Fundamentals of Human-Computer Interaction

Photos/collage by Jack L. Moffet in Dan R. Olsen, « Interacting in Chaos », Interactions, sept-oct 1999.

Michel Beaudouin-Lafon
Université Paris-Saclay
mbl@lri.fr

Master Informatique - Université Paris-Saclay

Outline

Human-Computer Interaction

Interaction

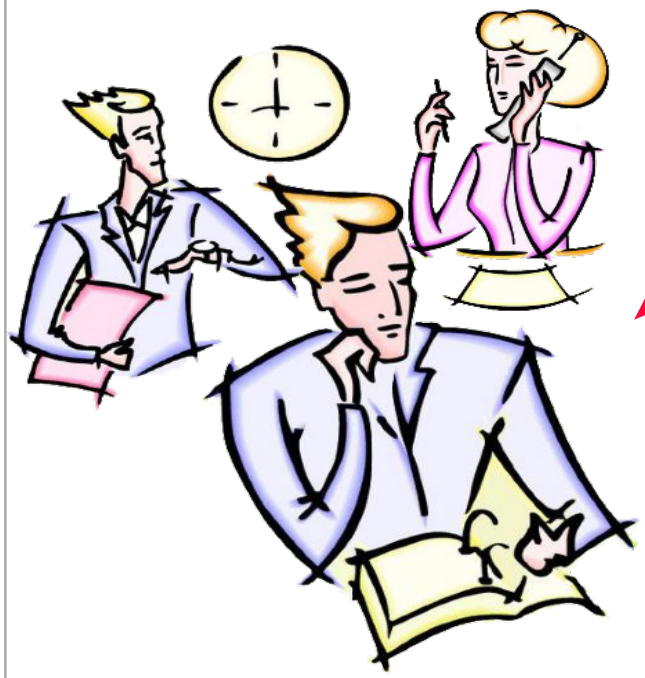
phenomenon
do be
controlled

Capabilities: action,
perception, cognition

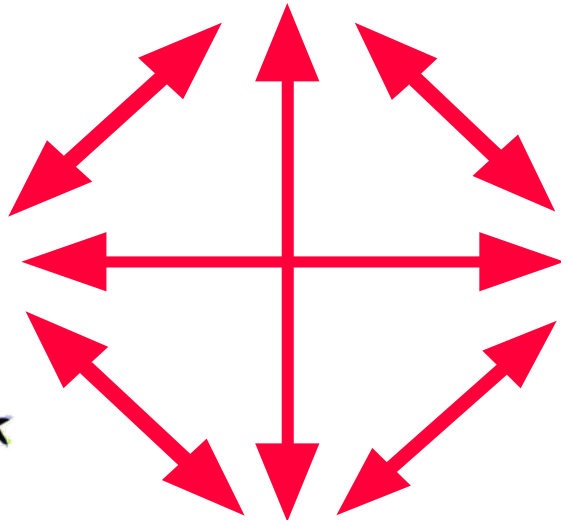
Capabilities: computation,
storage, input/output

Environment: physical, social,
organisational, cultural, etc.

In the real world: *Situated Interaction*



Environment



Users

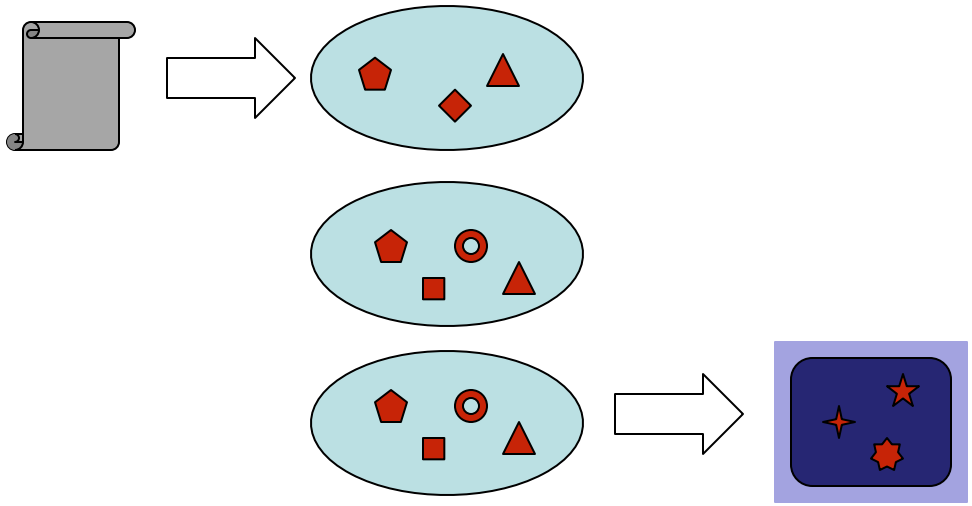
Artifacts

Computers

An interactive system is **not** ...

An algorithmic system that:

- Reads input
- Processes it
- Writes results

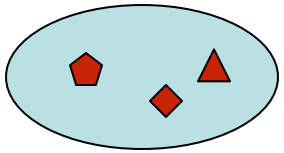


See Wegner, *Interaction is more powerful than algorithm*

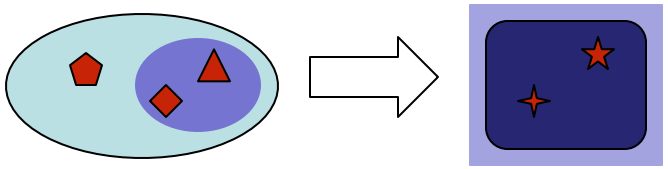
An interactive system is ...

A computer system that:

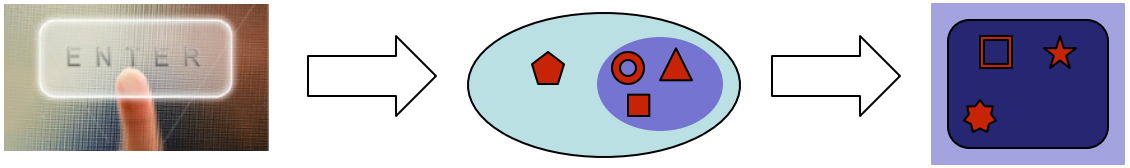
- Holds an internal state



- Creates perceivable representations of part of this state



- Reacts to input as soon as it arrives



Three properties of interactive systems

Reactive:

- U provides input to S,
- S must process it immediately and generate output to U

Open:

- dependencies between S's output and U's future input are unknown to S

Asymmetric:

- U does not have to react immediately to S
- U likes to know the dependencies between S's input and output

Two conceptions of human-computer systems

« human-in-the-loop »

System-centric view where the user must conform to the system's rules, e.g. provide input in a specific order or format

Addresses operational tasks where the user performs actions that the computer cannot (yet) do

Two conceptions of human-computer systems

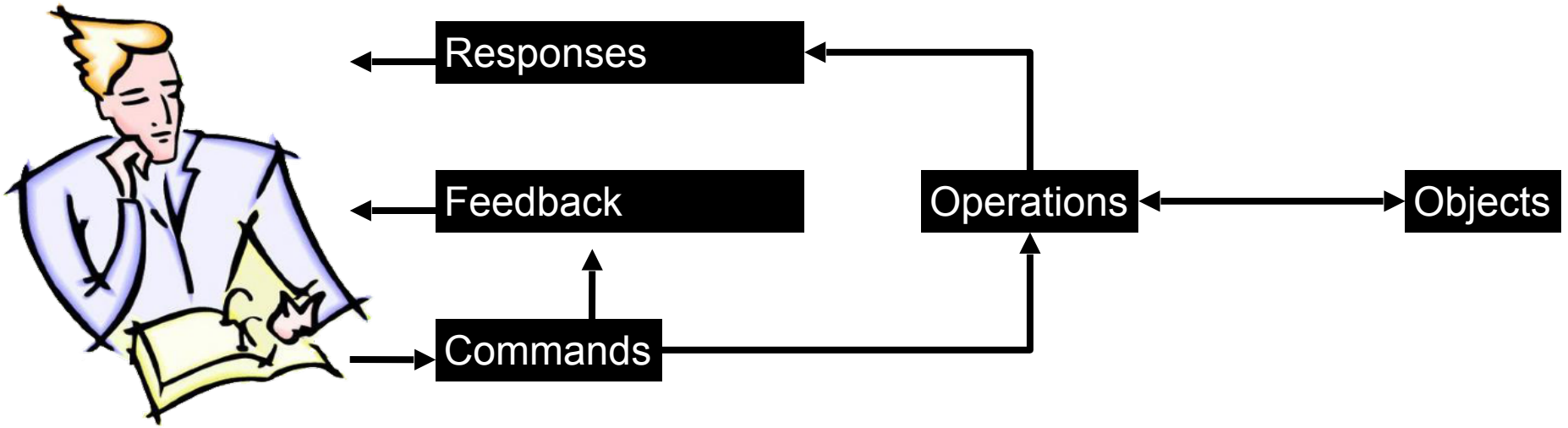
« computer-in-the-loop »

Human-centric view where the computer must be adapted to the capabilities of the user

Addresses creative tasks where the computer extends or augments the capabilities of the user

Conceptual model

Model of how this system operates



Ideally, matches the user's *mental model*

BEWARE!

We all use interactive systems

We all have ideas of how to improve them

... But few are designers or HCI researchers

Paradox of Human-Computer Interaction (HCI):

Measure of success = invisibility, transparency

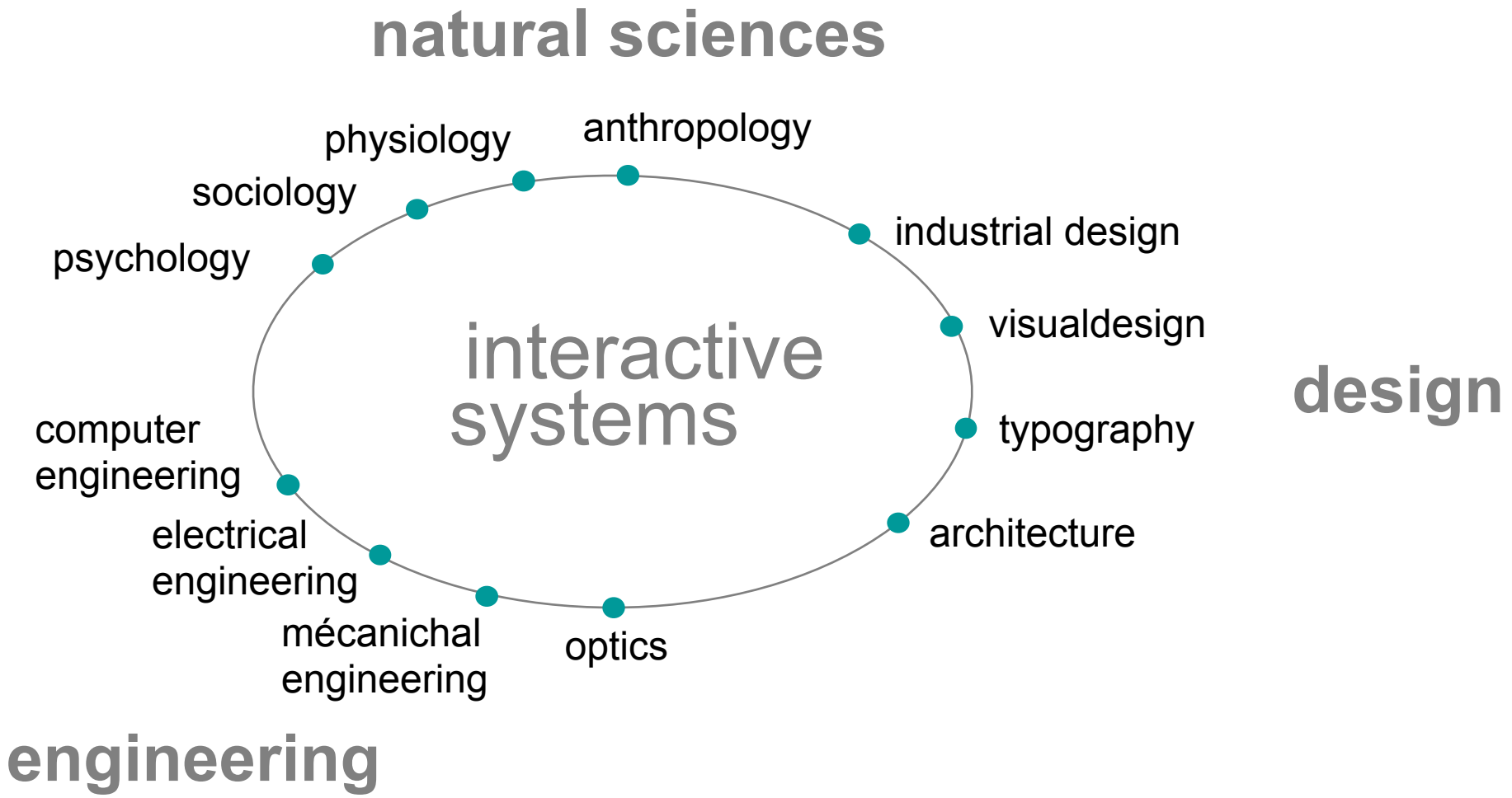
Making things simple is difficult (and difficult to understand)

Adaptability of humans is a strength ... and a weakness

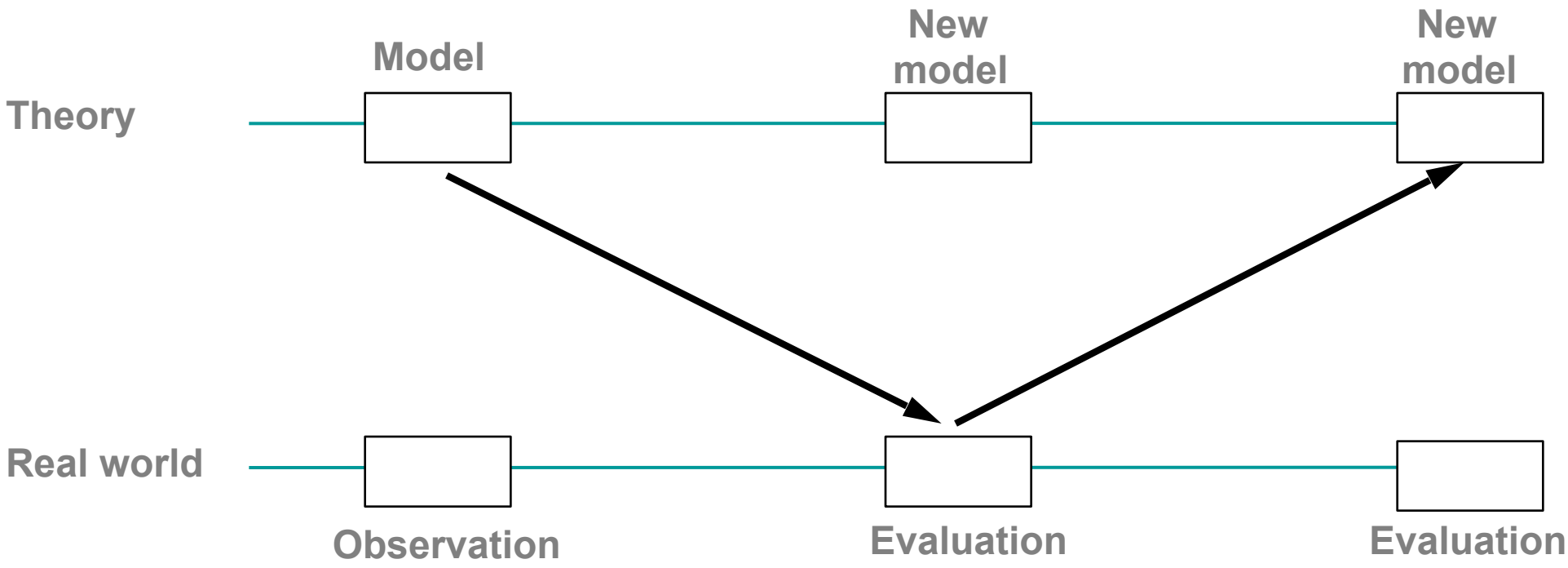
⇒ HCI is a complex multidisciplinary domain

⇒ Design and HCI research require unique skills

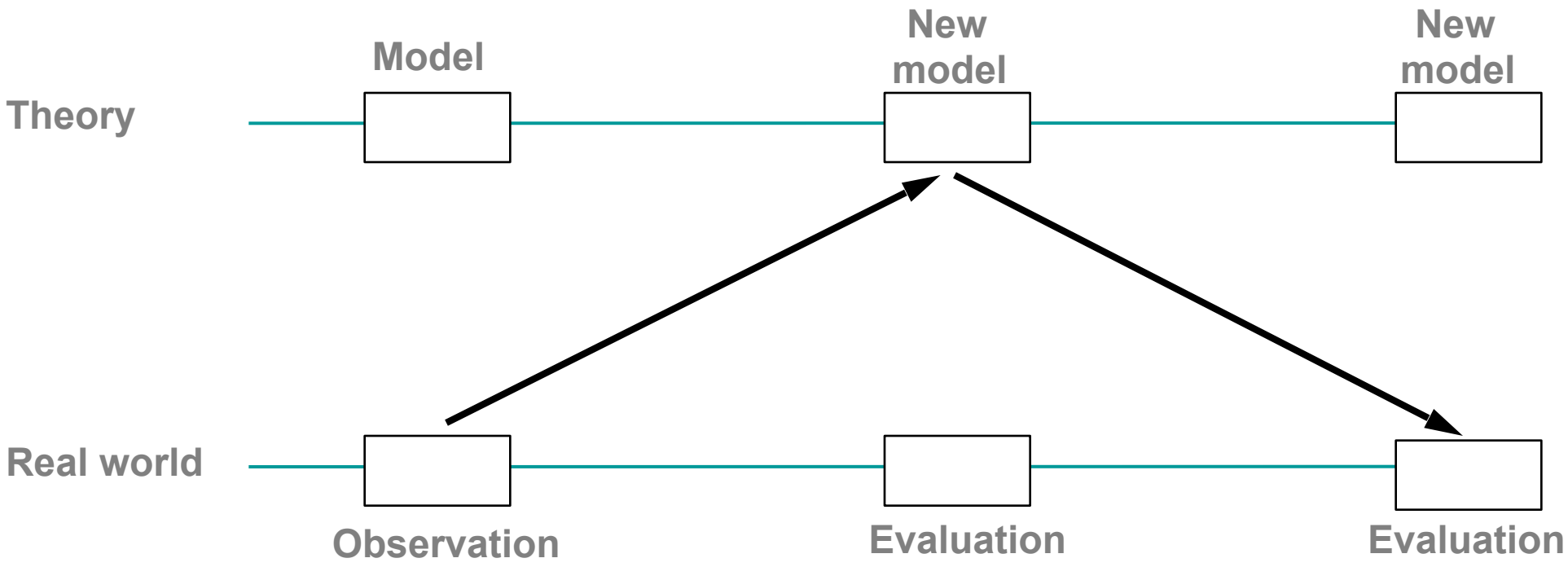
Multidisciplinary approach



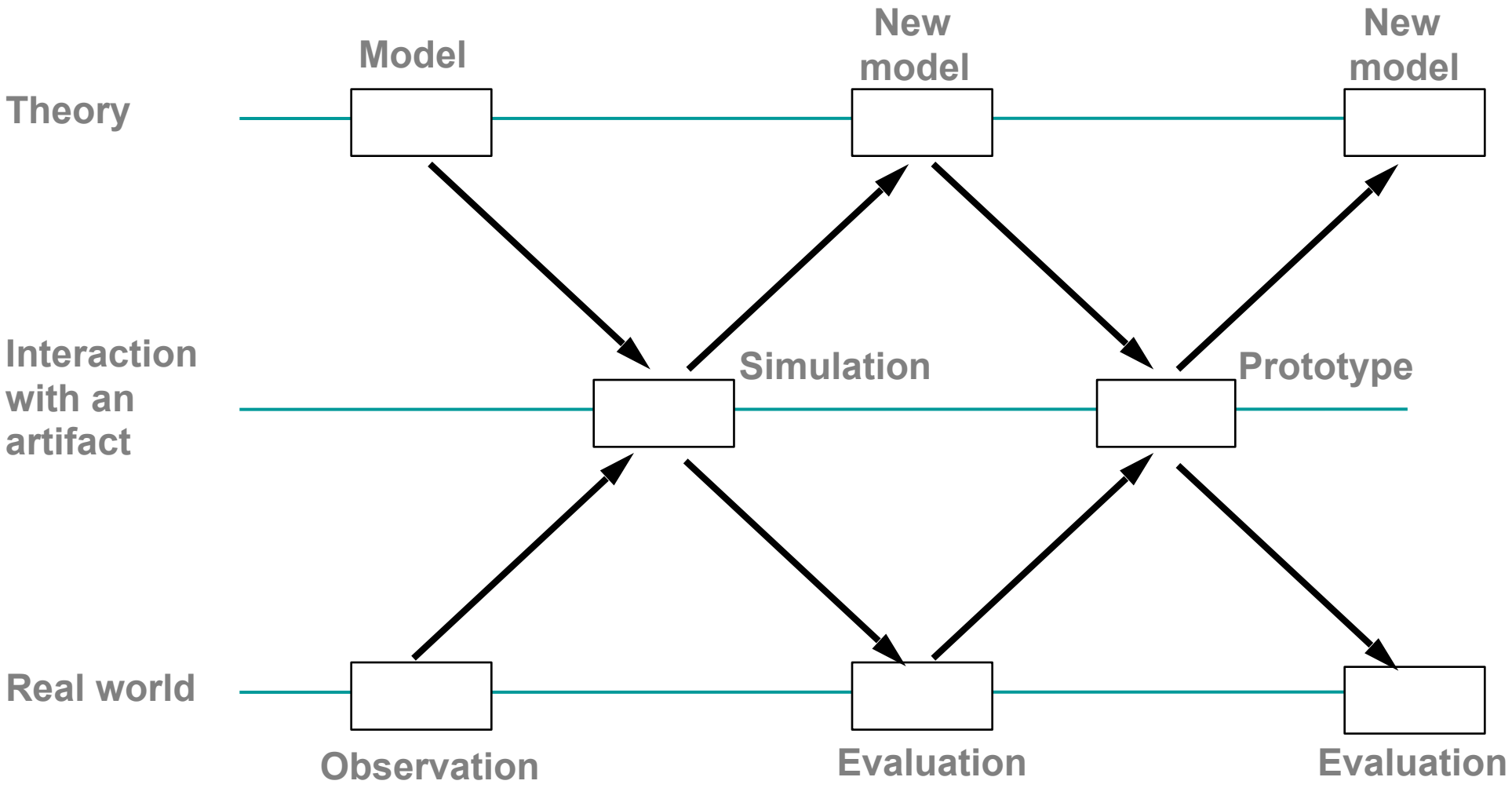
Research strategies: Psychology



Research strategies: Anthropology



Research strategies: HCI



The design of interactive systems

Importance of human factors

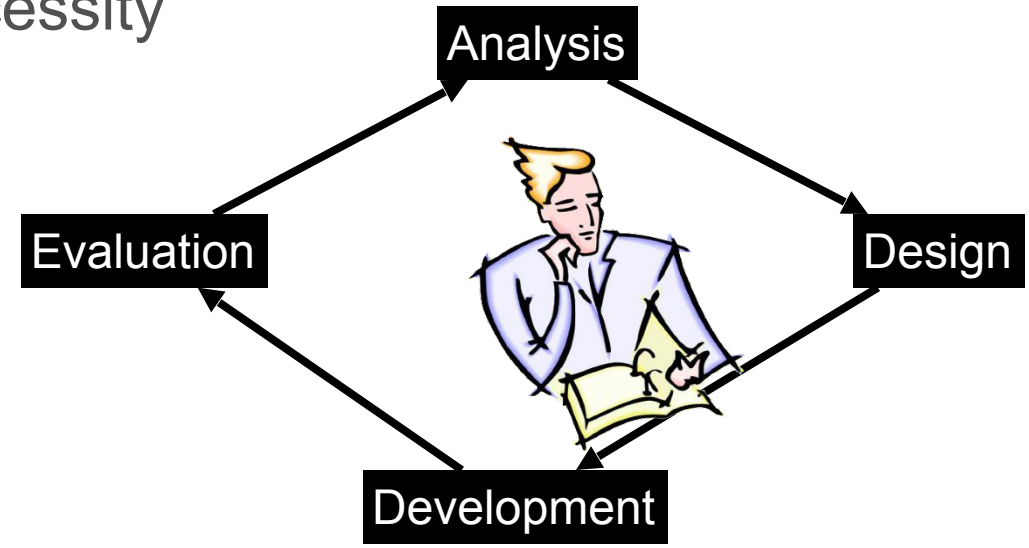
- Few quantitative and/or generative theories

Chaotic aspect of design

- Small causes, large effects

Iterative approach is a necessity

- User-centered design



Interaction paradigms

Computer-as-tool

- First person interfaces
- Augment the user

Focus of the course

Computer-as-partner

- Second person interfaces
- Delegate tasks

Computer-as-media

- Third person interfaces
- Human-human communication