

# *i213 User Interface Design and Development*

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## Is HCI a Discipline?

Dedicated conferences, journals and associations emerged in 70s and 80s

Includes researchers from CS, ISchools, Human Factors and Ergonomics, Information Systems, Cognitive Science, Psychology, Sociology, Industrial Engineering, Design, Art, etc.



*“In the beginning the computer was so costly that it had to be kept gainfully occupied for every second; people were almost slaves to feed it.”*

-- Brian Shackel

## Early Jobs

- 1) Operation
- 2) Management
- 3) Programming

# Human Factors & Ergonomics



Operators were first hands-on users

HF&E originated after WWI / WWII, for studying performance of fighter pilots

Research was on reducing training time, improving efficiency, and reducing the number of errors

- Improving the design of console buttons, switches, displays, ...

Increased affordability of mainframes (and later mini/micro-computers), led to business use of computers

Emergence of *Information Systems*, within schools of Management, focused on improving management decision-making

HCI was one of early research themes

*“The computer industry will be forced to become increasingly concerned with the usage of people, rather than with the computer’s intestines.”*

-- James Martin, Design of Man-Computer Dialogues, 1973

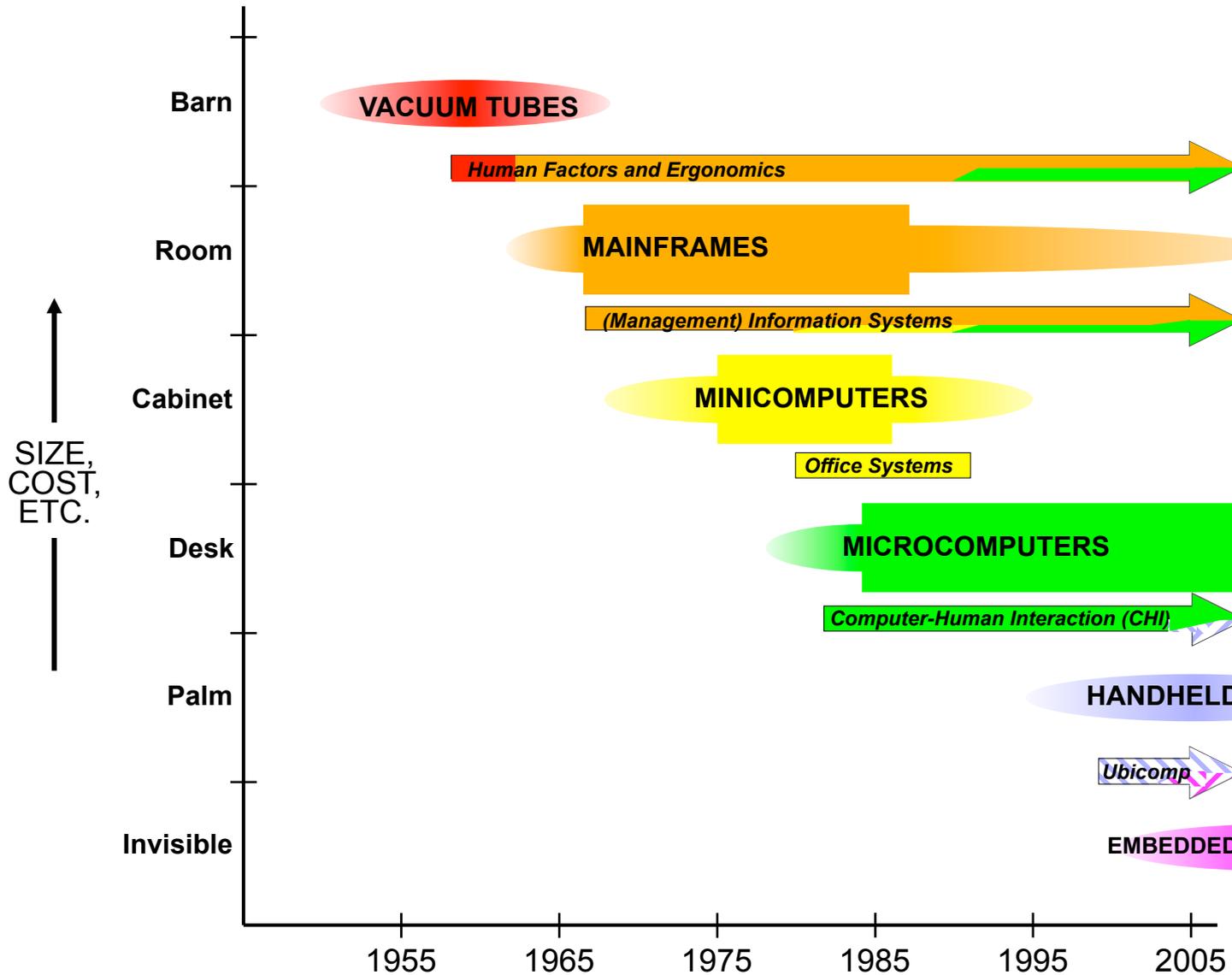


With the emergence of IBM PC in the early 1980s, computers began to be used by ordinary people, and not as part of their jobs

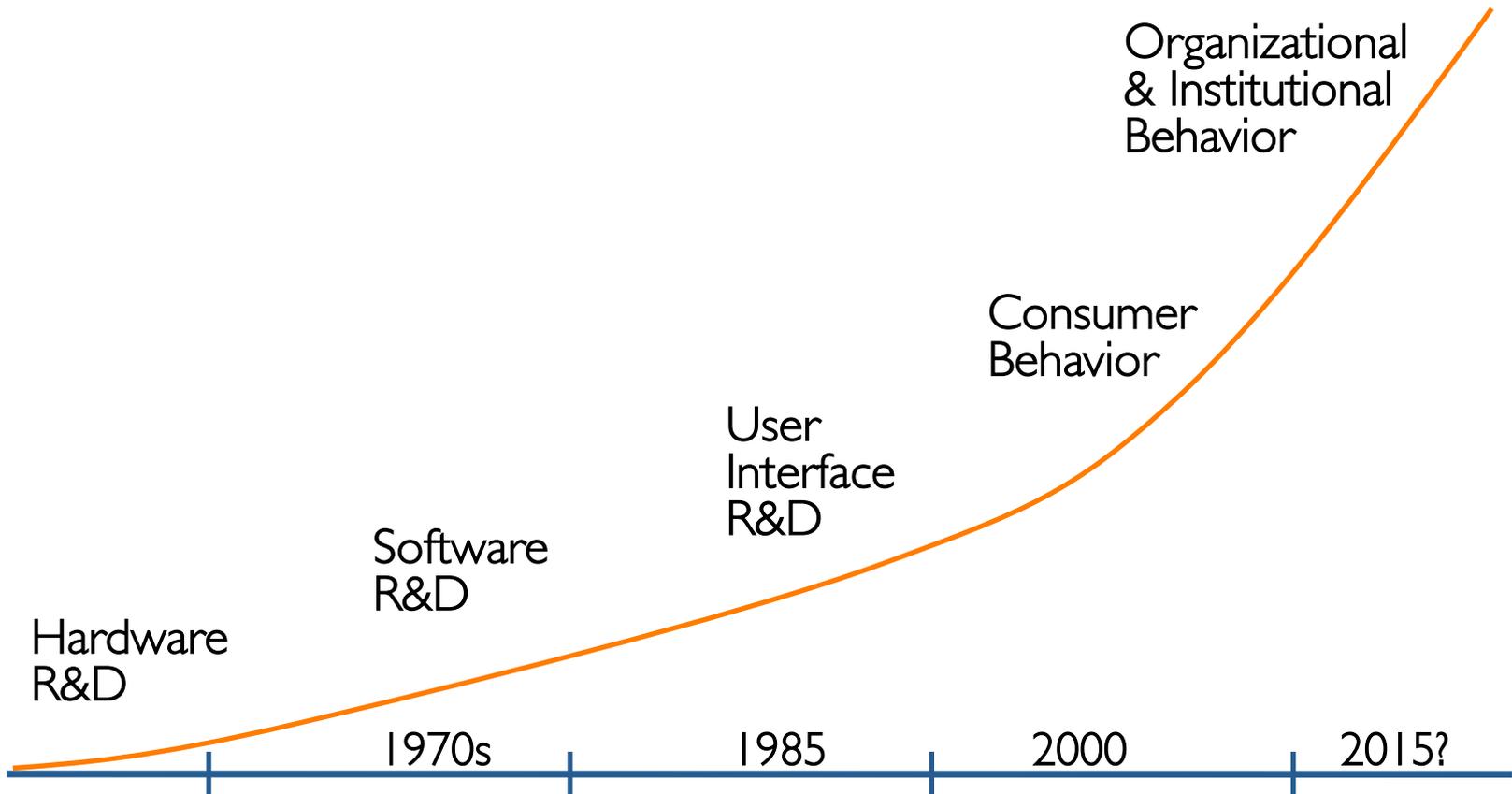
Many initial users were programmers

Early researchers had a background in Cognitive Psychology (including Card, Moran, Newell, Norman and others)

# Hardware Platforms and HCI Research Fields



# Impact of Hardware Changes

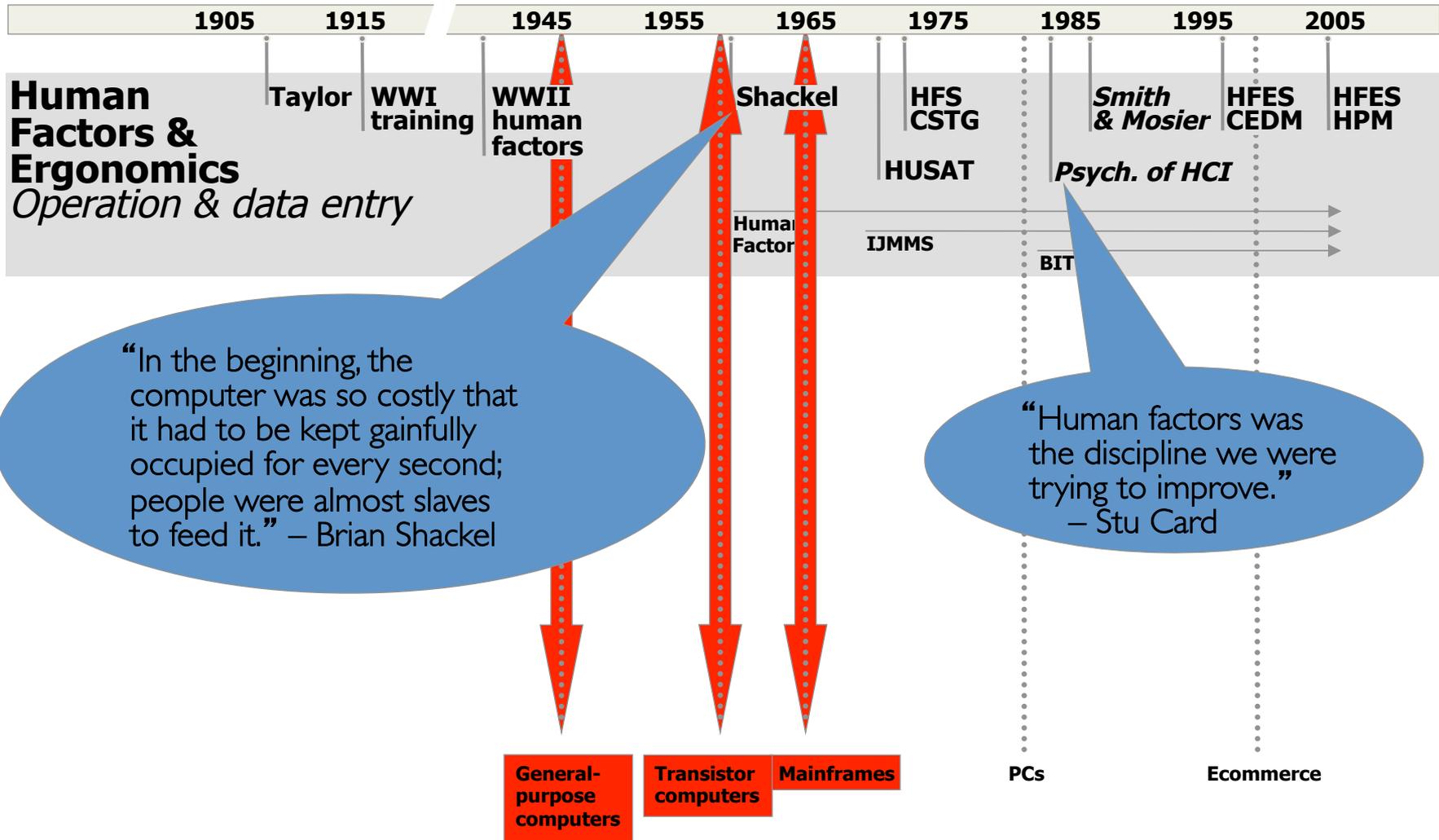


*“It’s not enough just to establish what people can and cannot do; we need to spend just as much effort establishing what people can and want to do”*

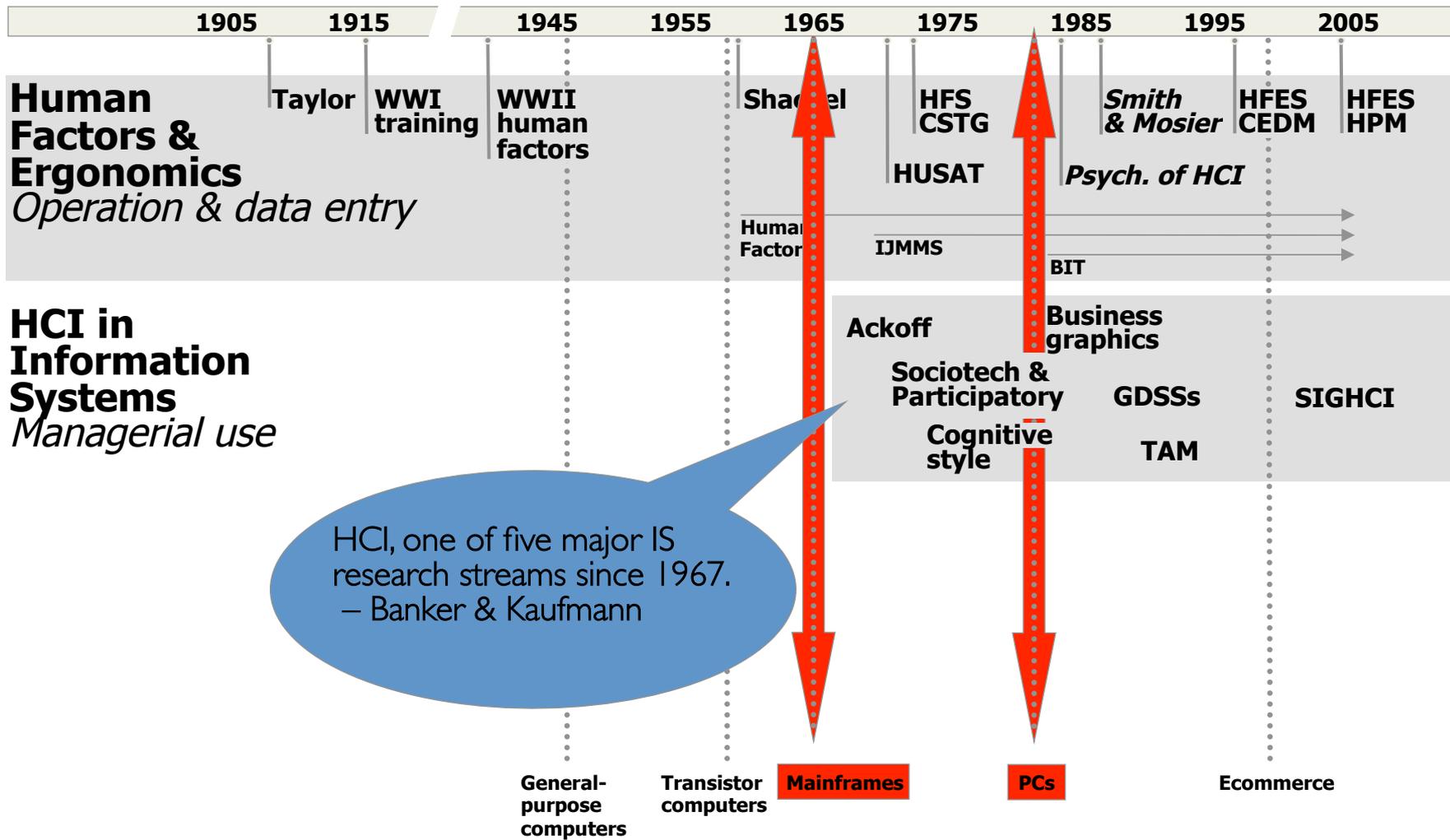
-- Smith & Green, Human Interaction with Computers, (1980)

# Human-Computer Interaction

- 1) Operation - *HF&E*
- 2) Management - *IS*
- 3) Programming - *HCI*



**Focus on non-discretionary use**

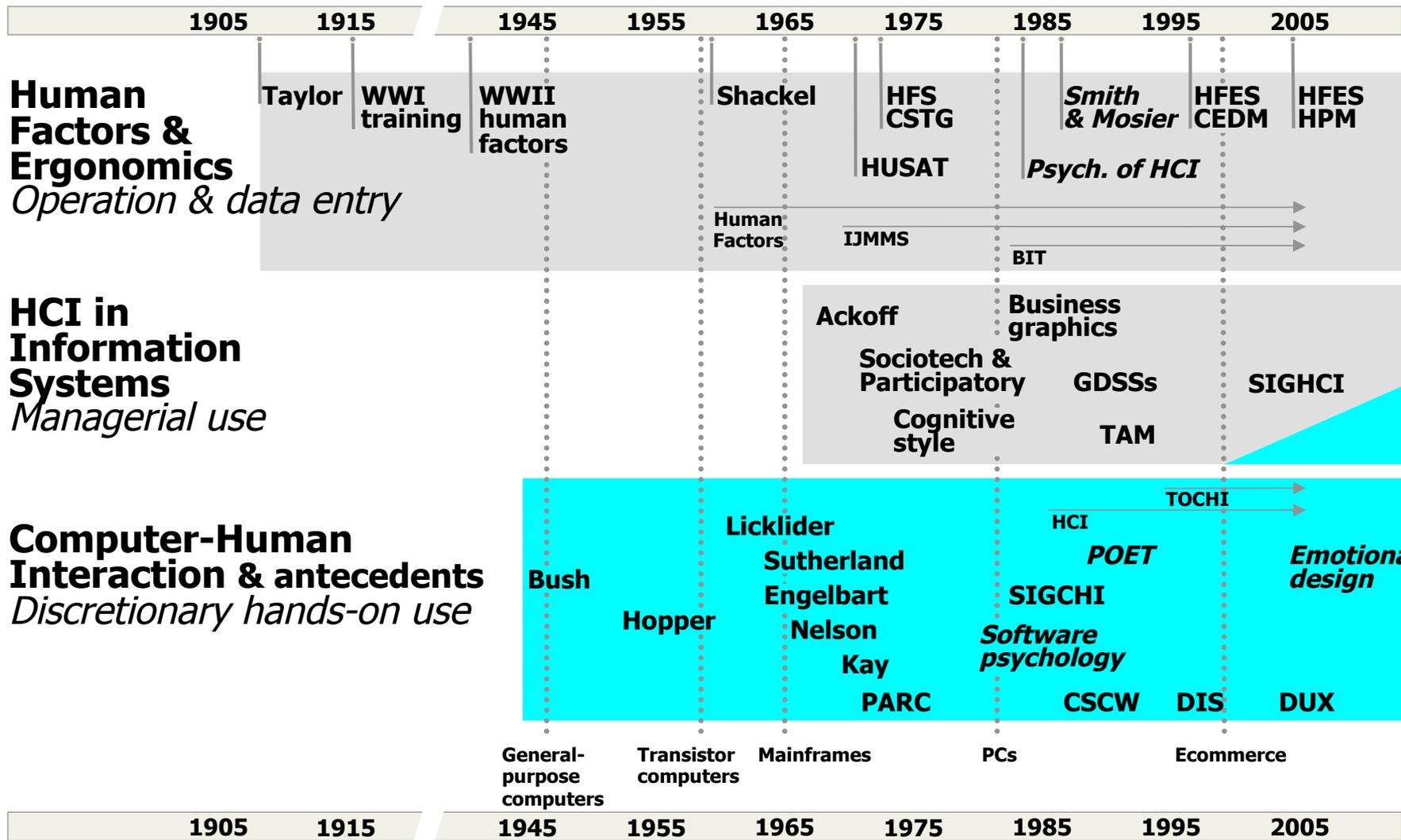


**Focus on non-discretionary use**

## Discretion in Computer Use

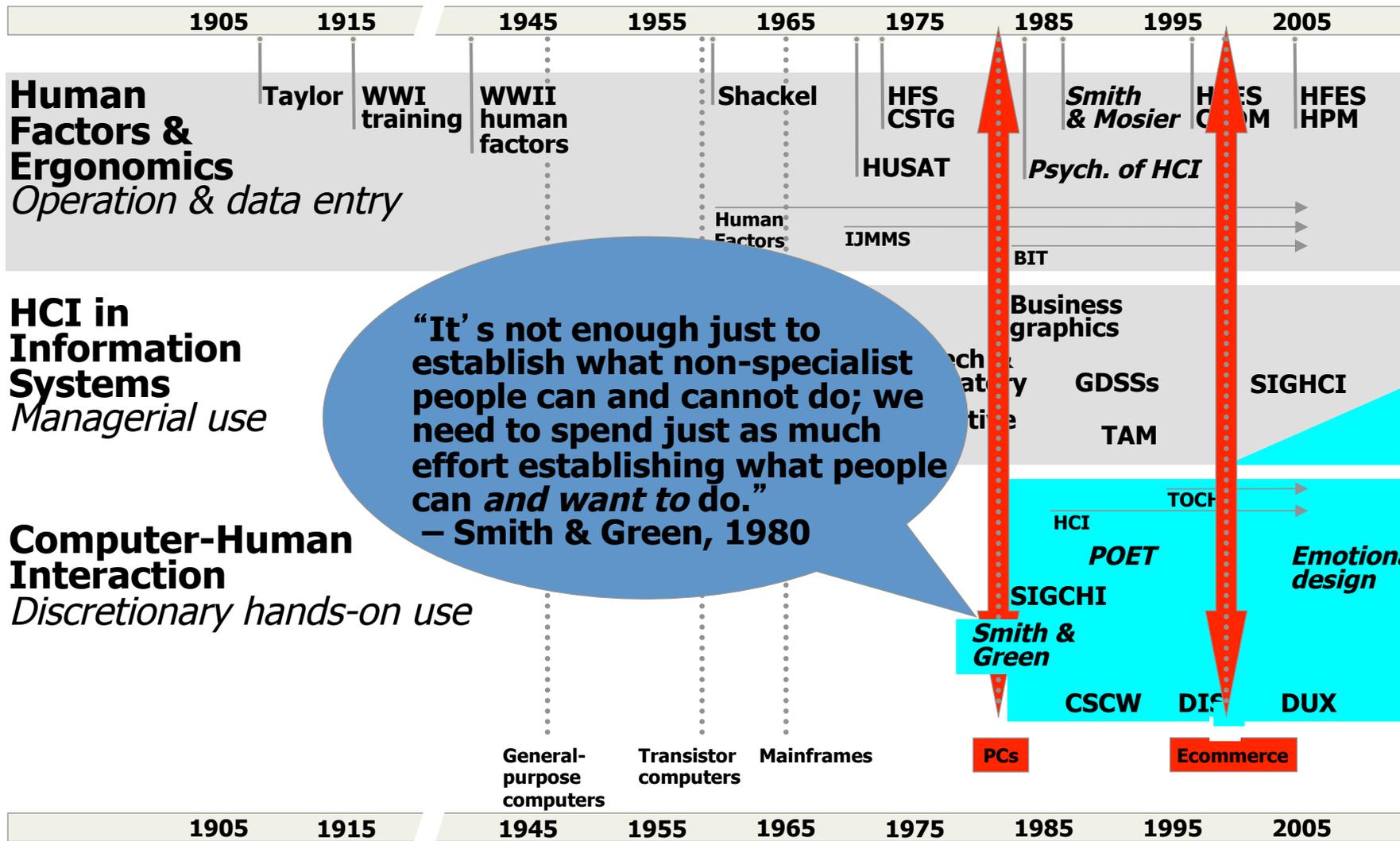
Computing jobs exist somewhere along a continuum between forced, repetitive tasks; and empowered, creative individuals

In 1979, John Bennett predicted that more discretionary use would lead to more concern for usability (and, as a result, for subjective metrics)



**Focus on non-discretionary use**

**Focus on discretionary use**



**Focus on non-discretionary use**

**Focus on discretionary use**

1905 1915 1945 1955 1965 1975 1985 1995 2005

**Human Factors & Ergonomics**

*Operation & data entry*

Taylor WWI training WWII human factors Shackel HFS CSTG HUSAT Smith & Mosier Psych. of HCI HFES CEDM HFES HPM

Human Factors IJMMS BIT

**HCI in Information Systems**

*Managerial use*

Ackoff Sociotech & Participatory Cognitive style Business graphics GDSSs TAM SIGHCI

**Computer-Human Interaction & Antecedents**

*Discretionary hands-on use*

Computer-Engineer Interaction Computer-Programmer Interaction Computer-Human Interaction

Hopper PARC Software psychology

“Freeing mathematicians to do mathematics.”  
– Grace Hopper

General-purpose computers Transistor computers Mainframes PCs Ecommerce

1905 1915 1945 1955 1965 1975 1985 1995 2005

Focus on non-discretionary use

Focus on discretionary use

“Text editors are the white rats of HCI.”  
– Thomas Green

1) Operation - *HF&E*

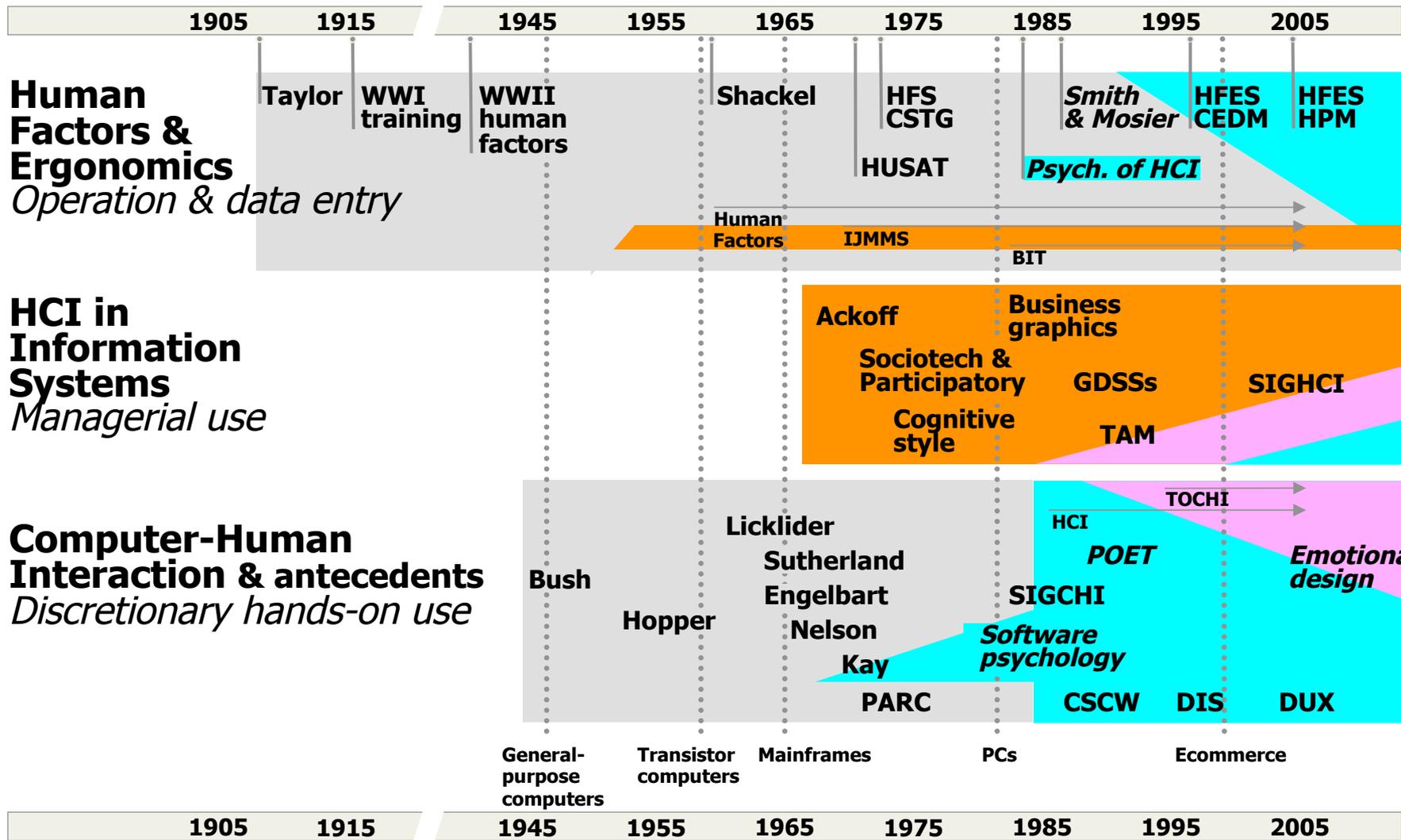
*Non-discretionary, hands-on*

2) Management - *IS*

*Discretionary, hands-off*

3) Programming - *CHI*

*Discretionary, hands-on*

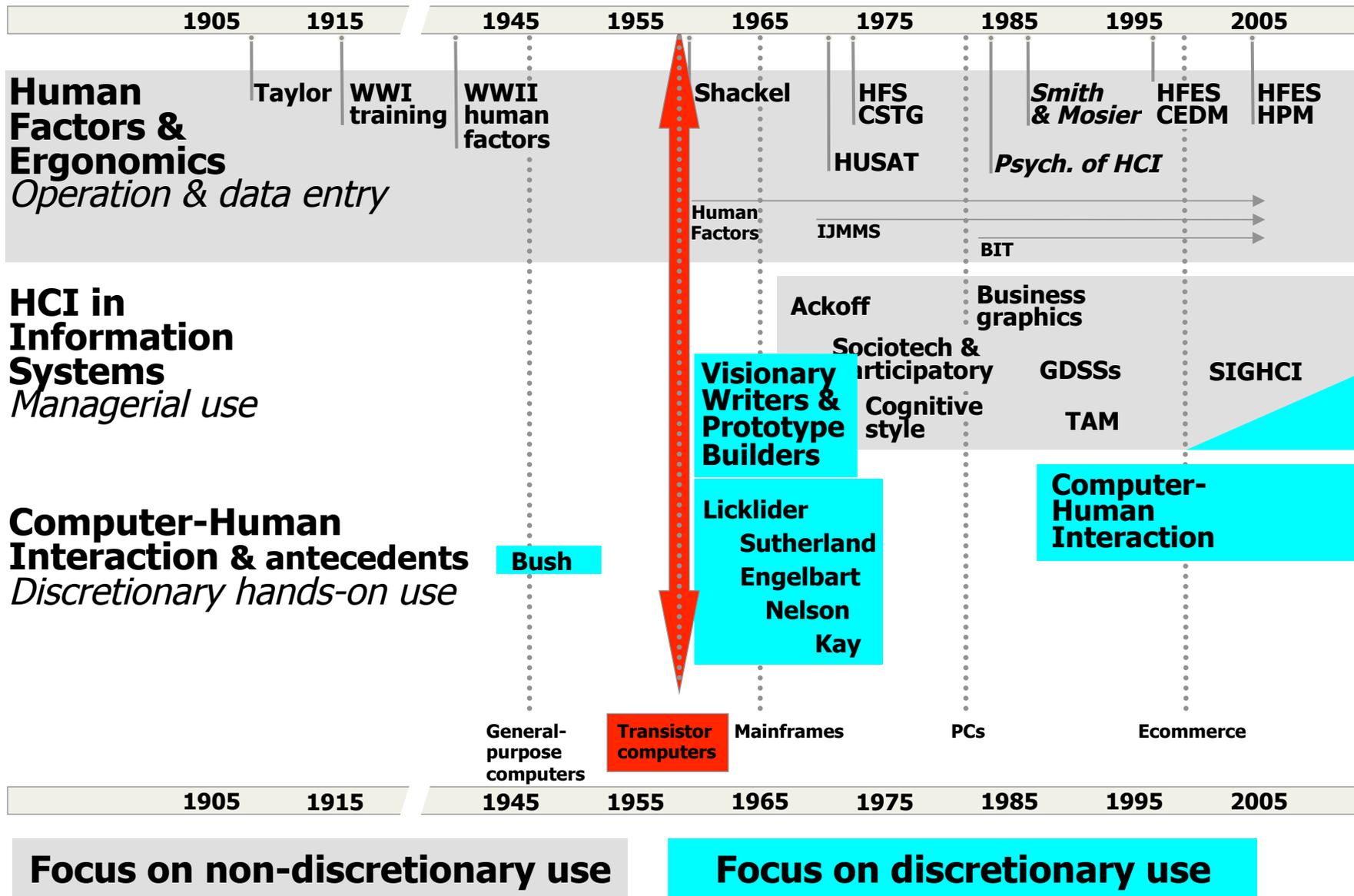


**Engineering Psychology**

**Industrial & Organizational Psychology**

**Cognitive Psychology**

**Social Psychology**



# Visionary: Vannevar Bush

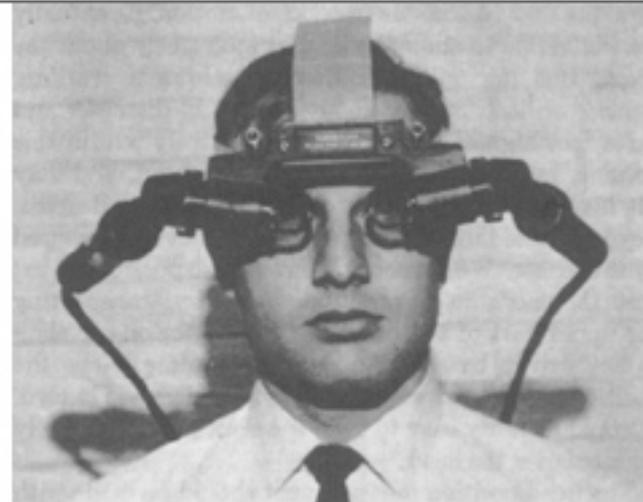
Professor and national science advisor - wrote *As We May Think* in 1945

Described the hypothetical Memex device, based on microfilm, that could be used to store, access, link, share and contribute to a global knowledge base

Led to Hypermedia, and the modern WWW

## Visionary: Ivan Sutherland

*"Without the fun, none of us would go on!" - Technology and Courage*



## Visionary: Ivan Sutherland

Sutherland's PhD thesis, *Sketchpad*, was a pioneering work in graphics and HCI

In 1963, this was one of the first GUI applications, using a light pen to create and edit interactive drawings

Inspired Windows, Icons, GUI, Object-Oriented Programming, CAD, etc.

[http://youtube.com/watch?v=USyoT\\_Ha\\_bA](http://youtube.com/watch?v=USyoT_Ha_bA)

<http://youtube.com/watch?v=BKM3CmRqK2o>

## Visionary: Douglas Engelbart

Engelbart's revolutionary 1968 demo (*the mother of all demos*) demonstrated the computer mouse, integrated text, graphics and video; real-time video conferencing, windowing, and the ancestors of email and word processing

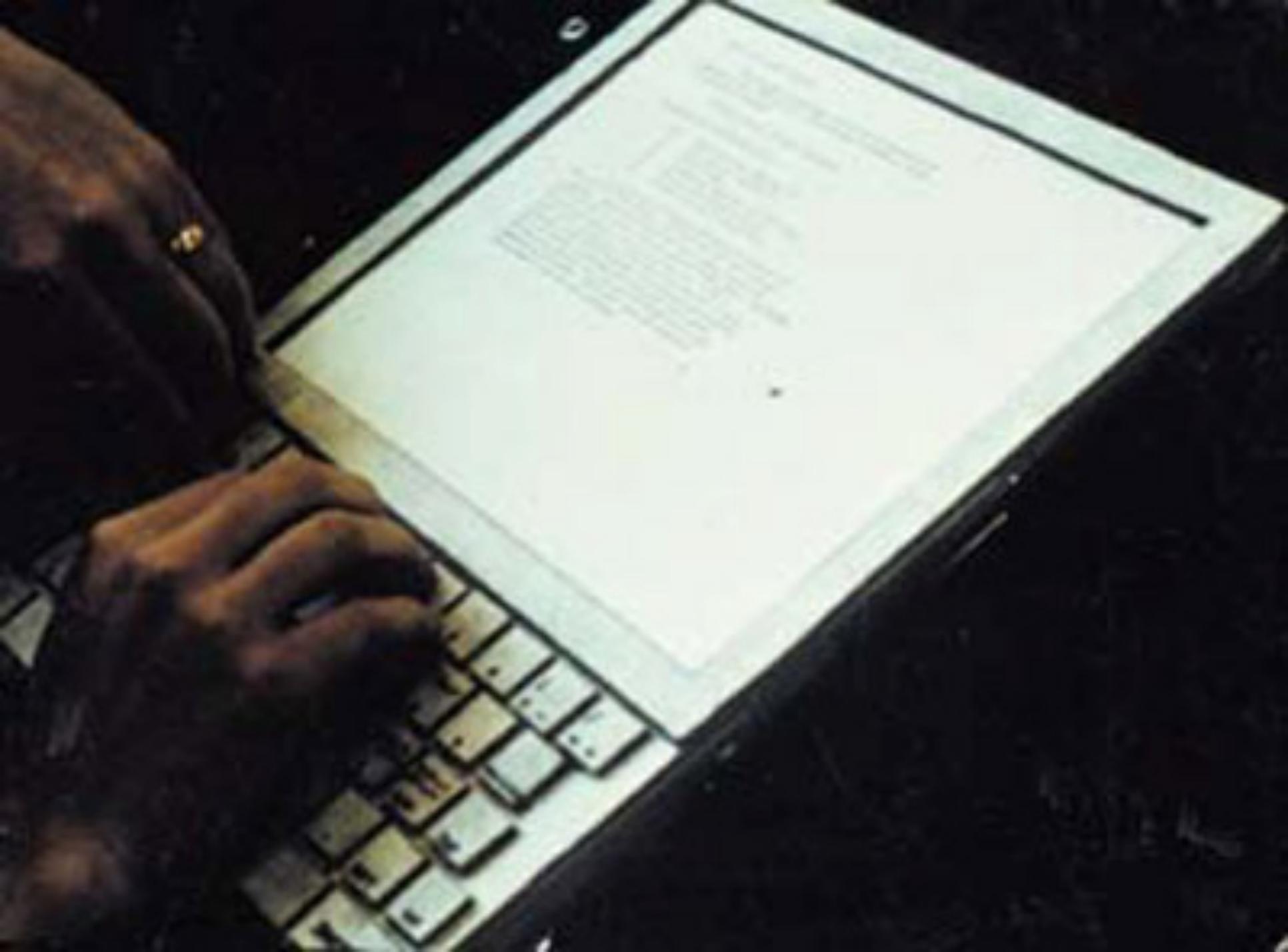
[http://www.youtube.com/view\\_play\\_list?p=3415B231F8D760C2](http://www.youtube.com/view_play_list?p=3415B231F8D760C2)



## Visionary: Alan Kay

Advised by Sutherland at the University of Utah, and later working at Xerox PARC, Alan Kay worked on the first GUI with overlapping windows, and developed the Smalltalk object-oriented programming language

His vision for the *Dynabook* (1968) presaged modern laptop and tablet computers



Visionary: Ted Nelson



Sociologist and philosopher who invented the idea of hypertext in 1963

*Project Xanadu's* initial goal was to support “non-sequential writing”, where readers could choose their own path through a literary work; later expanded to an interconnected network of digital objects

Many of these ideas were realized (incompletely, according to Nelson) in Tim Berners-Lee's WWW

## HUSAT and Xerox Parc

Two pioneering labs working on HCI, both founded in 1970

HUSAT, based in the UK, focused on human factors and ergonomics

PARC, based in the US, focused on new hardware, programming languages and environments

- Integrated the mouse, GUI, Ethernet, laser printing, object-oriented programming, and many other innovations in the Xerox Alto, which was the first modern PC (inspiration for the Macintosh)

Post-Mac, CHI began focusing on GUIs

- Needed programmers (CS researchers) to explore the design space
- More emphasis on quick-and-dirty lab studies, and qualitative methods
- Assimilated history of CS visionaries

Cognitive approaches (KLM, GOMS, etc.), focusing on expert use, eventually merged back with HF&E

CHI became focused on user-centered, iterative, prototype-based design (Gould and Lewis, 1983)

## Early CHI Conferences

1976 - User-Oriented Design of Interactive Graphic Systems  
(UODIGS) – SIGGRAPH

1981 - Joint Conference on Easier and More Productive Use of  
Computer Systems – SIGSOC

1982 or 1983 - First Conference on Human Factors in Computing  
Systems - SIGCHI (renamed from SIGSOC)

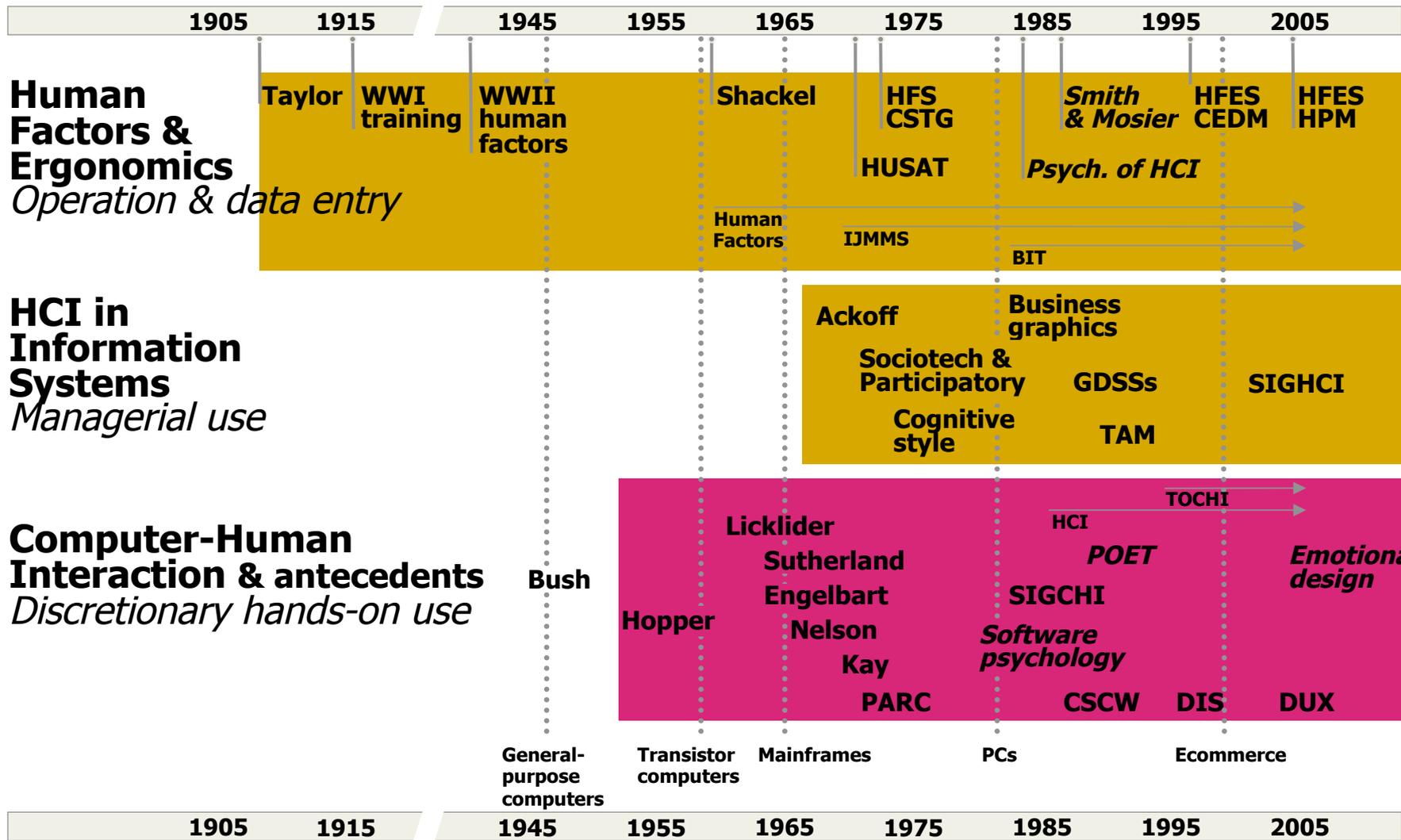
## Journal vs. Conferences

Most scientific disciplines use conferences for works in progress, and journals for finished work

HF&E and IS follow this tradition

CS (and HCI) researchers submit their best work to conferences, and rarely submit to journals

As a result, CS researchers think HF and IS conferences are poor quality, and HF and IS researchers have difficulty getting their preliminary work into CHI



**Journal-oriented field**

**Conference-oriented field**

*Operator* - a hands-on computer user

*Task Analysis* - organizational decomposition of work

*Implementation* - deployment of a system within an organization

*Man-machine interface*

Focus on expert, skilled use

Overall goal is *Automation*

Funded by government, military

*User* - a hands-on computer user

*Task Analysis* - cognitive decomposition of a task

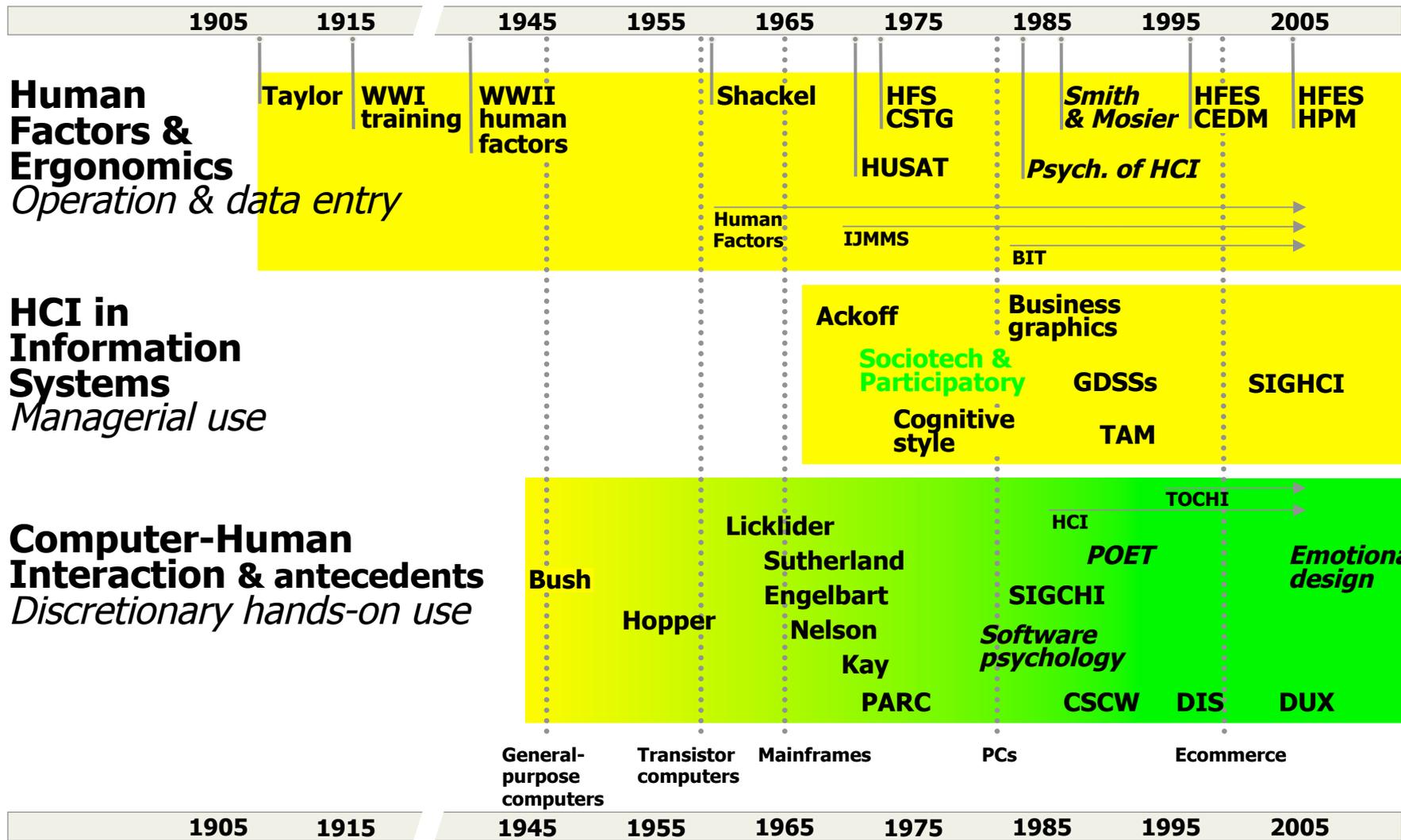
*Implementation* - a programmed software artifact

*Human-computer interface*

Focus on novice, initial use

Overall goal is *Augmentation*

Funded by software companies

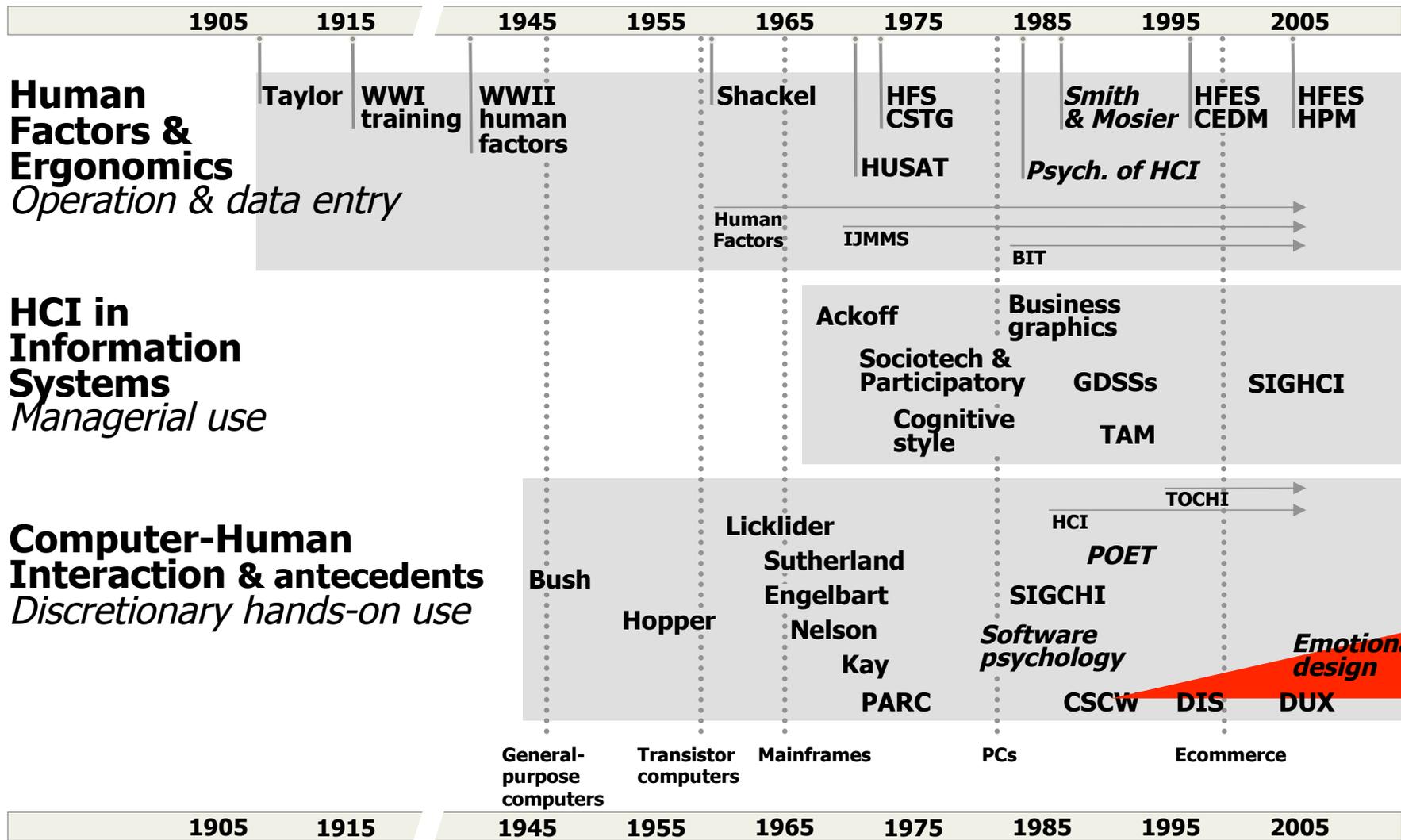


**Pre-60' s man-machine culture**

**Post-60' s human-computer culture**

*“[W]e use the same methods, we study the same things, but we do it to get new ideas, and they do it to improve what already exists.”*

-- Edie Adams (speaking from the CHI perspective)



**Design**

## Current Status

### Human Factors & Ergonomics

- Adopted many cognitive modeling approaches from early CHI research
- Few breakthroughs

### Information Systems

- Subsumed by other management disciplines
- Aligning closer to CS / CHI

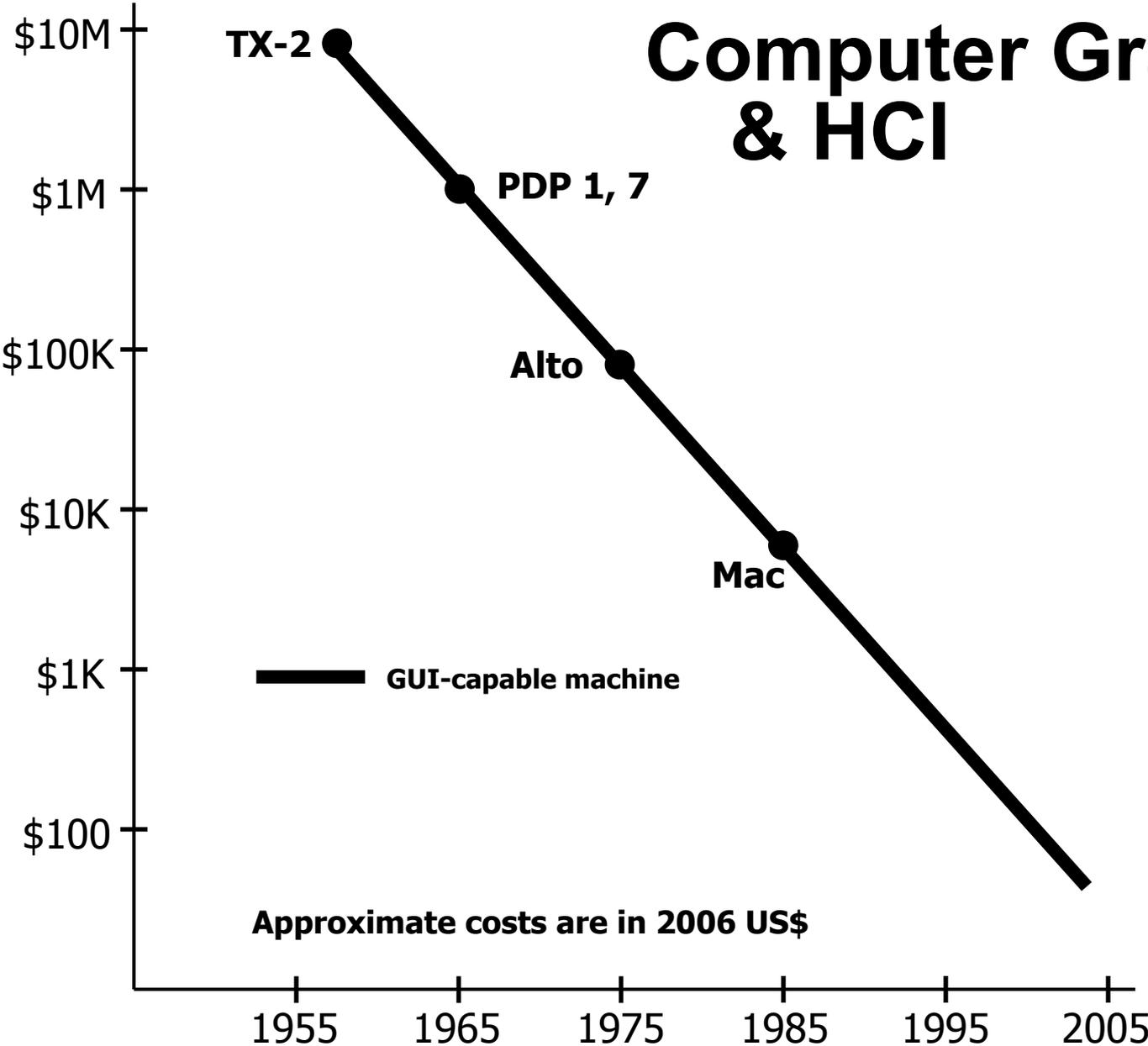
### Computer-Human Interaction

- Still on the fringe of Computer Science
- Are I-Schools the future?

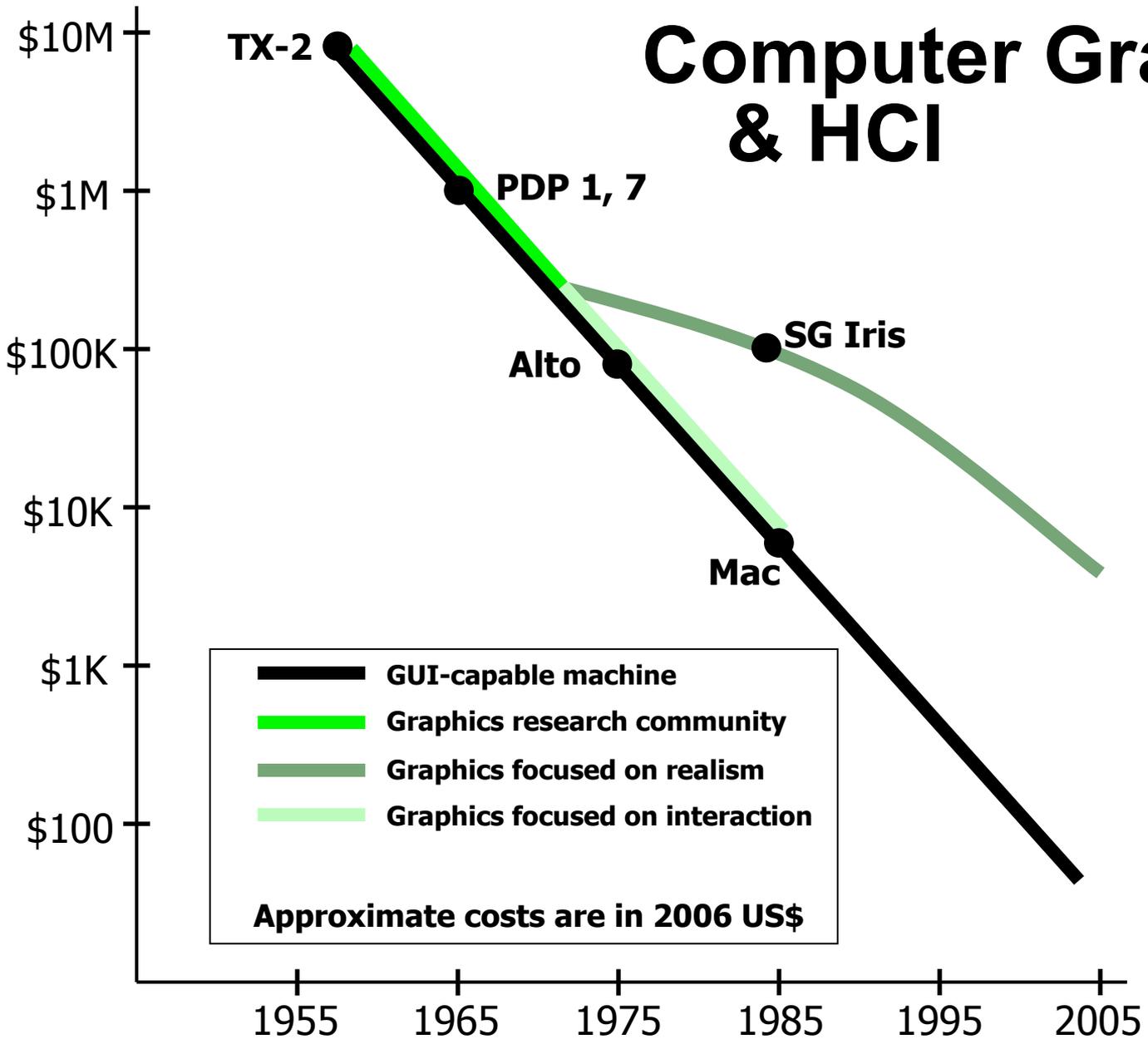
*“Your Quote here”*

-- Student, INFO 213

# Computer Graphics & HCI



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