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

Meta-Design:
A Framework for the Future of End-User Development (EUD)

Gerhard Fischer and Hal Eden
Spring Semester 2005

February 21,2005

paper: Fischer, G., Giaccardi, E., Ye, Y., Sutcliffe, A. G., & Mehandjiev, N. (2004) "Meta-Design: A Manifesto for End-User Development," Communications of the ACM, 47(9), pp. 33-37.
http://l3d.cs.colorado.edu/~gerhard/papers/CACM-meta-design.pdf

Core Message

The future success of EUD depends on creating tools that end users are motivated to learn and use in daily work practices.

Claims

- **meta-design** (= allowing people to act as designers) is **more than a technical problem**

- meta-design needs to provide tools, environments, and substrates for end user development — this **is necessary, but not sufficient**

- **meta-design** creates **new mindsets**, new **sources of creativity**, **cultures changes**, and **innovative societies** by providing new insights into
  - learning and working
  - communicating
  - design and design communities
  - collaboration
  - co-creation

Cultures and Media

- **claim: cultures** are substantially defined by their media and tools for thinking, working, learning, and collaborating (most prominent example: oral → literal societies)

- **fundamental challenge for computational media:** to contribute to the invention and design of cultures in which humans can express themselves and engage in **personally meaningful activities**

- **new media change**
  - the tasks which humans do (→ new divisions of labor)
  - the structure and contents of our interests
  - the nature of our cognitive and collaborative tools
  - the social environment in which thoughts originate and evolve, and mindsets develop

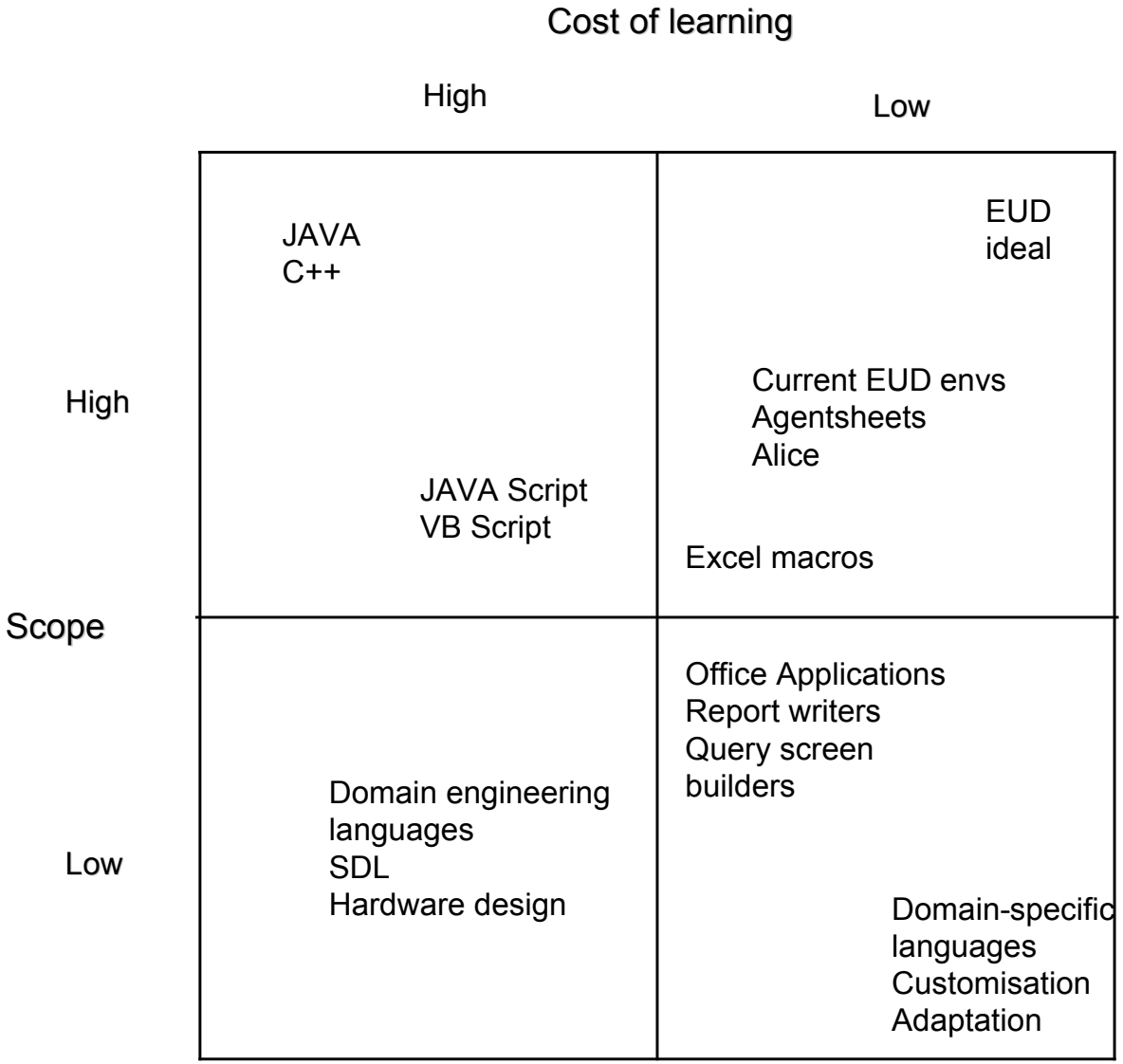
- **empirical observation:** a large number of new media are designed from the perspective of seeing and treating humans primarily as **consumers**

Design: Beyond Binary Choices

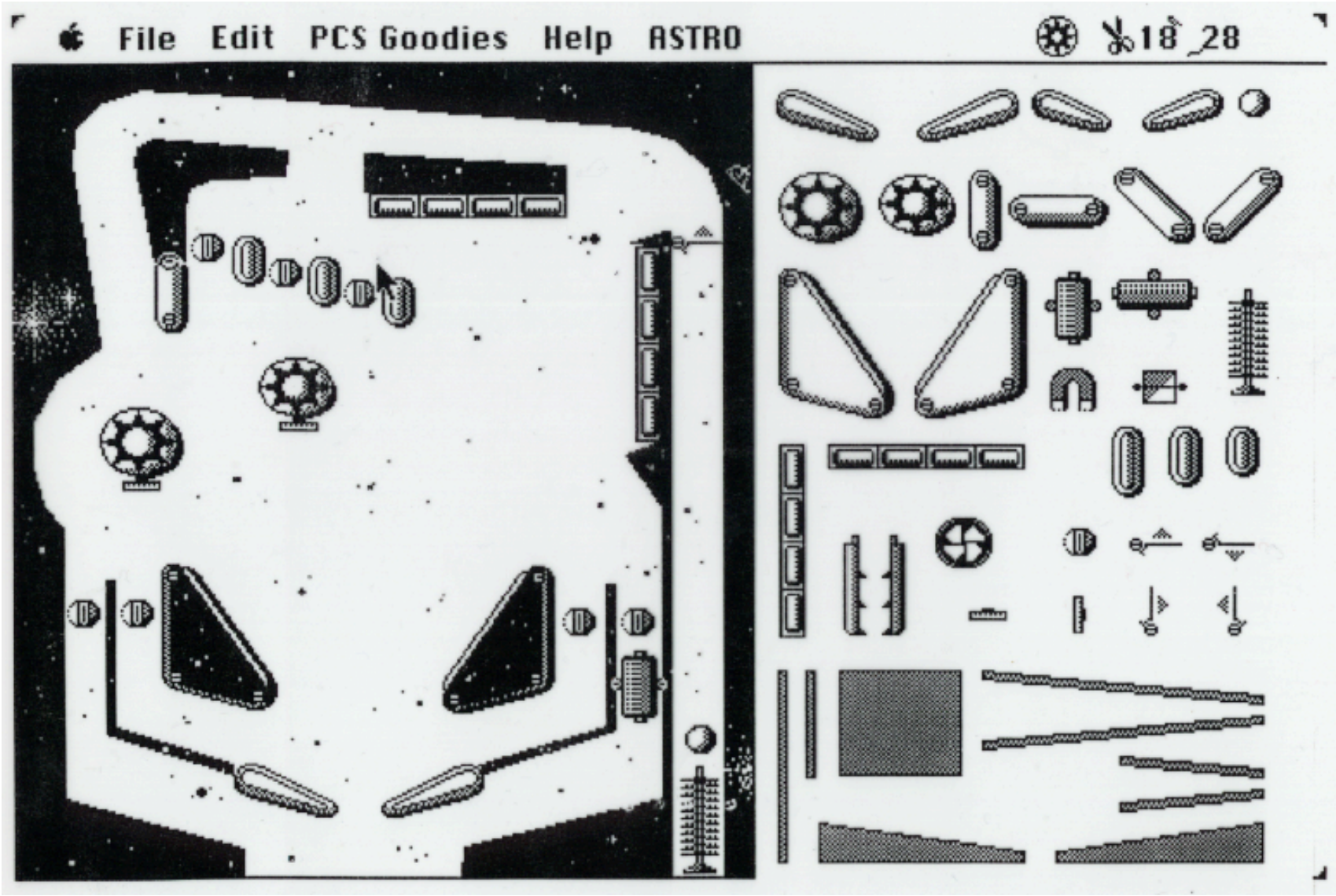
- **Turing Tar Pit:** *"Beware of the Turing Tar Pit, in which everything is possible, but nothing of interest is easy."*
  - why are current interactive programming environments, such as Logo, Smalltalk, Squeak, Agentsheets, …… not sufficient for supporting meta-design?
  - claim: level of representation is still too far removed from the conceptual world of the domain workers
  - claim: they 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 tools (such as SimCity) provide extensive support for certain problem contexts
  - the ability to extend these environments is limited — even minor incremental changes are often impossible in these systems

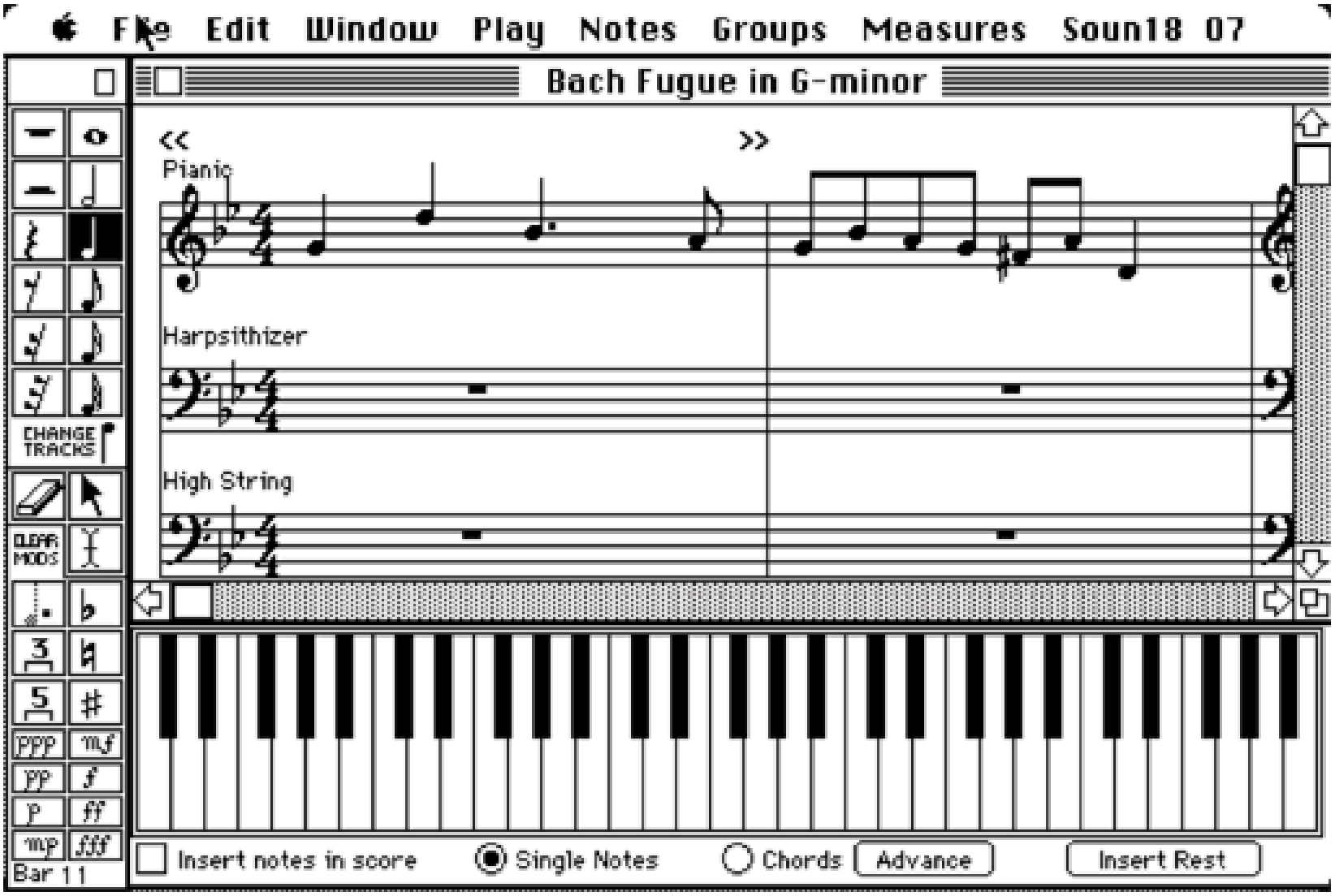
Cost-Scope Trade-offs in EUD Tools



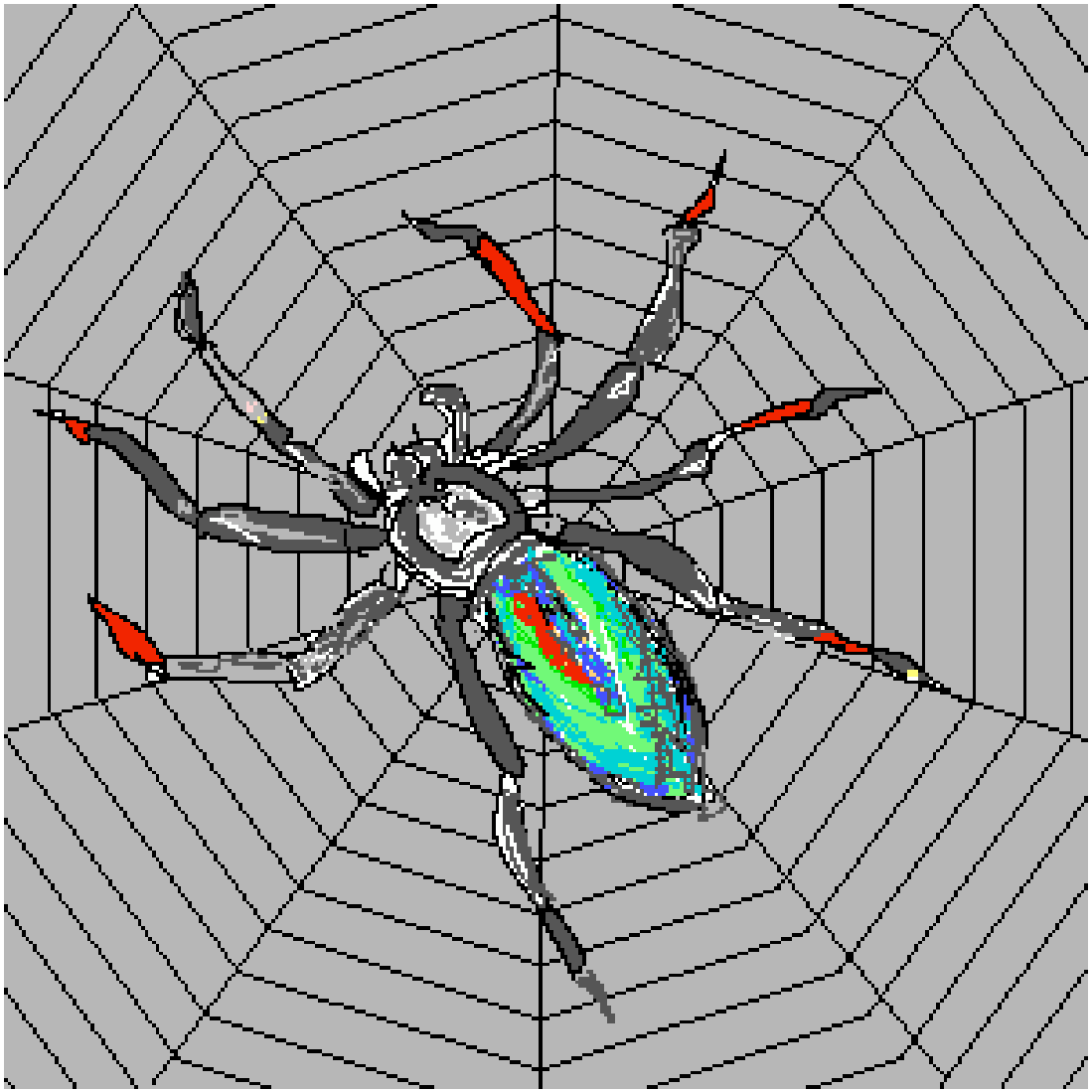
Human Problem Domain Interaction — Pinball Construction Kit



Human Problem Domain Interaction — Music Construction Kit



SchemePaint (M. Eisenberg): a programmable application combining direct manipulation with interactive programming



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:

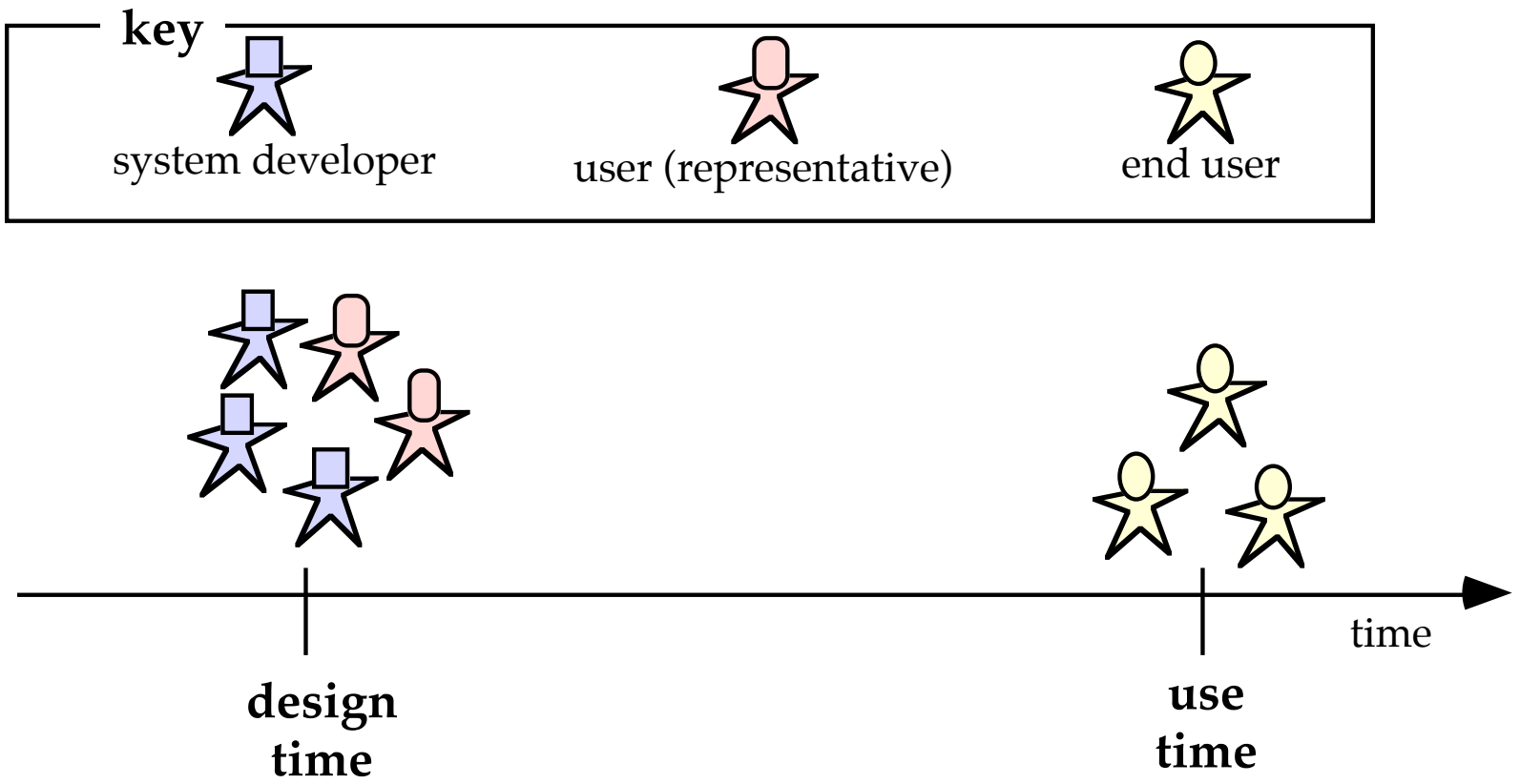
  "if we can provide the knowledge, the know-how, and the tools for making fishing rods, we can feed the whole community"

Meta-Design

- **meta-design**
  - new media that allow users to act as designers and be creative
  - the creation of context rather than content
  - puts the tools rather than the object of design in your hands
  - does not define a product, but the conditions for a process of interaction

- **why meta-design?**
  - design for diversity (for “a universe of one” → CLever Project)
  - design as a process is tightly coupled to use and continues during the use of the system
  - addresses and overcome problems of closed systems
  - prerequisite for social creativity and innovation
  - transcends a “consumer mindset”

Design Time and Use Time



world-as-imagined
prediction
planning

world-as-experienced
reality
situated action

Computational Media
—
Extending Design Opportunities at Use Time

- **print media:** a fixed context for use time is decided at design time

- **computational media**:
  - presentations at use time can take advantage of contextual factors only known at use time (about tasks, users, social systems,.....)
  - examples: specification sheets and usage data, supporting dynamic forms, dynamic websites, user and task specific maps and traffic schedules....

- **evolving existing systems**: users (acting as designers) can transcend at use time the boundaries of the systems as developed at design time

Meta-Design: Beyond Professionally-Dominated, User-Centered Design, and Participatory Design

- **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

- **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

- **meta-design:**
  - create design opportunities at use time
  - requires co-creation

What Do Meta-Designers Do?

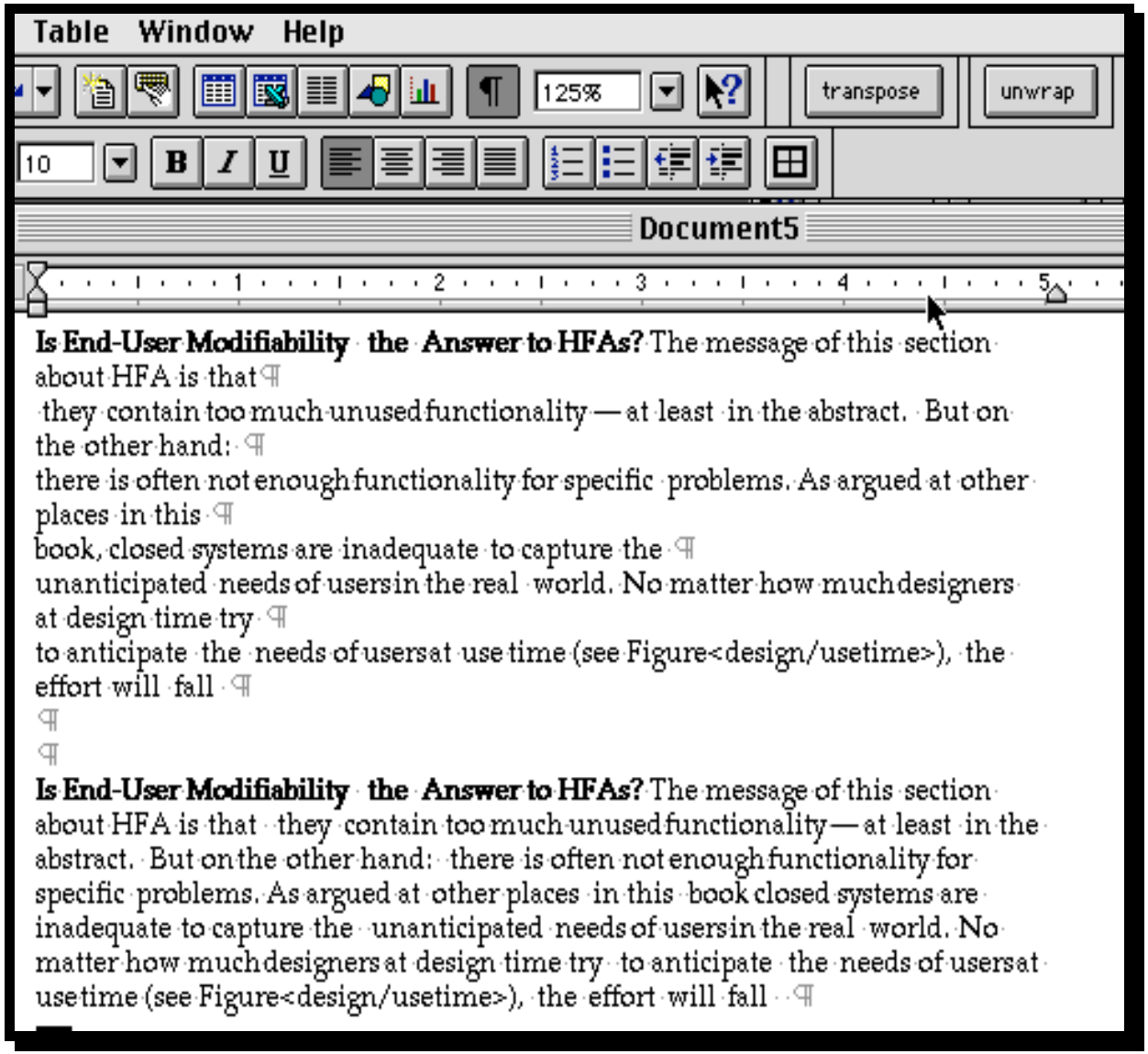
- use their own creativity to create socio-technical environments in which other people can be creative

- create the technical and social conditions for broad participation in design activities which are as important as creating the artifact itself

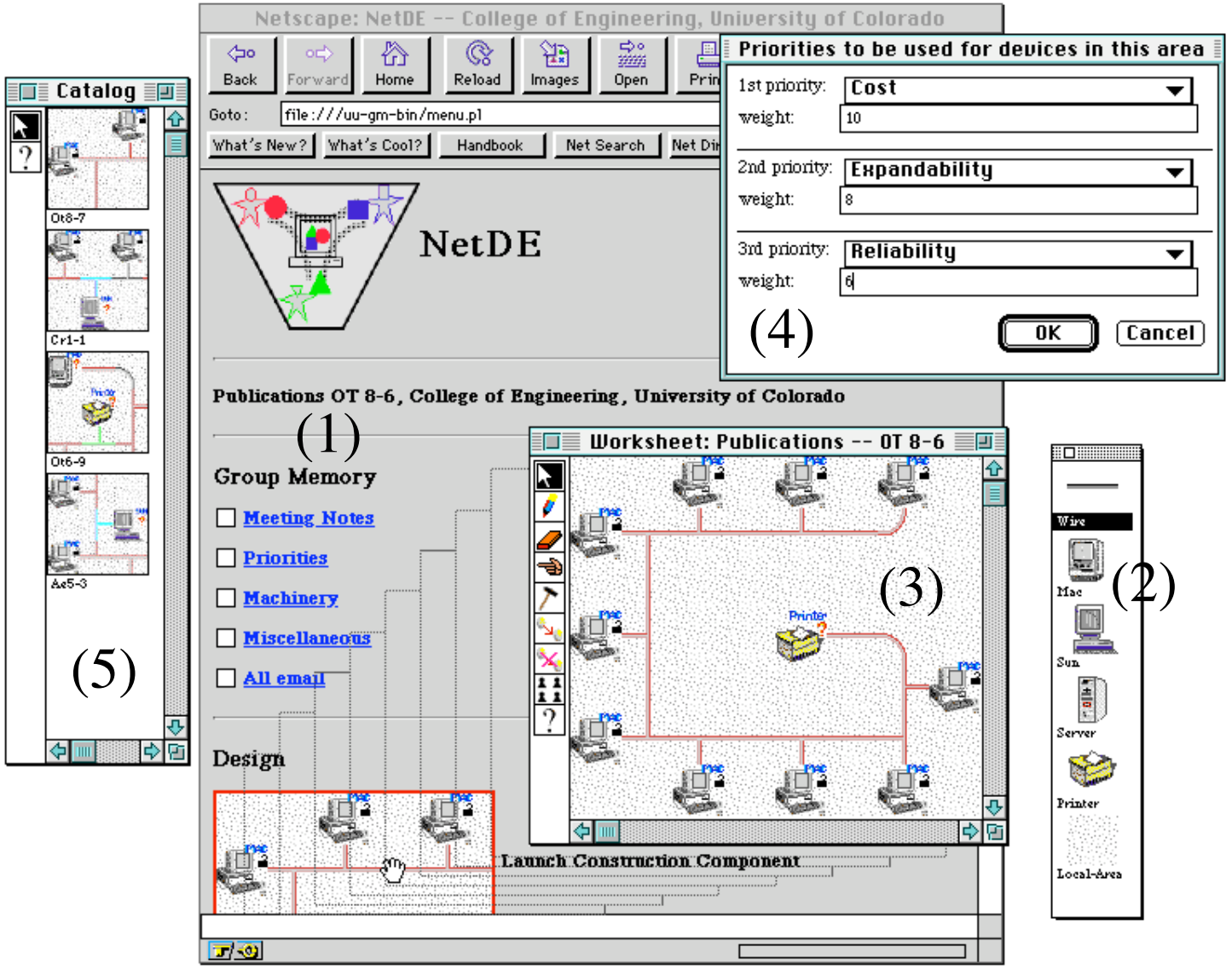
Meta-Design Concepts (in Microsoft Word)
—
Users as Co-Developers

- ***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

A Macro for Unwrapping Text

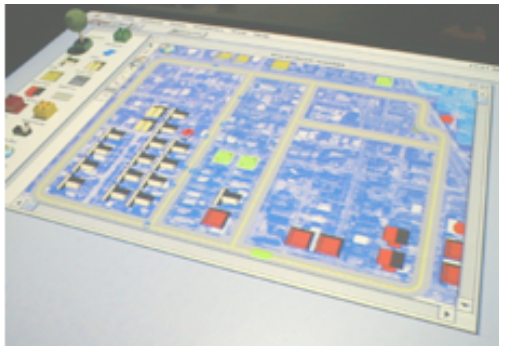


A Domain-Oriented Design Environment



The Envisionment and Discovery Collaboratory (EDC)

The Envisionment and Discovery Collaboratory

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**)

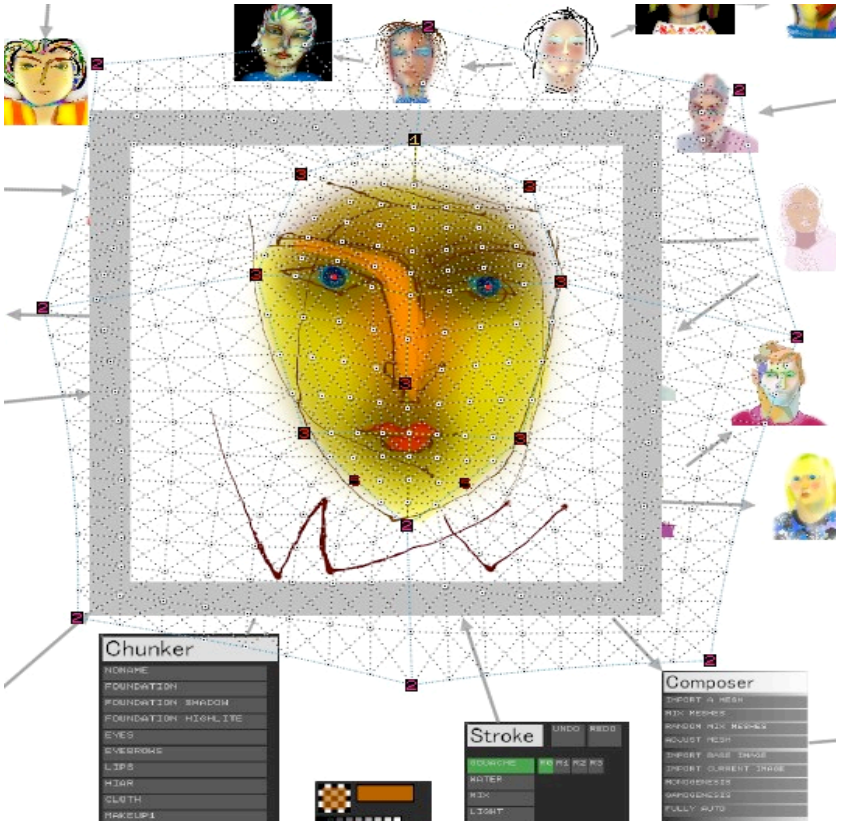
- **important goal of EDC:** create end-user modifiable versions of SimCity, because:
  - background knowledge can never be completely articulated
  - the world changes

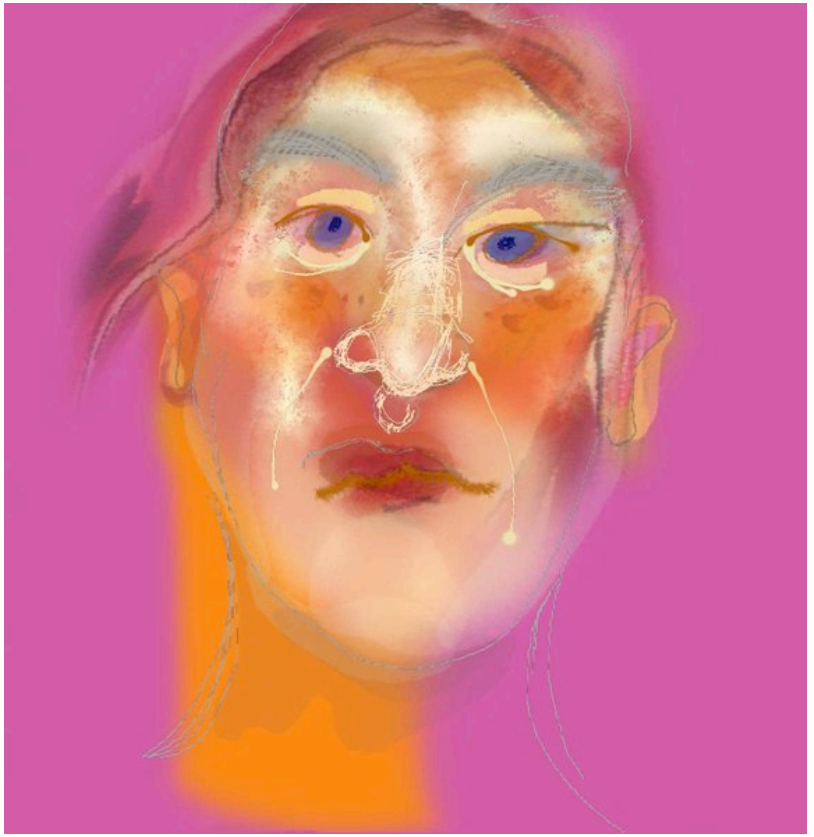
- **user control:**
  - end-user modifiability
  - conviviality (independence of high-tech scribes)
  - ownership (putting owners of problems in charge)

Interactive Art: *Face Poiesis*

(creating new faces by mixing features from previously created faces)

original creators: Toshihiro Anzai and Rieko Nakamura





Interactive Art: The Electronic Café Project

original creators: Kit Galloway & Sherrie Rabinowitz (founded 1984)

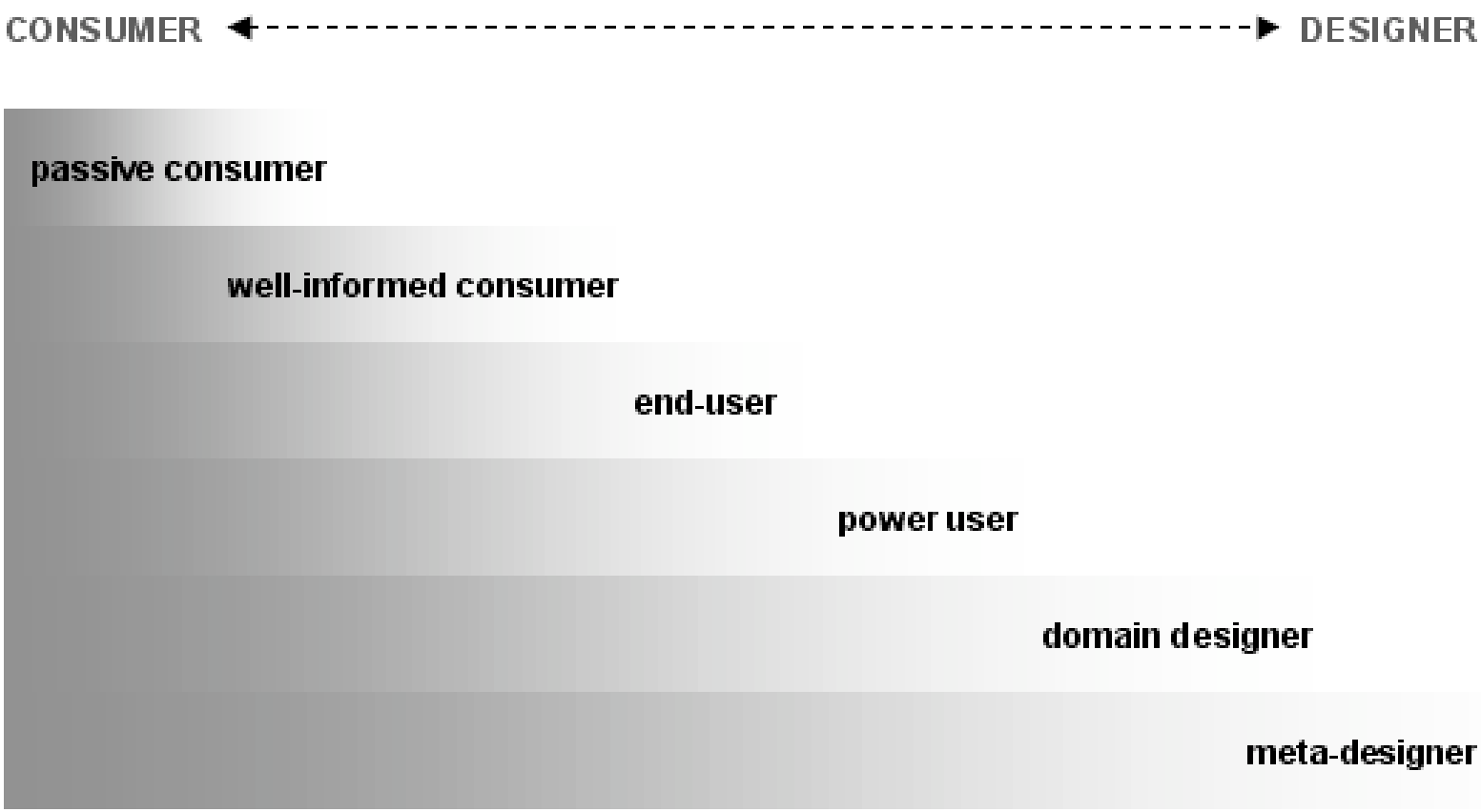
at: http://www.ecafe.com/

Consumer and Designers — Beyond Binary Choices

- **claims:**
  - there is nothing wrong being a consumer (watching a tennis match, listening to a concert, ...)
  - the same person wants to be a consumer in some situations and in others a designer
  - consumer / designer is not an attribute of a person, but of a context
    consumer / designer ≠ f{person} → f{context}

- **problems:**
  - someone wants to be a designer but is forced to be a consumer → ***personally meaningful activities***
  - someone wants to be a consumer but is forced to be a designer → ***personally irrelevant activities***

Consumer and Designers — A Continuum



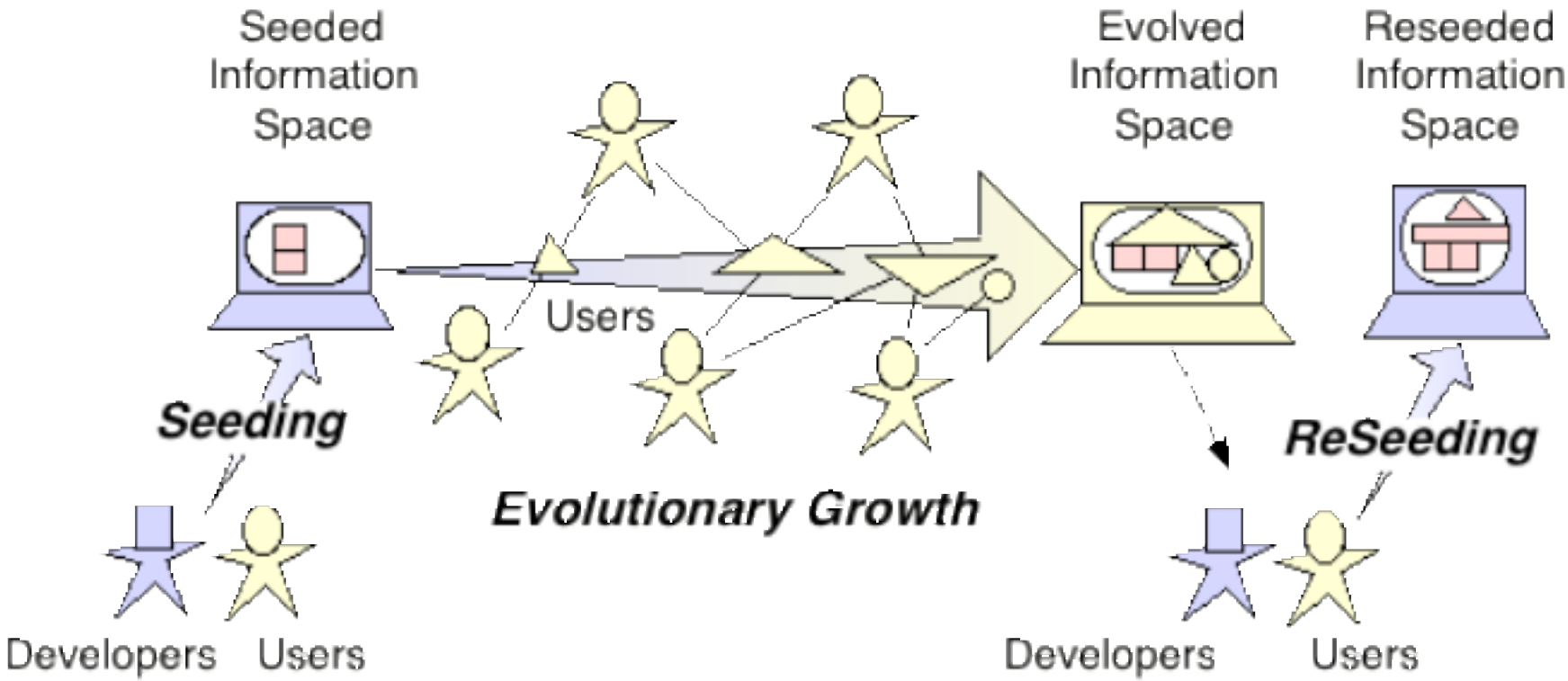
The Seeding, Evolutionary Growth, Reseeding (SER) Model Supporting Meta-Design

- **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



Comparing Self-conscious and Unself-conscious Cultures of Design

	self-conscious	unself-conscious
definition	an explicit, externalized description of a design exists (theoretical knowledge)	process of slow adaptation and error reduction; situated
original association	professionally-dominated design	primitive societies, handmade things
examples	seeding and reseeding designed cities: Brasilia, Canberra, Abudja	evolutionary growth naturally grown cities: London, Paris
strengths	activities can be delegated; division of labor becomes possible	many small improvements → artifacts well suited to their function; coping with ill-defined, unarticulated problems
weaknesses	many artifacts are ill-suited to the job expected of them	no general theories exist or can be studied (because the activity is not externalized)
requirements	externalized descriptions must exist—issue: how adequate are these externalized descriptions?	owner of problems must be involved because they have relevant, unarticulated knowledge

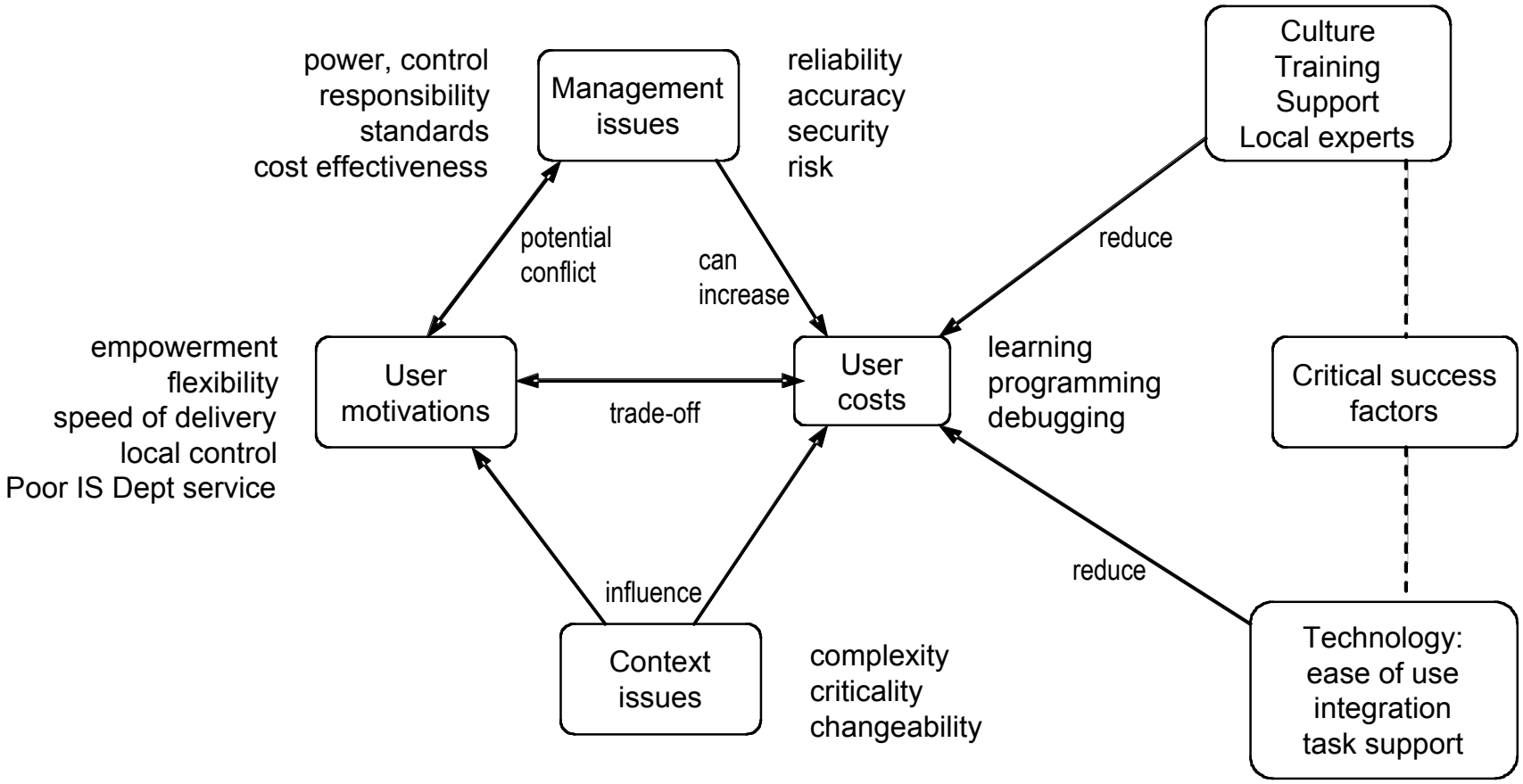
Explore Technical Issues in Real-World Settings
—
Improvisations versus Standardization

- **example:** SAP Info, July 2003, p 33: “Reduce the Number of Customer Modifications”

- **rationale:**
  “every customer modification implies costs because it has to be maintained by the customer. Each time a support package is imported there is a risk that the customer modification may have to be adjusted or re-implemented. To reduce the costs of such on-going maintenance of customer-specific changes, one of the key targets during an upgrade should be to return to the SAP standard wherever this is possible”

- **compare:**
  - “forking” in Open Source
  - “reseeding” in Seeding, Evolutionary Growth, Reseeding Model

Relationships between Social and Managerial Issues in EUD



Motivational Aspects and Meta-Design

- **what will make humans want to become designers/active contributors over time?**
  - serious working and learning does not have to be unpleasant but can be personally meaningful, empowering, engaging, and fun
  - comment by an artist: *"programming is not hard, but it is boring"*

- **what will make humans want to share?** → requires: mindset change, culture change, community knowledge bases, gift cultures, social capital
  - more details: Fischer, G., Scharff, E., & Ye, Y. (2004) "Fostering Social Creativity by Increasing Social Capital." In M. Huysman, & V. Wulf (Eds.), Social Capital and Information Technology, MIT Press, Cambridge, MA, pp. 355-399.

- **who is the beneficiary and who has to do the work?** → organizational rewards

Utility = Value / Effort

- **increase in value: motivation and rewards for a "design culture"**
  - feeling in control (i.e., independent from "high-tech scribes")
  - being able to solve or contribute to the solution of a problem
  - mastering a tool in greater depth
  - making an ego-satisfying contribution to a group
  - enjoying the feeling of good citizenship to a community ("social capital")

- **decrease in effort:**
  - meta-design is hard
  - extending meta-design to design for design communities

Meta-Design: Transforming Application Areas

- **design:** customization, personalization, tailorability, end-user development, design for diversity
- **architectural design:** underdesign, support for “unself-conscious culture of design”
- **teaching and learning:** teachers as facilitator, learning communities, courses-as-seeds
- **informed participation:** beyond access, social creativity

Meta-Design: Transforming Application Areas — Continued

- **open source:** a success model of decentralized, collaborative, evolutionary development (Eric Scharff, PhD thesis)

- **living organizational memories:** livingOM (Jonathan Ostwald), Web2Gether (Rogerio dePaula), Swikis

- **digital libraries:** community digital library (Michael Wright and Tamara Sumner)

- **interactive art:** collaboration, co-creation, puts the tools rather than the object of design in the hands of users (Elisa Giaccardi)
  - examples: http://www.sito.org/ — **Gridcosm, HyGrid**

Conclusions

- **meta-design offers:**
  - to invent and design a culture in which all participants in collaborative design processes can express themselves and engage in personally meaningful activities

- **meta-design requires**
  - a new **mindset** of all participants
  - designers giving up some **control** at design time
  - **active contributors** and not just passive consumers at use time

- **meta-design raises many issues and research problems of fundamental importance** including
  - new design methodologies
  - a new understanding of cognition, collaboration, and motivation
  - the design of new media and new technologies