

Activity Theory and HCI

Implications for user interfaces

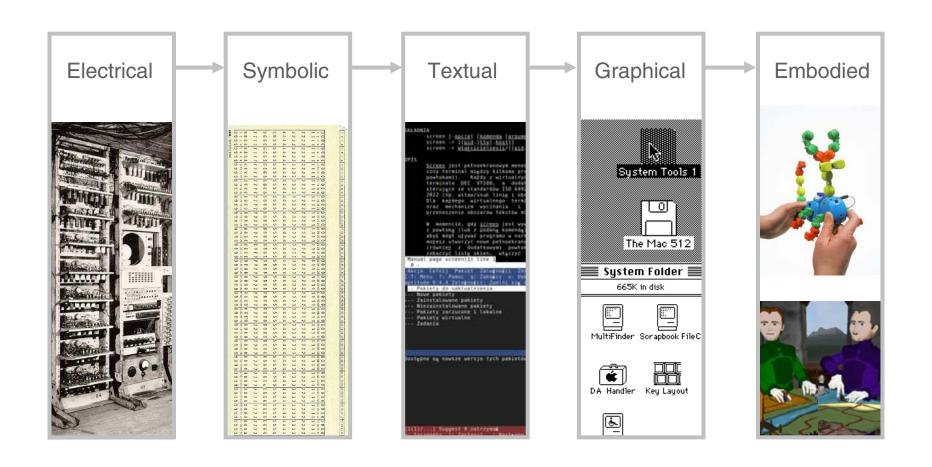
Lecture Outline

- Historical development of HCI
- Activity theory in a nutshell
- Activity theory and design implications for HCI

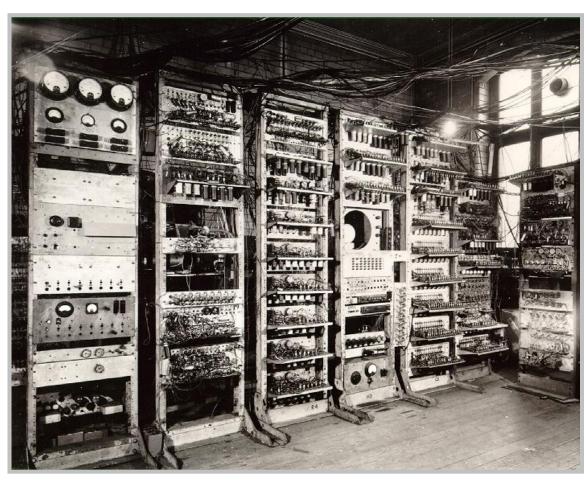
Historical Development of User Interfaces

From electrical to embodied interactions

"Our experience using computers reflects a tradeoff made more than 50 years ago. We are now in a position to reconsider the trade-off." From *Where the Action Is* (Dourish, 2001)



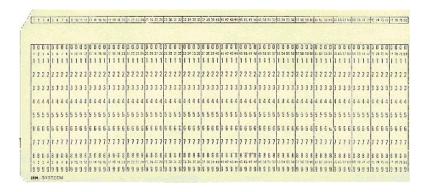
Electrical



- Special purpose devices (e.g., automatic calculation of missile trajectories, patterns in coded messages)
- To program the machine for different tasks, electrical circuits need to be changed
- Interacting with the system required a thorough understanding of the electronic design

The Small Scale Experimental Machine, AKA "Baby" built at Manchester University in 1948.

Symbolic



- Introduction of programming systems
- More regularized instructions available across a wider range of machines
- Symbolic forms of interaction is not textual (e.g., punched cards)





IBM 29 card punch (circa 1950's)

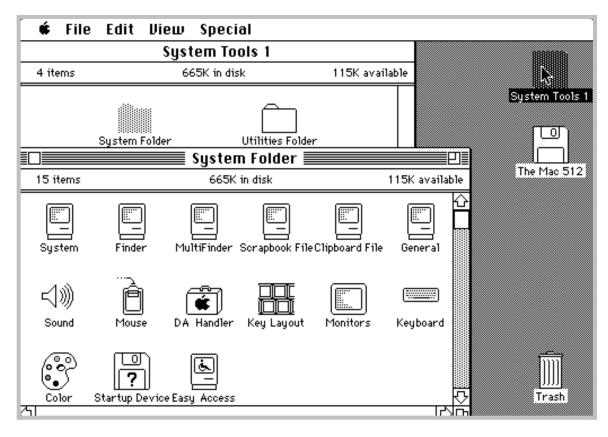
Textual

Electrical

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- Takes advantage of the best-developed form of symbolic interaction: written language
- More like a "dialog"

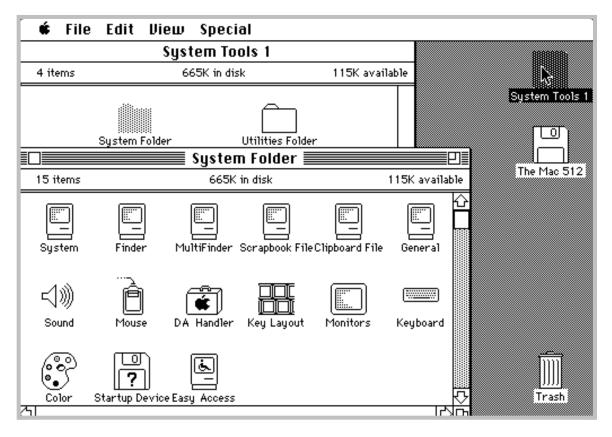
Graphical



Turning interaction into two-dimensional space rather than a onedimensional stream of characters

Macintosh System 4.2, 1987

Graphical



- Peripheral Attention
 Primary space, secondary space (e.g., windows and dashboards)
- Pattern recognition and spatial reasoning
 Opportunities to arrange data spatially
- Information density
 A picture really can be worth
 a thousand words (e.g.,
 diagrams)
- Visual metaphors
 File cabinets, trashcans, desktop tools

Macintosh System 4.2, 1987

Tangible Interaction



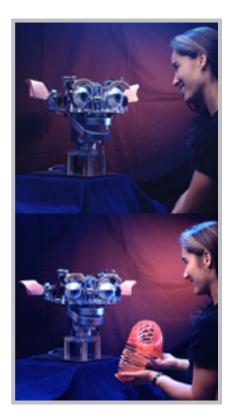


- Computation that moves beyond desktop
- Interaction is incorporated more richly in our daily experience of the physical world

Electrical

Historical Development of HCI

Social Computing



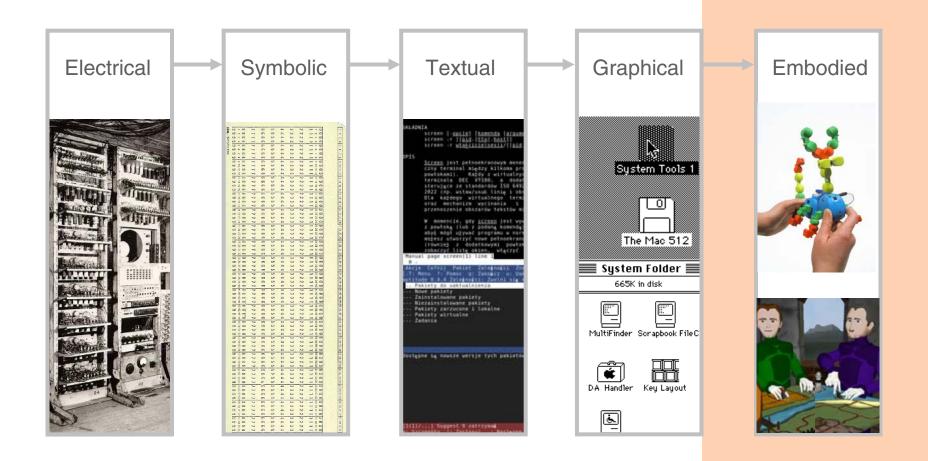


Spark (Vilhjálmsson, 2004)

 The application of sociological understanding to the design of interactive systems

Kismet (Breaseal, 2000)

Embodied Interaction



"Computer reaching out"

The scope of human-computer interaction is expanding to include larger-scale, longer-term phenomena of computer use. Interaction moves from being directly focused on the physical machine to incorporating more and more of the user's world and the social setting in which the user is embedded. (Dourish, 2004)

Activity Theory and HCI

From human factors to human actors

Attempts to incorporate human activity in interaction design have led to ideas of "activity-based," "activity-centered," or "activity-centric" computing. How people actually use technology at work and play.

Aims to understand individual human beings, as well as the social entities they compose, in their natural everyday life circumstances, through an analysis of the genesis, structure, and processes of their activities.

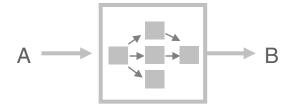
Brief Background



Brief Background



Behaviorist (circa 1930's)
Observable behaviors

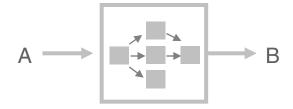


Cognitivist (circa 1950's – 1990's) Mental models

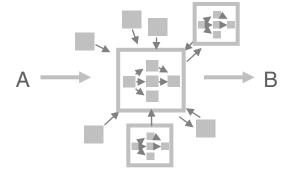
Brief Background



Behaviorist (circa 1930's) Observable behaviors



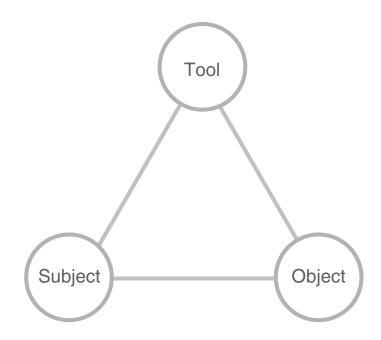
Cognitivist (circa 1950's – 1990's) Mental models



Social Constructivist (circa 1950's – 1990's) Activities and context

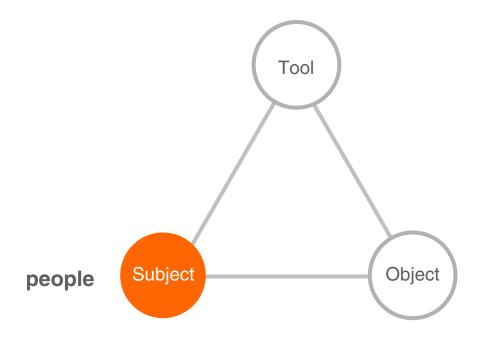
Unit of Analysis

People act as *subjects* in the world, constructing and instantiating their intentions and desires as *objects*.



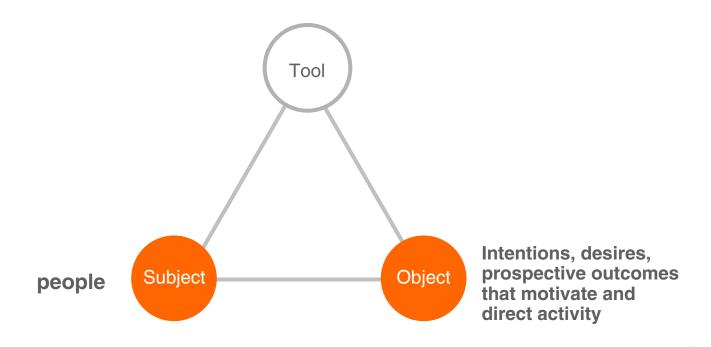
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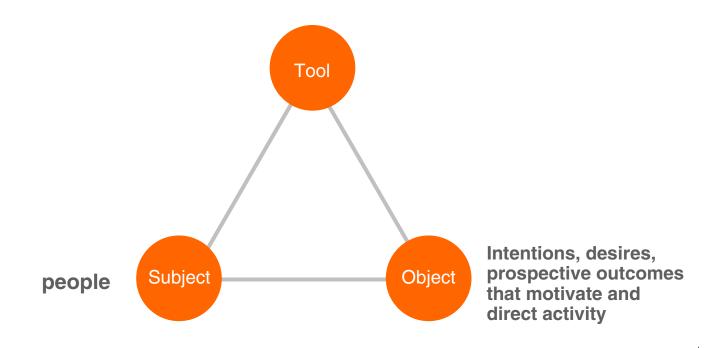
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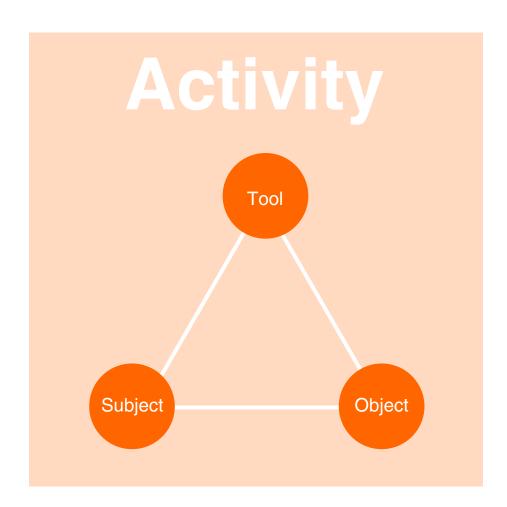


Unit of Analysis

Tools mediate between people and the world. Activity theory casts the relationship between people and tools as one of *mediation*.

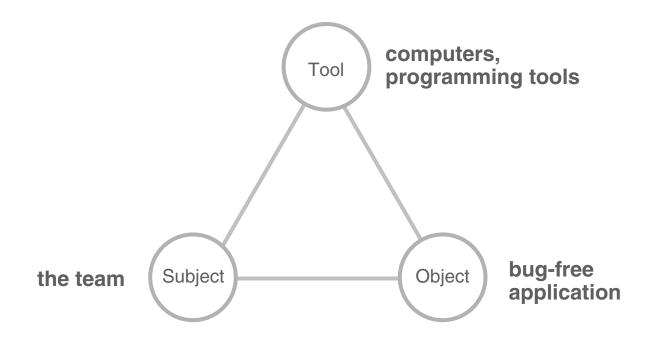


Unit of Analysis



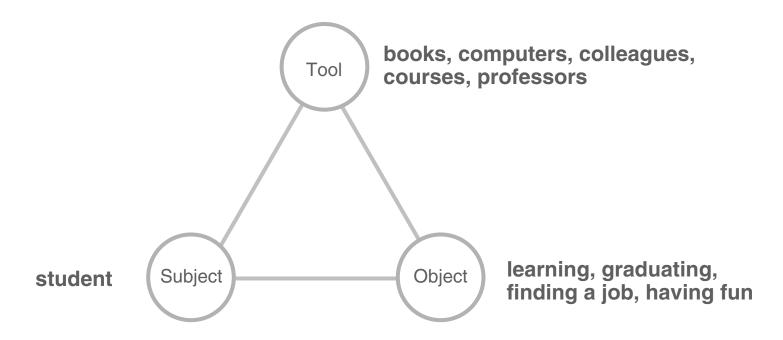
Example 1

A software team programming a system for a client



Example 2

Being a graduate student at UC Berkeley



Activity Theory Concepts

- Hierarchical structure of activity
- Object-oriented
- Internalization and Externalization
- Tool mediation
- Development

Hierarchical Structure



Hierarchical Structure

Example 1



Hierarchical Structure

Example 2



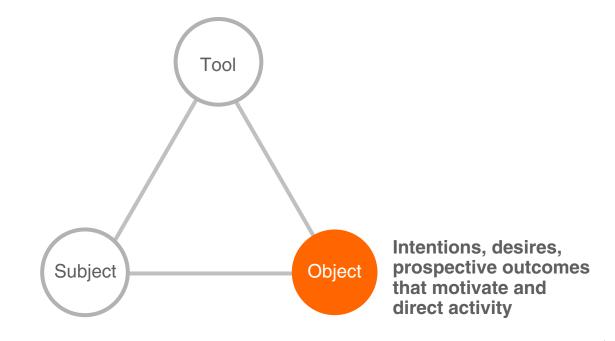
Hierarchical Structure

Example 3



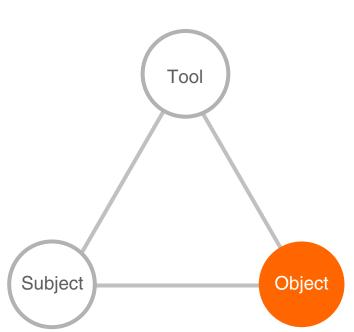
Object

Object gives meaning to what people do



Object

Can be physical thing or ideal object

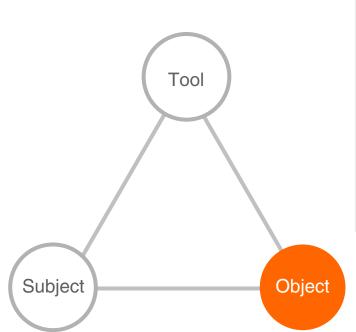


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Intentions, desires, prospective outcomes that motivate and direct activity

Object

The world provides **resistance** and **affordances** to our attempts to reach the object of our activities



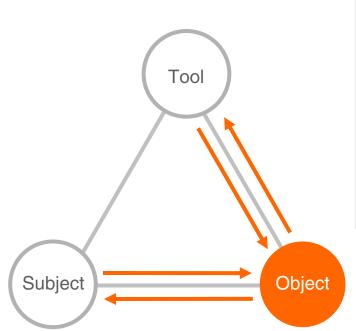
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Intentions, desires, prospective outcomes that motivate and direct activity

Object

Object is shaped by explicit and implicit rules, norms, and requirements existing in the local and the wider community



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Intentions, desires, prospective outcomes that motivate and direct activity

Internal and External Activity

Internal activity: Counting numbers in your head

External activity: Counting numbers with your fingers

Activity Theory: Internalization / Externalization

Internalization

Transformation of external activities into internal ones. Means for people to try potential interactions with reality without performing actual manipulation with real objects (mental simulations, imaginings, considering alternative plans, etc.).



Activity Theory: Internalization / Externalization

Externalization

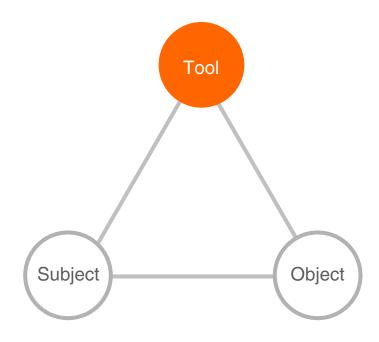
Transforms internal activities into external ones. It is important when a collaboration between several people requires their activities to be performed externally in order to be coordinated.



Activity Theory

Tools and Mediation

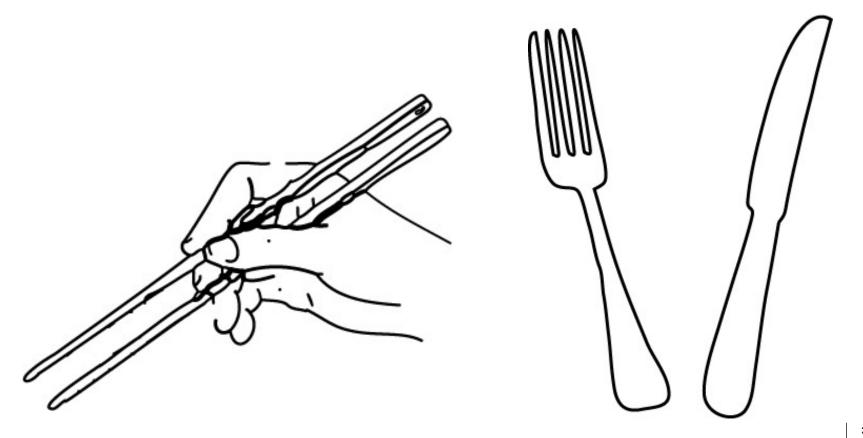
Tools shape the way human beings interact with reality. The shaping of external activities eventually results in the shaping of internal ones, and vice versa.



Activity Theory

Tools and Mediation

Use of tools is an accumulation and transmission of social knowledge.



Activity Theory

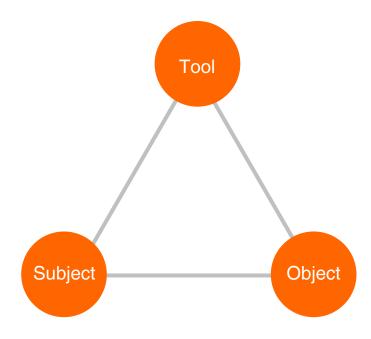
Development

Human activity unfolds over time in a historical frame.

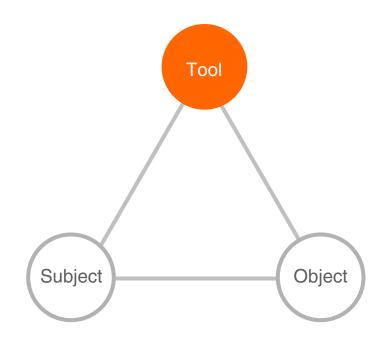
The long view: we cannot understand activity if we do not watch it cycle, grow, change. It would be desirable to establish a practice of design in which the development of users – their ability to grow and change with technology.

Activity Theory: Summary

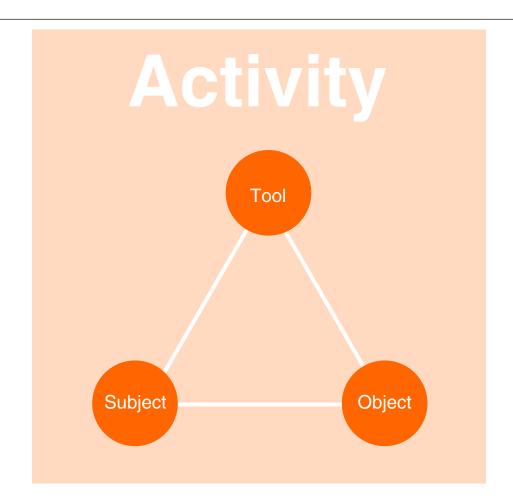
- Hierarchical structure of activity
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Why Should We Care about Activity Theory?



Designing Human Activities, Not Just Tools

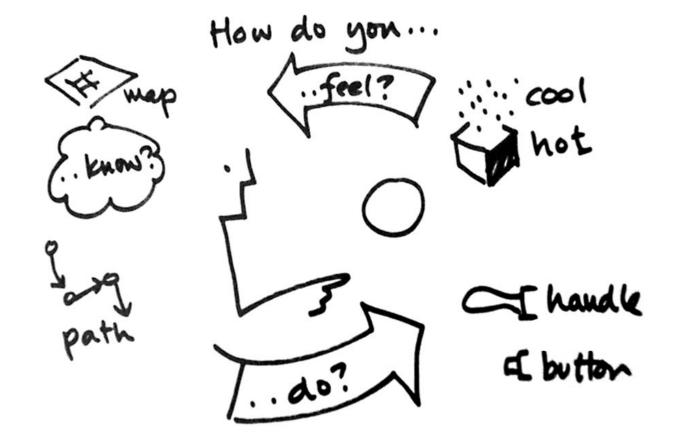


Designing Interactions

From designers' perspective

The term "interaction design" was coined by Moggridge in late 1980's. A new design discipline, dedicated to creating imaginative and attractive solutions in a virtual world, where one could design behaviors, animations, and sounds as well as shapes.

Designing Interactions



Theory and Practice of Tangible User Interfaces

Next Tuesday (Sept 10, 2007)

- Designing Interactions
- Tangible Bits

For Thursday (Sept 6th, 2007)

- Don't forget to bring your lab kit on Thursday
- Post your lab homework (blinking LED) on the course website
- Office hours this week: Tuesday (today), 3:30-4:30 in 110 South Hall

Thanks!