

Augmentation of Intellect: From Engelbart 1960 to SILS 2007

INLS 818

IT advantages

- Faster
 - Time to task completion
- Better
 - Qualitative differences?
- More
 - Manage complexity?

Engelbart's Process Hierarchies Human

Level N0: physiological/neural

Level N1: Specific Function/structures (e.g., memory)

STM/LTM

knowledge representation (semantic net, frame, scripts, mental models)

Level N1+N2: General Functions

perception (recognition)

memory

computation (compare, aggregate)

motor control

inference/logic

expression/representation

Engelbart's Human Process Hierarchies cont'

Level N1+N2+N3: Complex Functions

reading

writing

listening

speaking

walking, moving

problem solving

decision making

Level N1+N2+N3+N4: Thinking

Process Hierarchies

Artifacts and Impacts

	WWW	Book	Paper & Pencil
Perception			
Storage			
Representation			
Processing			
Movement			

Human Information Processing (Cognitive)

Recognize

Recall

Match Pattern

Compute

Apply

Analyze

Synthesize

Evaluate

Create

Augmentation of the Intellect

Calculator- - - Supercomputer

Spell Checker

Thesaurus, Grammar/Style Checker

Visual Representations- - - Media Shifts

Simulations, scientific visualizations

Spreadsheets, Decision Support Systems

Email, listservs, blogs

Groupware, wikis

Online Databases (LAN and WAN, free/fee)

Federated databases/Interoperating digital libraries—the Sharium

Spam filters, virus checkers, ID managers, autocompletes

User models

Change

- Today's IT change is not unprecedented.
- People are energy and time conscious.
- Technology changes quickly, people and institutions change slowly.

Storage

3000 BC	Clay Tablets	1 character/cubic inch (cci)
1450 AD	Printed Page	500 cci
1990's	Optical Disc	125,000,000,000 cci

Today: 1000 300-page books on a CD

Technoeffect: IT capability creates more demand—from HD video to TB/day streams

Computation

5000 BC	Abacus	2-4 instructions per second (ips)
1945 AD	Computer	100's ips
1960's	Computer	100,000's ips
1970's	Computer	1,000,000's ips (MFLOPS)
1980's	Computer	10,000,000's ips
1990's	Computer	1,000,000,000's ips (GFLOPS)

Technoeffect: IT capability creates more 3D voxel rendering

Transmission of Information

4000 BC	Messenger	.01 words per minute (wpm)
1844 AD	Telegraph	50-60 wpm
1980's	Cable/Fiber	1,000,000,000 wpm (GBPS)
1990's	Fiber	100,000,000,000 wpm

"Within a decade or so we will be able to send all human knowledge past your house in a few seconds".

Eric Sumner, 1990 (President IEEE) [oops]

Technoeffect: IT capability creates more demand—access your life stream everywhere

Human Processing

4000 BC Written Language 300 words per minute (wpm)

Today Written Language 300 wpm

4000 BC Visual Images 100,000,000 "bits per glance"

Today Visual Images 100,000,000 "bits per glance"

4000 BC Spoken Language 120 wpm

Today Spoken Language 120 wpm

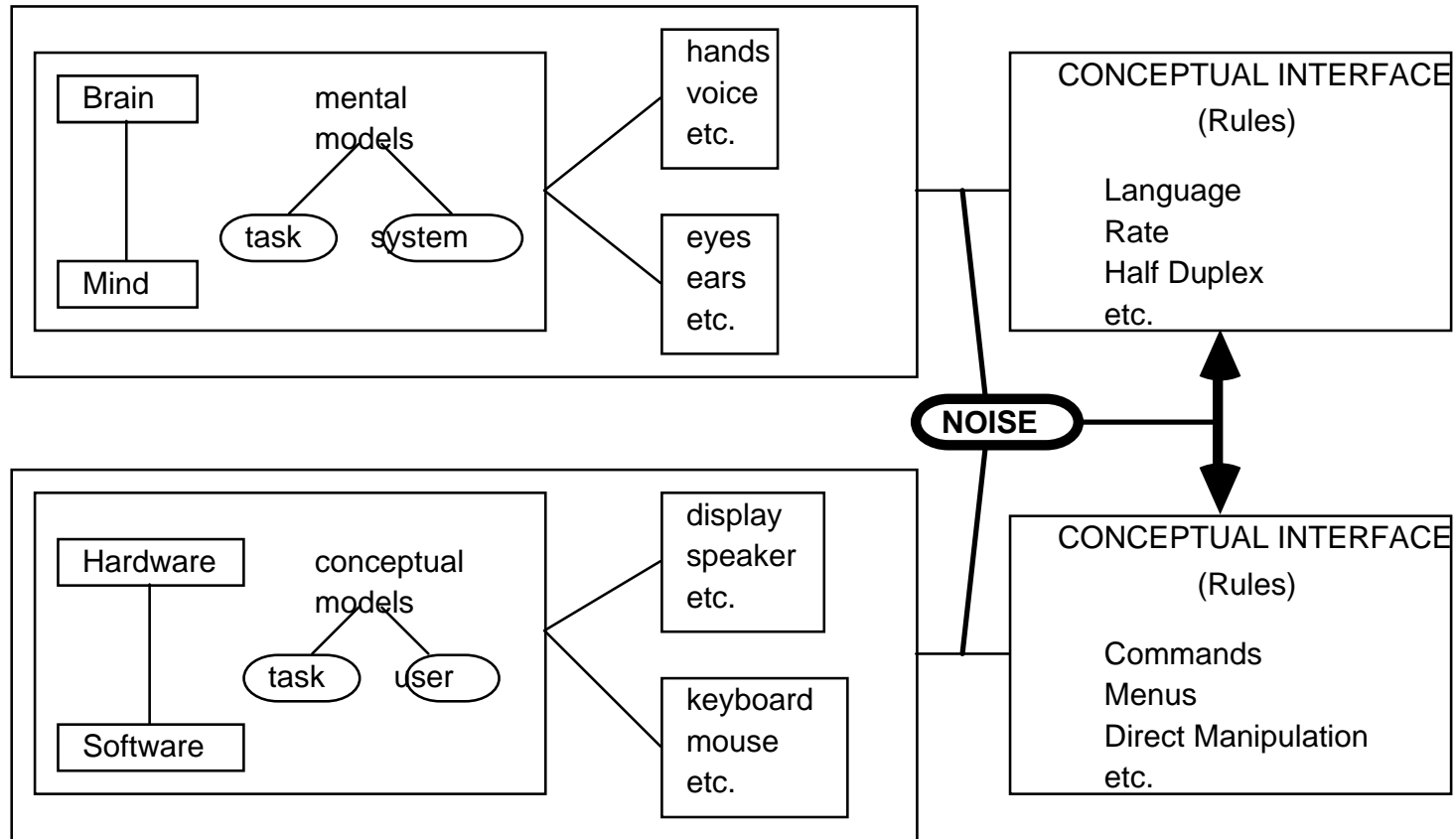
Human-Computer Communication

<u>Participants</u>	<u>Speed</u>	<u>Channels</u>
Human-Human	120-300 wpm	Multiple, rich, analog
Computer-Computer	1 billion wpm	single, digital
Human-Computer	120-300 wpm	single/few, digital

**The computer slows down for us;
We give up fidelity for the computer.**

Human-Computer Communication Model

A user-oriented model that has driven R&D. Evaluation based on user time, accuracy, and satisfaction. A problem is explicit turn taking.



Beyond Cognitive Augmentation

- Englebart's Bootstrap Institute: augment society
- What about the affective domain? (searching the web is an emotional roller coaster—Tenopir); Norman's 'emotional design; Nahl's affective info behavior)
- What about the spiritual domain?
- Clark's tripartite objective reality
 - Mind, body, environment
 - People are situated in increasingly sensor-rich environments