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

Less Is More
—
HCI, HPDC, HFAs

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Spring Semester 2005
Feb 16, 2005

paper: Buxton, W. (2001) "Less is More (More or Less)." In P. J. Denning (Ed.), The Invisible Future — the seamless integration of technology in everyday life, McGraw-Hill, New York, pp. 145-179. available at: http://billbuxton.com/LessIsMore.html

Less Is More — Some Interesting Claims

- why and under which conditions is it **true** that “less is more”?

- **some claims:**
  - Systems will have to be tailored to dynamically connect the user with artefacts relevant to the user's current actions -- and do so in a way, form, place, and cost appropriate to the user.
  - “Despite the increasing reliance on technology in our society, in my view, the key to designing a different future is to focus less on technology and engineering, and far more on the humanities and the design arts.”
  - “Given the much discussed constraints on human ability, how can we expect an individual to maintain the requisite specialist knowledge in their technological discipline, while at the same time have the needed competence in industrial design, sociology, anthropology, psychology, etc., which this essay implies are required to do one’s job?”

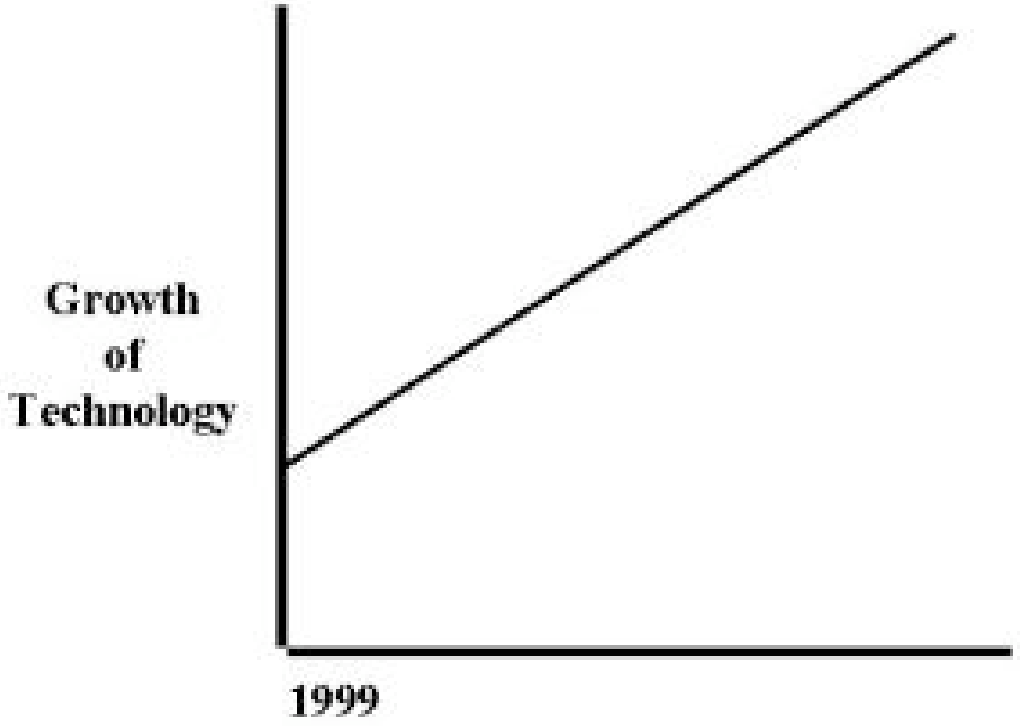
From a Techno-Centric Bias to a Human-Centric Perspective

- the importance of **usage and activity** rather than technology

- **questions** to be asked:
  - **Who** is using the computer?
  - **What** they are doing?
  - **Where** they are doing it?
  - **When** they are able to do it?
  - **Why** they are doing it?
  - **How** they do it?

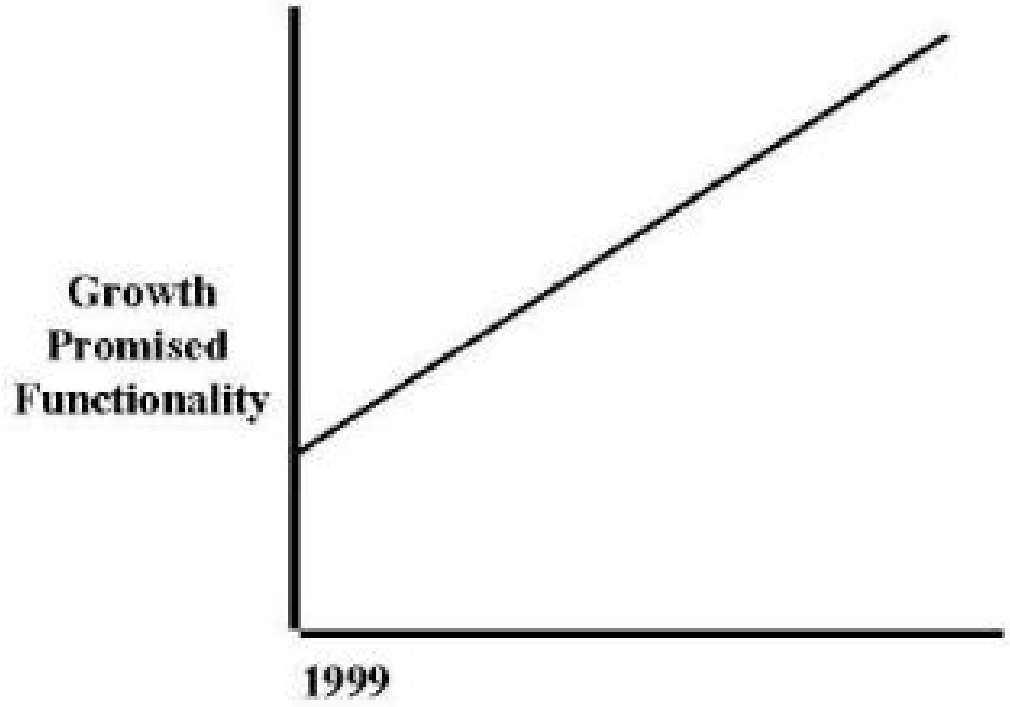
Moore's Law: the growth of technology as a function of time

there will be more technology tomorrow than there is today

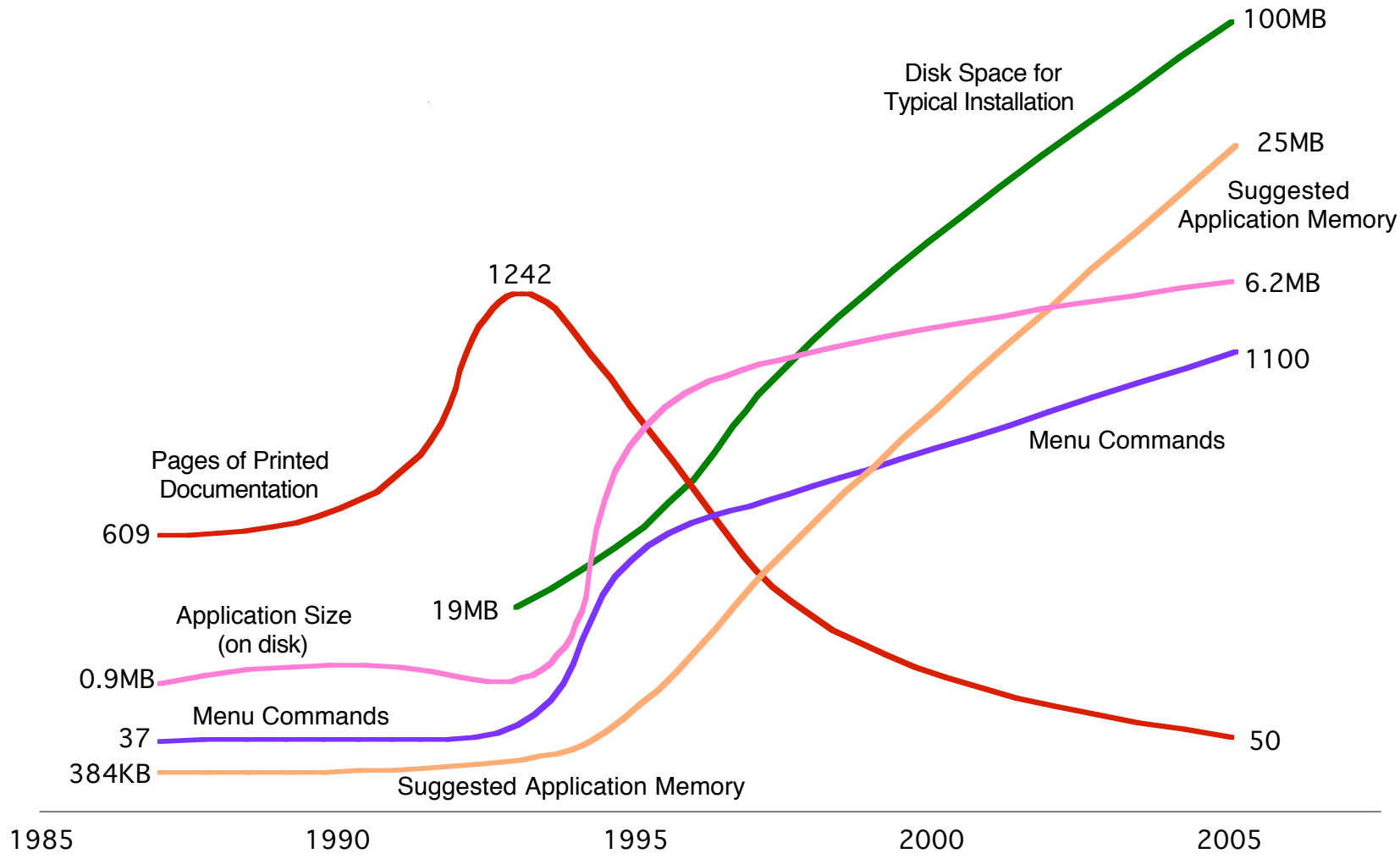


Buxton's Law: Promised functionality and benefits of technology will increase directly with Moore's Law

there will be more functionality promised/offered tomorrow than there is today

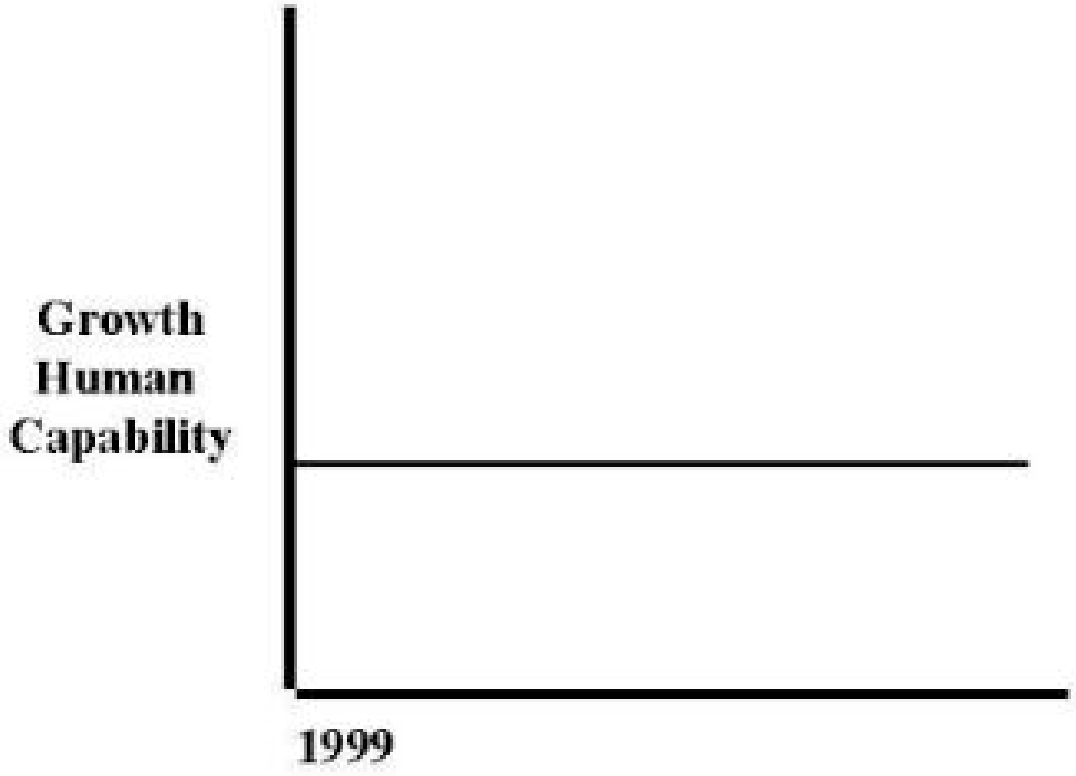


A qualitative view of trends as observed in Microsoft Word in 2000



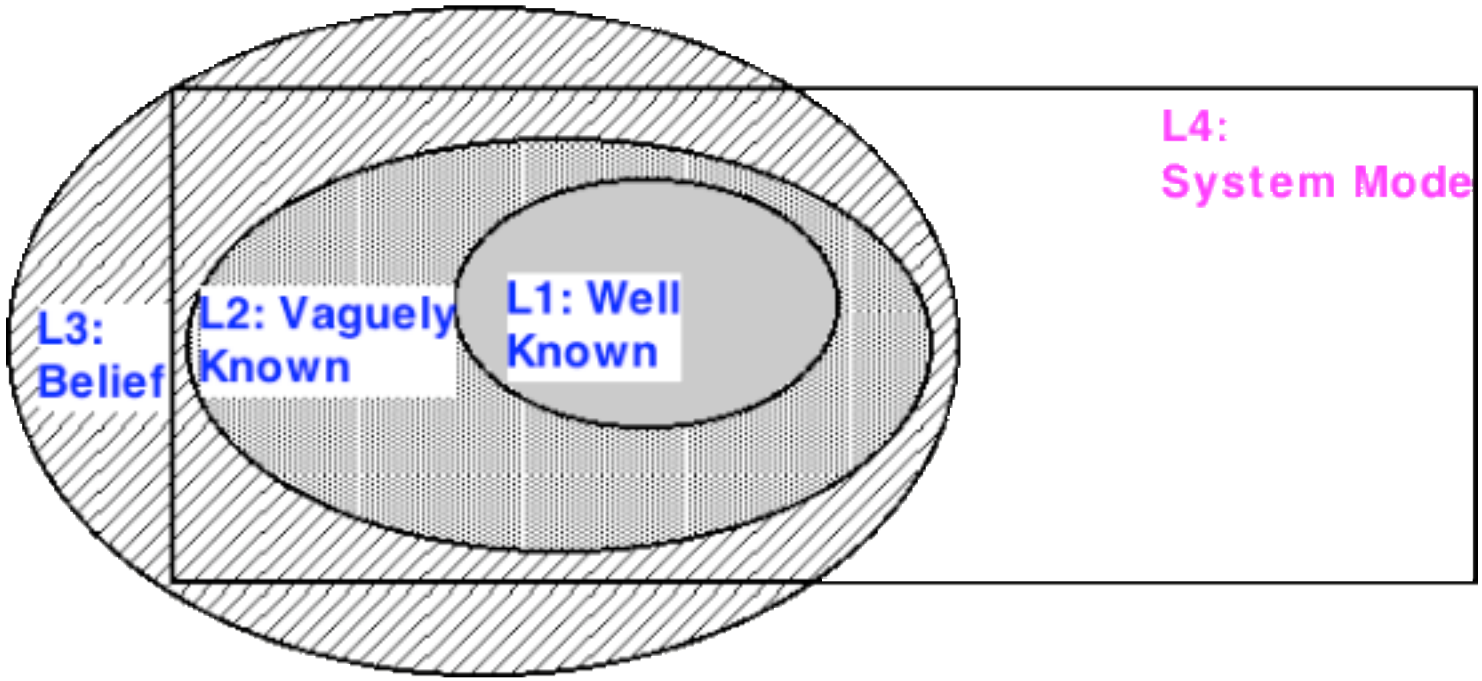
God's Law: Humans' capacity is limited and does not increase over time

our neurons do not fire faster, our memory doesn't increase in capacity, and we do not learn or think faster as time progresses



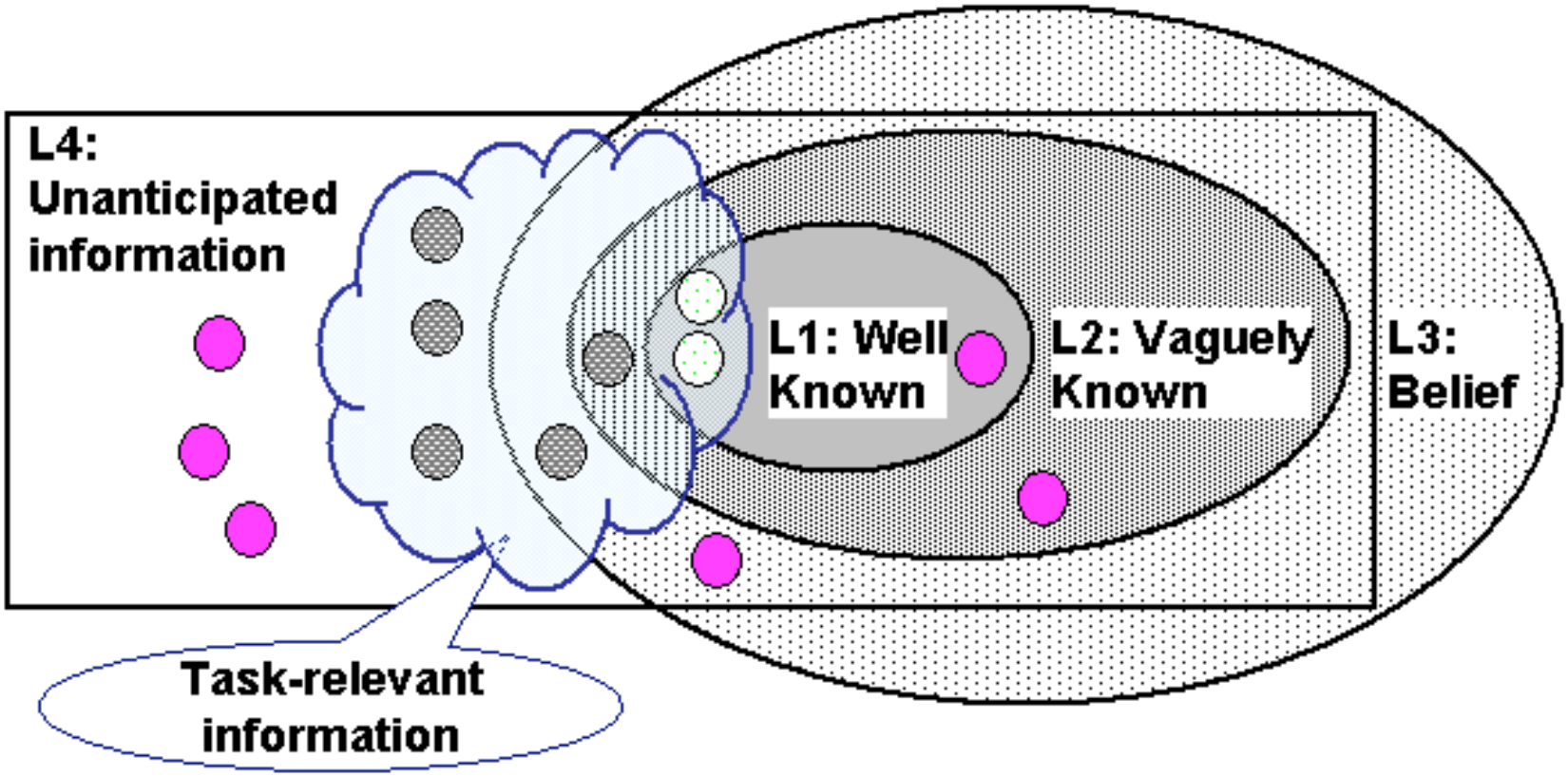
High-Functionality Applications (HFAs)

Mental Models Held by User (L1,L2,L3) and System Model (L4)

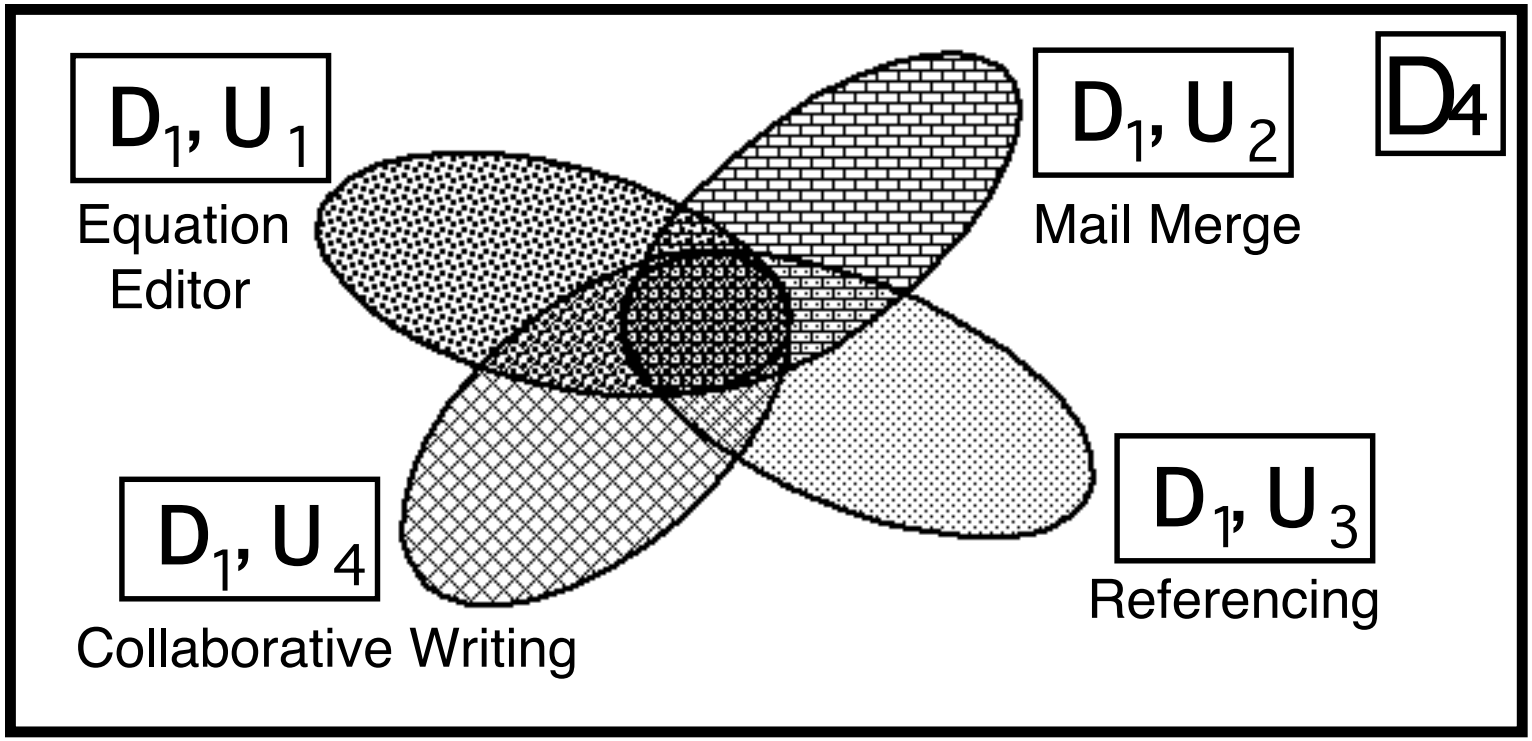


User Modeling and Identification of the Task at Hand in HFAs

Why “Did You Know (DYK)” and “MS Tip of the Day” are of limited success

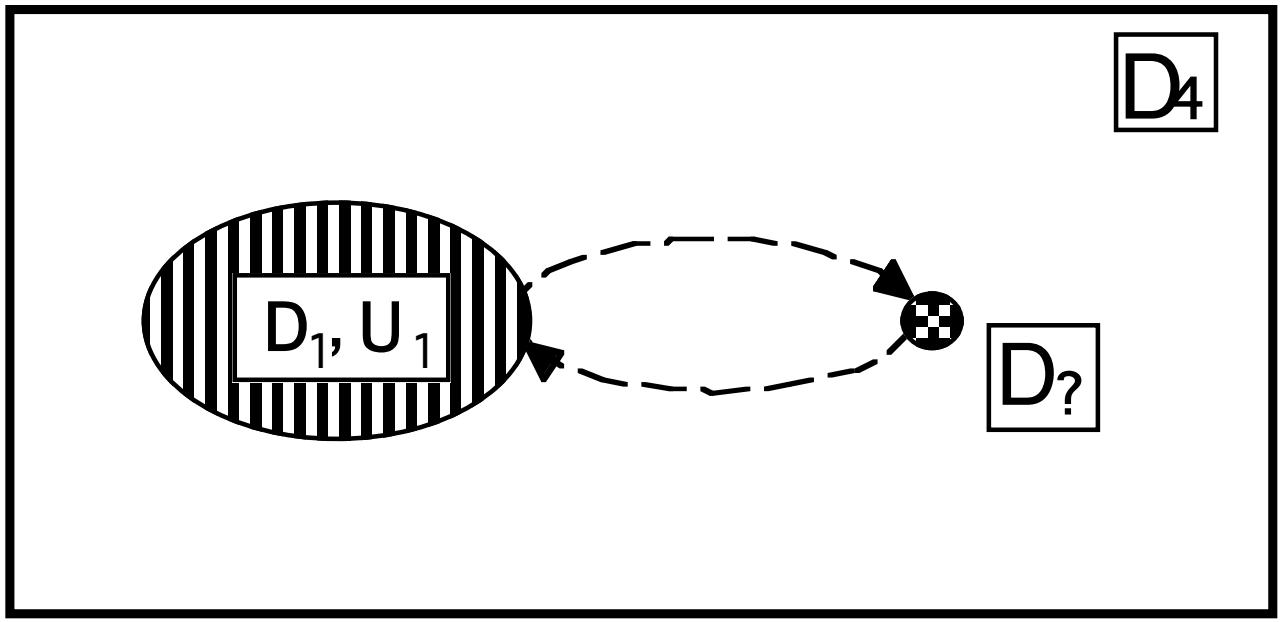


Expertise in HFAs is an Attribute of a Context, not of a Person



Entering Unknown Parts of D4 — Opportunity or Problem

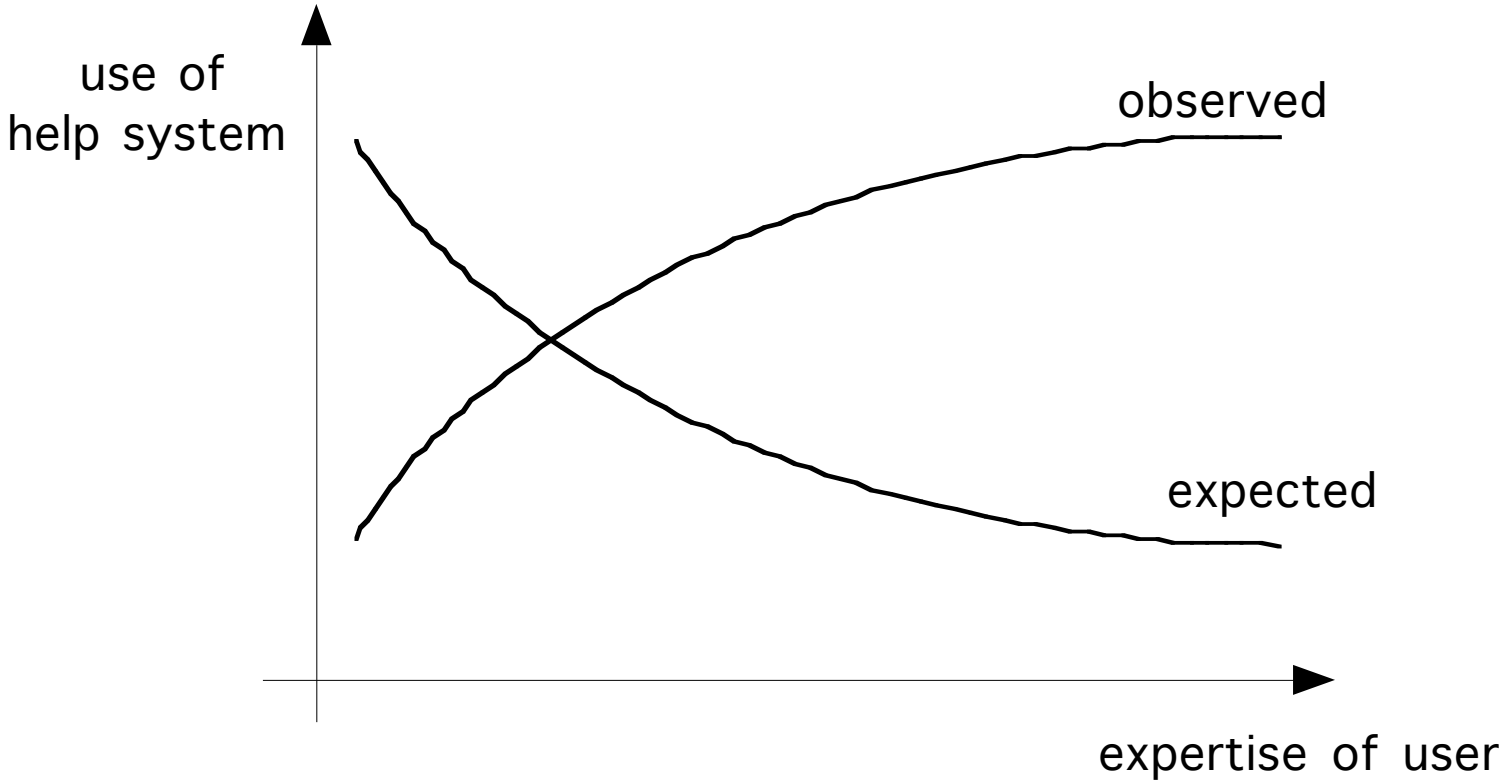
- **issues:** a user hits the wrong keys (but the keystrokes get interpreted in D4); the system infers the "wrong" intentions from the users actions — ***"every wrong answer is the right answer to some other question"***
- **problem**: "smart" systems which guess wrong (e.g., in MS-Word: AutoCorrect, Tables, Bullets and Numbering, ……)
- **opportunity**: serendipity



Problems with HFA

- users do not know about the **existence** of tools (D_4 □ □D_3)
- users do not know how to **access** tools
- users do not know when to use tools (lack “applicability conditions”)
- users cannot **combine, adapt, and modify tools** according to their specific needs
- additional complicating factor: in the real world problems are not given but emerge, implying that no precise goals and specifications can be articulated →intertwining of problem formulation and problem solving

Usage of Sophisticated Help Systems



Problems with HFA: Microsoft's View and Objectives

- some "routine" tasks could be and needed to be **automated (→ Autocorrect)**
- some tasks were **used too infrequently** by users to make it worthwhile for them to learn how to complete them and complex enough that users would need to relearn how to perform them each time they tried to accomplish the task (→ **use on demand**)
- complex tasks may include options that could benefit the users — **options that the user might never take advantage of**
- users have **different levels of expertise and backgrounds** and therefore require different levels of support
- tasks supported by software are **broad**
- users don't want to become technical experts, they just want to **get their tasks done**
- users don't know about all software features that could help them
- **help** is **insufficient**, spread out over the user interface, **hard to use**, and requires prior knowledge of computer software lingo
- users want tailored help delivered in a friendly and easy to understand manner (→ **personalization**)

Commercial Applications: Microsoft's IntelliSense

- **technology started to appear in Office 97**

- **claims: the software "understands"**
  - the context of an end-user's actions
  - recognizes the user's intent
  - automatically produces the correct result

IntelliSense's Features

- **routine task automation**
  - background spelling and grammar checks
  - automatic formatting of one paragraph based on format of the previous paragraph
- **tasks are simplified through the offering of wizards (e.g., wizards for creating faxes or letters)**
- **personalization of the software**
  - allowing users to control how the office assistant behaves
  - allowing developers to program additional features
  - allowing users to create additional features (e.g., macros)

How Our Research Addresses the Problems Created by HFAs

- **active help systems** — analyze the behavior of users and infer higher-level goals from low-level operations
- **specification components** — allow users to enrich the description of their tasks
- **critiquing components** — analyze and infer the task at hand; detect and identify the potential for a design information need; present contextualized knowledge for designers
- **increase user and task relevance** by integrating specification component and critiquing components; *generic critics* (defined at design time) → *specific critics* (information only known at use time)
- **create malleable systems** by integrating *adaptive and adaptable* components
- **support learning on demand**

Some Challenging Research Problems

- **identify user goals from low-level interactions**
  - active help systems
  - data detectors
- **integrate different modeling techniques**
  - domain-orientation
  - explicit and implicit
  - give a user specific problems to solve
- **capture the larger (often unarticulated) context and what users are doing** (especially beyond the direct interaction with the computer system)
  - embedded communication
  - ubiquitous computing
- **reduce information overload by making information relevant**
  - to the task at hand
  - to the assumed background knowledge of the users
- **support differential descriptions** (relate new information to information and concepts assumed to be known by the user)

Super-Appliances versus Domain-Oriented Tools

What are the Tradeoffs?

- strengths and weaknesses of **Super-Appliances**
  - ……
  - ……
  - ……

- strengths and weaknesses of **Domain-Oriented Tools**
  - ……
  - ……
  - ……

- **global considerations / analogies**
  - in biological systems, there is a tendency for specialised organisms to win out over generalised ones
  - Buxton's argument: "the evolution of technology will likely be no different"
  - rather than converging towards ever more complex multifunction tools → we must diverge towards a set of simpler more specialised tools

Educational Implications: How do we educate the "Renaissance Scholar" of the 21st Century?

- **claim:** the design principles that we can apply to the social engineering that addresses this issue are the same as those of the engineering of future information appliances.
  - weak-general vs strong-specific systems
  - discipline specialization vs general holistic knowledge

- given the **constraints on human ability** → how can we expect an individual to maintain the requisite specialist knowledge in their technological discipline, while at the same time have the needed competence in industrial design, sociology, anthropology, psychology, etc.,

- Renaissance man and woman have **not** been viable for the past 300-400 years → the world has simply become too complex

- the notion of ***renaissance team*** is entirely viable: a social network of specialists from different disciplines working as a team with a common language →