally, but also noninstrumentally. We act for material gain, but also for psychological well-being and gratification, and for social connectedness. → e.g.: *"Is there an Ikea Effect that we Overvalue what we make?"* (see the book by Ariely)

In environments characterized by user-generated content, there exist three layers:

- the availability of hard- and software and access to the environment
- the knowledge of how to participate and contribute (e.g.: learning SketchUp, learning the Wiki substrate for Wikipedia)
- the interest, willingness, motivation to contribute

Explore all dimensions which are relevant to understand the last layer, including:

- different reward structures (including recognition by the community and featuring your work)
- social capital, gift cultures, altruism
- reputation economy
- in relationship to the Figure in Project 6:
  - How do we encourage individuals to make the initial contribution?
  - How do we encourage first-time contributors to contribute again?
  - what motivates people to migrate from the left to the right (to the more demanding roles)?
  - in general there is a big funnel effect migrating from left to right? is this a necessity, a desirable effect? if not: how can it be reduced?

- **claims:**
  - "crowd-contributing works because the tasks are broken down to small enough pieces so that the cost is low enough for individuals to move from consumers to contributors"
  - peer production in culture of participation begins to offer a rich texture in which to study the much more varied and multifarious nature of human motivation and effective human action.

relevant literature:

1. Malone, T.W. & Lepper, M.R. Making learning fun: A taxonomy of intrinsic motivations for learning. In R.E. Snow and M.J. Farr (Eds.), Aptitude, Learning and Instruction III: Conative and Affective Process Analyses. Hillsdale, N.J.: Erlbaum, 1987.
2. Hidi, S., & Renninger, K. A. (2006) "The Four-Phase Model of Interest Development," Educational Psychologist, 41(2),
3. Benkler, Y., & Nissenbaum, H. (2006) "Commons-Based Peer Production and Virtue," Political Philosophy, 14(4), pp. 394-419.
4. Ariely, D. (2010) The Upside of Irrationality — the Unexpected Benefits of Defying Logic at Work and at Home, HarperCollins, New York, N.Y.

worthwhile movies to watch

- the Piano Stairs http://www.youtube.com/watch?v=2lXh2n0aPyw&feature=player_embedded#
- Bootle Recycling: http://www.autoblog.com/2009/10/19/fun-theory-part-3-vws-bottle-bank-arcade-finds-plenty-video/
- Why create 3D models for Google Earth? http://www.youtube.com/watch?v=RSynol0bQzE

Sponsor: Gerhard Fischer

Project-8: Model-Authoritative versus Model-Democratic — different models for knowledge creation, accumulation, and sharing

Objectives:

1. Study two models of knowledge creation and sharing in online media: Model-Authoritative and Model-Democratic
2. Define Model-Authoritative and Model-Democratic in your own words, based and supported by your own analysis of examples for each model
3. Analyze the content as well as the user activity for representative examples; where do the websites differ, where are they similar
4. Explore the changing roles of curators in Model-Democratic Environments vs. in Model-Authoritative Environments
5. Describe and evaluate existing output filters
    1. **Think off, describe, and implement prototypes of new output filters**

A Description of the Two Models:

MODEL-AUTHORITATIVE

characterized by a small number of experts acting as contributors and a large number of passive consumers. In such cultures, strong input filters exist and creates barriers based on the following:

- large organizations and high investments for production are required (e.g., film studios such as those in Hollywood, newspaper production facilities);
- substantial knowledge is necessary for contributions (e.g., the need to learn highly specialized high-functionality tools); and
- extensive quality control mechanisms exist (e.g., strict review criteria leading to low acceptance rates for conference papers and journal articles).
- quality and trustworthiness of the accumulated information is high because the strong input filters will reject unreliable and untrustworthy information
- Based on the smaller size of the resulting information repositories, relatively weak output filters are required.

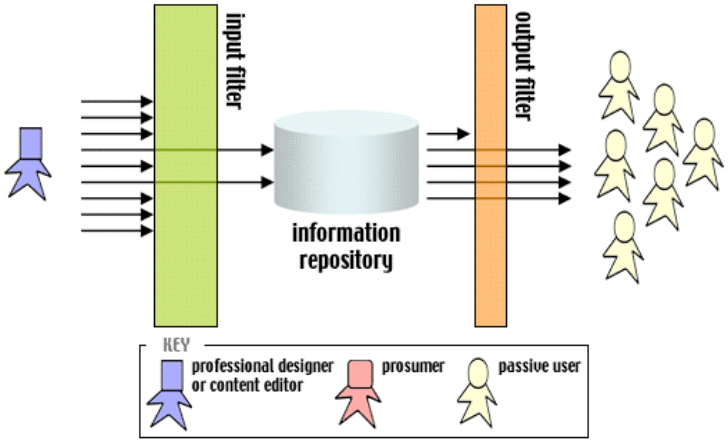


Figure 1: MODEL-AUTHORITATIVE

MODEL-DEMOCRATIC

characterized by weak input filters allowing users not only to access information but some passive users become prosumers.

- The weak input filters of MODEL-DEMOCRATIC result in much larger information

repositories, with the World Wide Web being the prime example.

- major limitation: the potential reduction in trust and reliability of the content of the information repositories based on the weak input filters.
- large information repositories are a mixed blessing because human attention and awareness are limiting factors in attending to information→ exploit existing and develop new output filters (e.g., powerful search mechanisms to find relevant information, collaborative filtering, recommender and tagging systems, and user and task models to personalize information

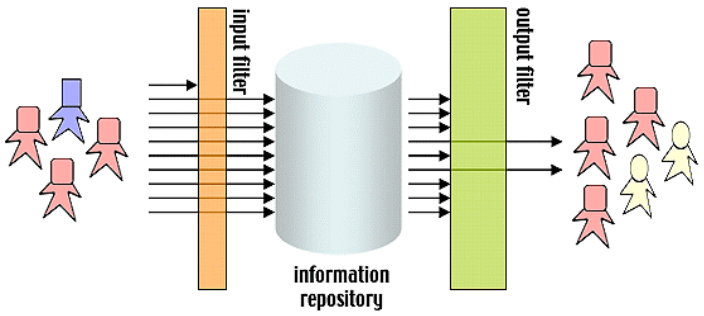


Figure 2: MODEL-DEMOCRATIC

Starting Points

An example of Model-A and Model-D in the energy domain:

1. VIBE (a portal) http://vibe.nrel.gov/
2. OpenEI (a wiki): http://en.openei.org/wiki/Main_Page

Another example might be online news portal

3. Model-D: User Contributed News Portals (e.g., Digg, reddit)
4. Model-A: Centralized News Portals (e.g. yahoo.com, aol.com)
5. Model-X: Automated News Portals (e.g. news.google.com)

relevant literature:

- Fischer, G. (2009) "Democratizing Design: New Challenges and Opportunities for Computer-Supported Collaborative Learning." In Proceedings (Vol 1) of CSCL 2009: 8th International Conference on Computer Supported Collaborative Learning, University of the Aegean, Rhodes, Greece, pp. 282-286.
- chapter on "Filter and Publish" versus "Publish and Filter" in Shirky, C. (2008) Here Comes Everybody: The Power of Organizing without Organization, Penguin Books,, New York, NY.
- chapter on "RO (Read Only)" and "RX (Read and Write)" environments in Lessig, L. (2008) Remix: Making Art and Commerce Thrive in the Hybrid Economy, Penguin Press, New York.

Sponsor: Holger Dick