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

Design Methodologies

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Design for Which World?

- **Objective world**: quality is a question of prediction and control

- **Social world**: quality is a question of ethics determined through communication and interpretation

- **Subjective world**: quality is a question of aesthetics centered on emotional experiences
Design Trade-Offs: **Complexity ↔ Simplicity**

- **Don Norman: Complexity**
  - I argue in favor of complexity, against the simple-minded notion that things should be simple. Simplicity is boring.
  - We want richness and depth in our lives.
  - the world and our activities are inherently complex, so the tools we use must match that complexity.
  - We don’t want confusion, perplexity, and confusion → we want our complex tools and activities to be understandable.

- **John Maeda: Simplicity**
  - we can learn to simplify without sacrificing comfort and meaning
  - 10 laws:
    - law-1: Reduce = it is not beneficial to add technology features just because we can
    - law-10: simplicity is about subtracting the obvious, and adding the meaningful
THE LAWS OF SIMPLICITY

DESIGN, TECHNOLOGY, BUSINESS, LIFE

John Maeda

“Maeda is the Master of Simplicity.”
—Andrea Ragnetti, Board of Management, Royal Philips Electronics

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Major Challenges for (Software) Design

- Importance of Application Domain Knowledge
- Supporting Communication and Coordination
- Designing Open and Evolvable Systems

Different Generations of Design Methods

- **1st Generation (before 1970)** — *example*: waterfall-type models
  - directionality and causality
  - separation of analysis from synthesis
  - major drawback: (a) perceived by the designers as being unnatural, and (b) does not correspond to actual design practice

- **2nd Generation in the early 70'es** — *example*: participatory design
  - participation — expertise in design is distributed among all participants
  - argumentation — various positions on each issue
  - major drawback: insisting on total participation neglects expertise possessed by a well-informed and skilled designer

- **3rd Generation (in the late 70'es)** — *example*: meta-design
  - inspired by Popper: the role of the designer is to make expert design conjectures
  - these conjectures must be open to refutation, rejection, and elaboration by the people for whom they are made
The Waterfall Model (strictly sequential)
The Waterfall Model (with Feedback)
The Spiral Model
Overview of Different 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
  - very different from user-design (design done by users; facilitated by meta-design)

- **learner-centered design**
  - low threshold and high ceiling
  - 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 by empowering them to propose and generate design alternatives
  - focus on system development at design time by bringing developers and users together to envision the contexts of use
Different Design Methodologies — continued

- **collaborative design**
  - the power of many hands and many heads
  - communities of practice and communities of interest (more in lecture on: Oct 27)

- **meta-design (more in lecture on Sept 27)**
  - create design opportunities at use time
  - improvisation, local knowledge, tacit knowledge getting activated in actual use situations is supported

- **value-sensitive design (Batya Friedman)**
  - an approach to the design of technology that accounts for human values in a principled and systematic manner throughout the design process

- **emotional design (Donald Norman)**
  - questions: does cheap wine taste better in fancy glasses?
  - claim: “*when a product is aesthetically pleasing and plays to our ideas about ourselves and society, we experience it positively*”
  - [http://www.jnd.org/](http://www.jnd.org/)
Professionally-Dominated Design

- Motto of the 1933 Chicago World’s Fair:
  - Science Finds,
  - Industry Applies,
  - Man Conforms

- A person-centered motto for the 21st century:
  - People Propose,
  - Science Studies,
  - Technology Conforms

Professionally-Dominated Design

t_{0}: design by software professions

use by end-users

t_{1}
User-Centered Design — More than “Ease-of-Use”

- **human-computer interaction is more than user interfaces**
  
  Applying the Macintosh style to poorly designed applications and machines is like trying to put Béarnaise sauce on a hot-dog! (A. Kay)

- **make systems useful and usable**
  
  If ease of use was the only valid criterion, people would stick to tricycles and never try bicycles. (D. Engelbart)

- **support human problem-domain interaction**
  
  Interfaces get into the way. I don't want to focus my energies on an interface. I want to focus on the job. (D. Norman)
Usable and / versus Useful → **Usable** as Main Objective

- novices
- limited functionality
- low threshold to get started
- walk-up and use
- experts exist
- understandable model of the complete system can be developed
- examples: water faucets, ATMs, VCRs,
Usable and / versus Useful → Useful as Main Objective

- skilled users
- broad functionality
- high ceiling for skilled users
- no “experts” (learning on demand is a necessity rather than a luxury)
- no complete models
- end-user modifiability, programmability
- examples: Unix, MS-Word, Excel, Mathematica, Photoshop
Learner-Centered Design

- it has been years since most designers were children
  - many myths of what children want have developed in the design world
  - children should be part of the design process in order dispel the myths

- learner-centered design requires redefining the modeling task, focusing on providing support to learners while they engage in activities that are normally beyond their abilities
  - scaffolding
  - tools for living versus tools for learning
  - focus on developing a learner's understanding, rather than on improving usability issues
Tools for Living and Tools for Learning

- **tools for living (doing tasks with tools):**
  - grounded in a distributed intelligence perspective
  - intelligence is mediated by tools for achieving activities that would be error prone, challenging, or impossible to achieve (e.g., microscope, telescope, ...)

- **tools for learning (scaffolding with fading):**
  - *objective*: autonomous performance by people without tools
  - *examples*: training wheels, wizards, external scripts, templates, prompting systems

- **the fundamental question:** what does it mean to “learn” in the 21st century in which powerful tools are available for many intellectual activities?
Tools for Living
Tools for Learning
Participatory Design

- attempts to actively involve the end users in the design process to help ensure that the product designed is **useful** and **usable**

- used in **software design, urban design, architecture, landscape architecture, and planning** as a way of creating environments that are more responsive and appropriate to their inhabitants and users cultural, emotional, spiritual and practical needs

- a series of bi-annual conferences
  - [http://pdc08.informatics.indiana.edu/](http://pdc08.informatics.indiana.edu/)
PARTICIPATORY DESIGN
Principles and Practices
edited by
Douglas Schuler
Aki Namiooka
Participatory Design

design by software professions with users

t₀:

use by end-users

t₁
Collaborative Design

- **why?**
  - design problems are *systemic problems*; they seldom fall within the boundaries of one specific domain → they require the participation and contributions of several stakeholders with various backgrounds

- **concepts:**
  - symmetry of ignorance
  - conceptual collision
  - epistemological pluralism to avoid group-think
Basic Patterns of Collaborative Design
### Dimensions of Collaboration: Spatial, Temporal, Conceptual, Technological

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Rationale</th>
<th>Addressed by</th>
<th>Media / Technologies</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>spatial</strong></td>
<td>participants are unable to meet face-to-face; low local density of people sharing interests</td>
<td>computer-mediated communication</td>
<td>e-mail, chat rooms, video conferences, local knowledge in global societies</td>
<td>achieve common ground; involve large communities (&quot;the talent pool of the whole world&quot;);</td>
</tr>
<tr>
<td><strong>temporal</strong></td>
<td>design and use time: who is the beneficiary and who has to do the work?</td>
<td>long-term, indirect communication; meta-design</td>
<td>group memories, organizational memories</td>
<td>build on the work of the giants before us; design rationale, reflexive CSCW</td>
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## Dimensions of Collaboration: Continued

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<td><strong>conceptual within domains</strong></td>
<td>shared understanding</td>
<td>communities of practice (CoPs), legitimate peripheral participation (LPP)</td>
<td>domain-oriented design environments (DODEs)</td>
<td>innovation; avoid group-think</td>
</tr>
<tr>
<td><strong>conceptual between domains</strong></td>
<td>make all voices heard</td>
<td>communities of interest (Cols); boundary objects</td>
<td>Envisionment and Discovery Collaboratory</td>
<td>common ground; different ontologies; integration of diversity</td>
</tr>
<tr>
<td><strong>technological</strong></td>
<td>things are available; complement human abilities</td>
<td>distributed cognition, socio-technical environments; meta-design</td>
<td>agents, critics, simulations</td>
<td>formalization; human-problem-domain interaction; digital fluency</td>
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