Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

Meta-Design: Expanding Boundaries and Redistributing Control in Design

Gerhard Fischer and Hal Eden
Fall Semester 2008, October 1

Basic Message

- **meta-design = design for designers:** participants can express themselves and engage in personally meaningful activities

- **basic assumption:**
  - future uses and problems cannot be completely anticipated at design time, when a system is developed
  - users, at use time, will discover mismatches between their needs and the support that an existing system can provide for them

- **meta-design**
  - **extends boundaries** by supporting users as active contributors,
  - **distributes control** among all stakeholders in the design process
Meta-Design — How We Think About It

- “if you give a fish to a human, you will feed him for a day — if you give someone a fishing rod, you will feed him for life” (Chinese Proverb)

- **meta-design** extends this to:

  “if we can provide the knowledge, the know-how, and the tools for making fishing rods, we can feed the whole community”
Background: Research Grants on Meta-Design

- **A Meta-Design Framework for Participative Software Systems** (2006-2009),
  - “Science of Design” Program, NSF-CISE
  - objective: define the scientific foundation for designing participative software systems as socio-technical environments that empower users, as owners of problems, to engage actively and collaboratively in the continual development of software systems
  - more information: [http://l3d.cs.colorado.edu/~SoD/](http://l3d.cs.colorado.edu/~SoD/)

- **A New Generation Wiki for Supporting a Research Community in Creativity and IT** (2007-2008)
  - “Creativity and IT” Program, NSF-CISE
  - objective: create new paradigms and representations for socio-technical environments that are open and extensible
  - more information: [http://swiki.cs.colorado.edu:3232/CreativeIT](http://swiki.cs.colorado.edu:3232/CreativeIT)
The CreativeIT Wiki

CreativeIT Community Wiki

Research Resources

Discussion Forum

Workshops

Conferences

Grad-Student Community

Success Factors Workshop

MakaBlog

NSF CreativeIT Program

Exhibitions

About This Wiki

Community Participants

Gallery
Design: Beyond Binary Choices

- Turing Tar Pit: “Beware of the Turing Tar Pit, in which everything is possible, but nothing of interest is easy.”
  - Turing Machines emphasize objective computability → the challenge: subjective computability

- The Inverse of the Turing Tar Pit: “Beware of the over-specialized systems, where operations are easy, but little of interest is possible.”
  - domain-specific artifacts and tools provide extensive support for certain problem contexts → but the ability to extend these environments is limited
Meta-Design: Exploring Middle Ground

Turing Tar Pit:
Saw + Wood

Inverse of the Turing Tar Pit:
Plastic Car

Construction
Kits

Saw + Wood

Plastic Car

Construction
Kits
Design Time and Use Time

- **key**
  - system developer
  - user (representative)
  - end user

- **design time**

- **use time**

- **world-as-imagined**
- prediction
- planning

- **world-as-experienced**
- reality
- situated action

Gerhard Fischer
Meta-Design: Design for Designers

- new media that allow users to act as designers and be creative

- the creation of context rather than content → underdesign

- does not define a product, but the conditions for a process of interaction

- supports problem solving processes that remain liquid and open (“final” is used only in a tentative sense)
Why Meta-Design

- design for diversity (for “a universe of one” → CLever Project)

- complements planning with situated action

- design as a process is tightly coupled to use and continues during the use of the system

- prerequisite for social creativity and innovation

- transcends a “consumer mindset”
Putting Owners of Problems in Charge

—

Ill-defined problems cannot be delegated to professional software developers

- **interview with a geoscientist** (University of Colorado):
  - “I spend in average an hour every day developing software for myself to analyze the data I collected because there is not any available software.
  - Even if there is a software developer sitting next to me, it would not be of much help because my needs vary as my research progresses and I cannot clearly explain what I want to do at any moment.
  - So I spent three months to gain enough programming knowledge to get by.
  - Software development has now become an essential task of my research, but I do not consider myself a software developer and I don’t know many other things about software development.”
Meta-Design: Complementing Other Design Methodologies


- professionally-dominated design
  - works best for people with the same interests and background knowledge

- user-centered design:
  - analyze the needs of the users
  - understand the conceptual worlds of the users

- learner-centered design
  - draws attention to the changing needs of users
  - combine HCI interaction principles with educational interaction support

- participatory design
  - involve users more deeply in the process as co-designers
  - focus on system development at design time

- meta-design:
  - create design opportunities at use time
  - requires co-creation
What Do Meta-Designers Do?

- they use their own creativity to create socio-technical environments in which other people can be creative

- they **underdesign**
  - by creating **contexts** and **content creation** tools rather than content
  - by creating **technical** and **social** conditions for broad participation in design activities
  - by supporting ‘**hackability**’ and ‘**remixability**’

**examples for meta-design:** Web 2.0 Technologies
  - Wikis
  - **Google-SketchUp + 3D Warehouse + Google Earth**
  - **Second Life**
  - Open Source
# Traditional Design versus Meta-Design

<table>
<thead>
<tr>
<th>Traditional Design</th>
<th>Meta-design</th>
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</thead>
<tbody>
<tr>
<td>guidelines and rules</td>
<td>exceptions and negotiations</td>
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<tr>
<td>content</td>
<td>context</td>
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<tr>
<td>object</td>
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<td>perspective</td>
<td>immersion</td>
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<td>certainty</td>
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<td>resolution</td>
<td>emergence</td>
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<td>top-down</td>
<td>bottom-up</td>
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<td>autonomous mind</td>
<td>distributed mind</td>
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<tr>
<td>creation</td>
<td>co-creation</td>
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<tr>
<td>specific solutions</td>
<td>solutions spaces</td>
</tr>
<tr>
<td>art</td>
<td>interactive art</td>
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</tbody>
</table>
Meta-Design Concepts (in Microsoft Word)

Users as Co-Developers

- **tailor** and **customize** the system by setting different parameters as their personal preferences

- **extend** and **evolve** existing information structures (e.g., menus, spelling dictionaries, auto-correct tables, …)

- write **macros** to create new operations (an example of “programming by example” or “programming by demonstration”)

- create **programs in VisualBasic** to extend the functionality of the system

- **share** the user-defined extensions
Is End-User Modifiability the Answer to HFAs? The message of this section about HFA is that they contain too much unused functionality—at least in the abstract. But on the other hand, there is often not enough functionality for specific problems. As argued at other places in this book, closed systems are inadequate to capture the unanticipated needs of users in the real world. No matter how much designers at design time try to anticipate the needs of users at use time (see Figure<design/usetime>), the effort will fall.
The Seeding, Evolutionary Growth, Reseeding (SER) Model Supporting Meta-Design

- at design time:
  - development of an initial system that can change over time (seed)
  - underdesign: creating design options for users

- at use time:
  - support for “unself-conscious culture of design”: users will experience breakdowns by recognizing “bad fit” at use time
  - end-user modifications allow users to address limitations they experience
  - evolutionary growth through incremental modifications

- reseeding:
  - significant reconceptualization of the system
  - account for incremental modifications, mitigate conflicts between changes, and establish an enhanced system
The Seeding, Evolutionary Growth, Reseeding (SER) Model

Gerhard Fischer
DSS Course, Fall 2008
Examples of Socio-Technical Environments Exploring and Supporting Meta-Design

- **Envisionment and Discovery Collaboratory** — see course meeting on October 15


Meta-Design Aspects in the EDC: Closed versus Open Systems

- **example for a closed system: SimCity** — too much crime
  - solution supported: build more police stations (**fight crime**)  
  - solution not supported: increase social services, improve education (**prevent crime**)  

- **important goal of EDC**: create end-user modifiable versions of SimCity, because:  
  - background knowledge can never be completely articulated  
  - the world changes
CLever: Cognitive Levers Project - “Helping People Help Themselves”
Web2Gether

National Arena
- Freedom Initiative
- ADA

Institutional Arena
- NCLB
- IDEA
- HIPAA

Work Arena
- Agreement
- IEP
- SAP

Design Arena
- Workshop Participants
- Subject-Matter Experts
- Web2gether

- AT specialists
- Related Service Providers
- Parents
- Students
- Special Education Teachers
- Researchers

- Special Education Director
- Parent Liaison

- Teacher Union
- Lawyers
- Parent Organizations & Advocates

- School Board
- Coordinators
Web2Gether: Contribution to our Evolving Framework of Meta-Design

- participatory design: socio-technical environments constructed by different social groups who participated throughout this research

- design through cycles of closure and opening

- co-evolution of design and context: shaped to fit the needs of the context — and at the same time the context was reevaluated

- seeding process: not restricted to creating initial content, but supporting structured activities, the technology, and the envisioned use community

- integration of innovations into the practices of users and the merging of new with existing organizational structures
End-User Development (by Caregivers) in the Memory Aiding Prompting System (MAPS)
The MAPS Script Editor: Design for Designers
Use of MAPS in Mobility-for-All

This is your Bus, Get ready to get on

Script Use Time
Assessment and Implications

Expanding Boundaries and Redistributing Control

- **expanding boundaries:**
  - power of the few $\rightarrow$ wisdom of the crowds
  - socio-technical environments are living entities
  - breaks down the sharp distinction between designers and users: users become co-designers

- **redistributing control:**
  - developers and user-designers: sharing control
    - benign dictatorship
    - council control
    - complete decentralized
  - control is desired only for personally meaningful problems
  - the pitfalls associated with a “do-it-yourself” society
Contributions of Meta-Design to Digital and Social Systems (DSS)

- **improves the quality of life:** Web2gether and MAPS: an attempt to improve the quality of life for people with cognitive disabilities.

- **democratizes design and innovation:** meta-design eliminates the constraint that users are restricted to what is given to them.

- **makes all voices heard:** participation and contributions of different stakeholders with various backgrounds.

- **changes professional practice:** creation of convivial tools and deprofessionalization.

- **revolutionizes the creation of systems:** creates foundation for social production and mass collaboration.

- **establishes new paradigms in learning and teaching:** focus on community-based learning theories with innovative collaborative technologies.