Human-Computer Interaction IS4300

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What is interaction?

- communication
- ⟷ system

Frameworks for conceptualizing "interaction"

- Benyon examples
- Norman: psychopathology of everyday things
- Interaction styles
- Interaction paradigms

Benyon

- Early models from cognitive psychology
  - HIP
  - disembodied cognition

Benyon

- HIP

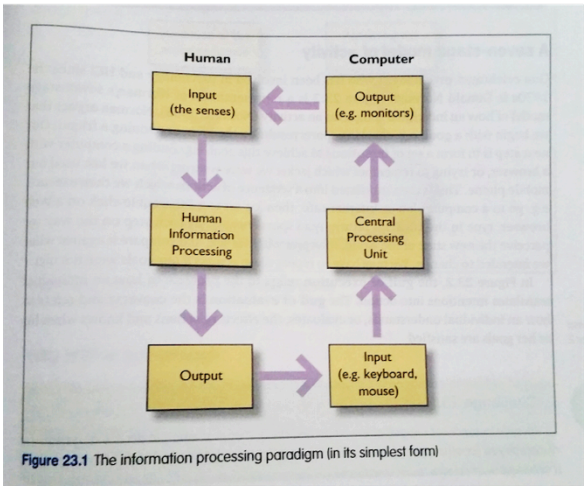
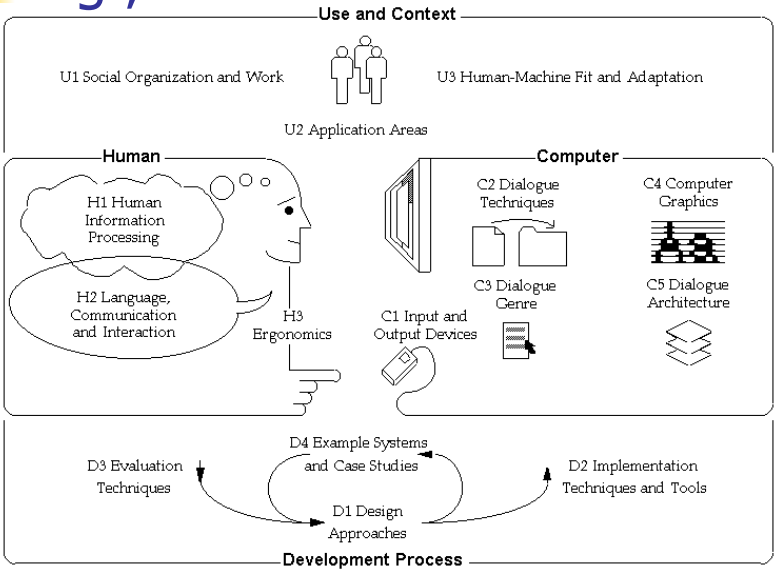
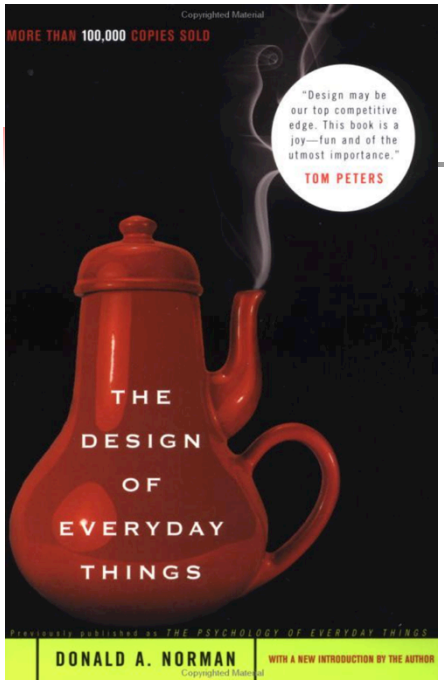


Figure 23.1 The information processing paradigm (in its simplest form)

Cognitive Psyc Model e.g., SIGCHI Framework





The psychopathology of everyday things

- What objects do we routinely interact with in our environment?
- Norman: We routinely interact with 10,000-30,000 objects in our environment
- Norman: interested in failures

Norman Ch 1

- Affordances
- Visibility
- Conceptual models
- Constraints
- Mappings
- Feedback

Affordances

- The fundamental properties of a thing that determine just how it could possibly be used.
  - Examples?
    - A chair affords sitting
    - Knobs are for turning.
    - Slots are for inserting things into.

Visibility

- *aka "Obviousness"*
- The correct parts must be visible.
- They must convey the correct message.
- Impacts learnability.

- How different from affordance?
- Examples?

Affordances & Signifiers

Conceptual models

- Mental representation of how a thing works – allows you to mentally simulate and predict its behavior.

- Daily
- Weekday
- Custom

Conceptual models

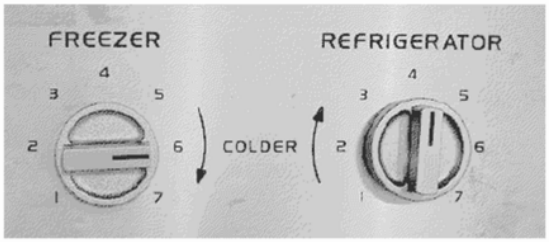
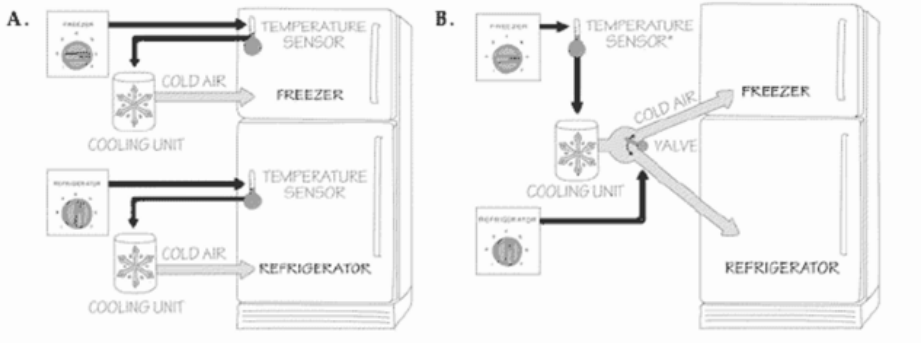
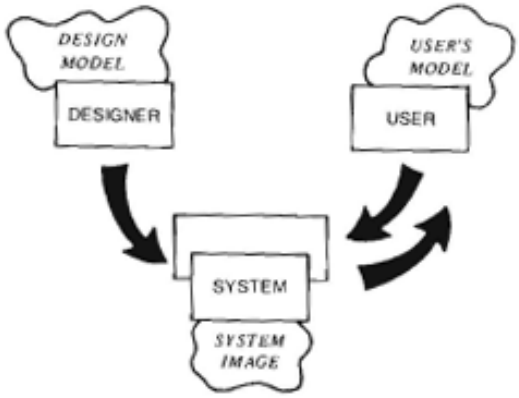


FIGURE 1.9. Refrigerator Controls. Two compartments—fresh food and freezer—and two controls (in the fresh food unit). Your task: Suppose the freezer is too cold, the fresh food section just right. How would you adjust the controls so as to make the freezer warmer and keep the fresh food the same? (Photograph by the author.)

Conceptual models



"I am not my user…"



Constraints

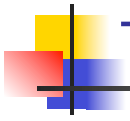
- Limit the ways you can interact with an object.

Mappings

- Relationship between controls and functions.
- Natural mapping – taking advantage of physical analogies and cultural standards – leads to immediate understanding.

Some Kinds of Feedback

- Immediate control manipulation feedback
- "Action in progress" feedback
- Updated system state feedback



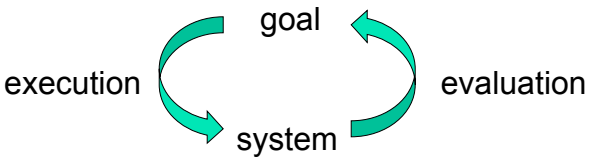
Norman's Interaction Framework Terminology

domain – the area of work under study
e.g. graphic design

goal – what you want to achieve
e.g. create a solid red triangle

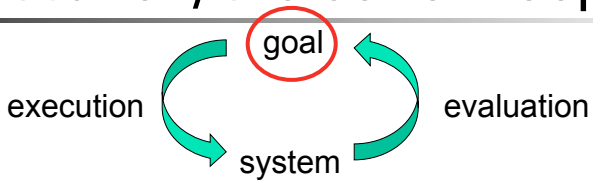
task – how you go about doing it
– ultimately in terms of operations or actions
e.g. … select fill tool, click over triangle

execution/evaluation loop



- user establishes the goal
- formulates intention
- specifies actions at interface
- executes action
- perceives system state
- interprets system state
- evaluates system state with respect to goal

execution/evaluation loop



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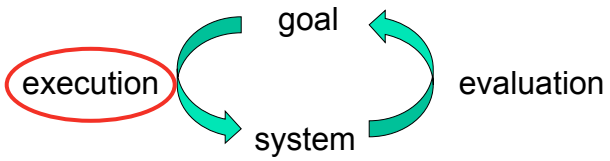

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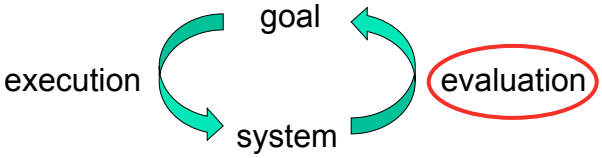

- user establishes the goal
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Norman's Interaction Framework

1. user establishes the goal
2. formulates intention
3. specifies actions at interface
4. executes action
5. perceives system state
6. interprets system state
7. evaluates system state with respect to goal

Gulf of execution

user's formulation of actions
≠ actions allowed by the system

Gulf of evaluation

user's expectations about system state
≠ presentation of state by system

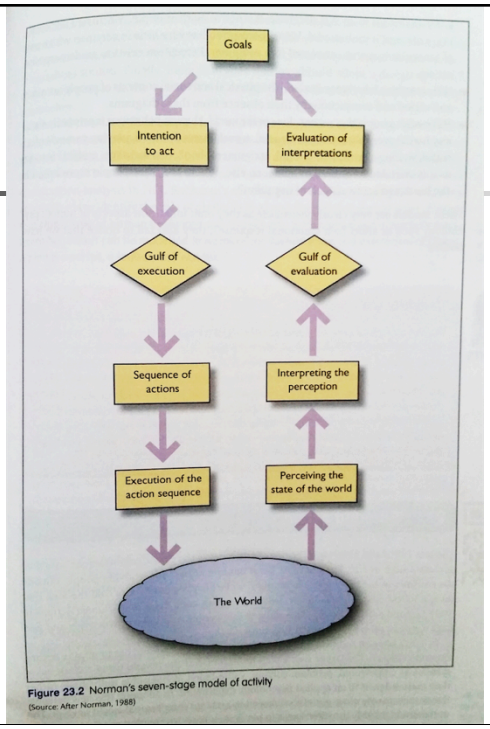


Figure 23.2 Norman's seven-stage model of activity
(Source: After Norman, 1988)

Slip vs. Mistake

- Slip
  - Error in executing action
- Mistake
  - Error in formulating intention & action

Human error - slips and mistakes

slip

- understand system and goal
- correct formulation of action
- incorrect action

mistake

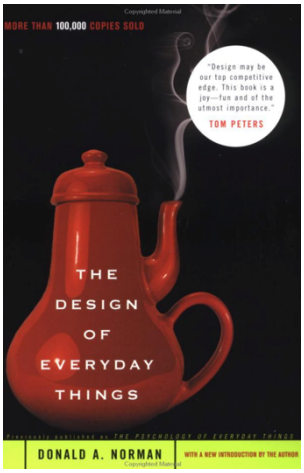
- may not even have right goal!

How to fix these?

slip – better interface design
mistake – better understanding of system

Norman Ch 5
Design for Errors

- Slips
- Mistakes
- Modes
- Preventing Errors
- Error Recovery



Slips

- Capture errors
  - start of task sequence same, e.g., drive to store, but end up going to work
- Description errors
  - two tasks are very similar, e.g., throwing laundry in toilet
- Data-driven errors
  - need a number, but confronted with another and get confused
- Associative activation errors
  - internal associations between tasks, e.g., freudian slips
- Loss-of-activation errors
  - forgetting why you started a task
- Mode errors

- *All caused by inattention*
- *Do confirmation dialogs help?*

Mistakes

- "Wide" vs. "Deep" tasks
  - Many options, but few steps (e.g. ordering)
  - Many steps (driving to work)
  - examples ?
- Most everyday tasks are Wide or Deep
- Most computer tasks are BOTH

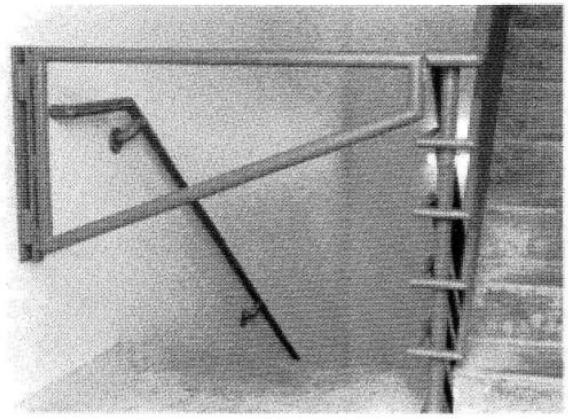
- Do confirmation dialogs help?

Design for Error

- Design to minimize error
- Undo
- Error Feedback
- Attitude: assume errors will be made as part of problem solving

Forcing Functions

- Lockouts



Quiz
Slip or Mistake?

1. A user playing your new Virtual Autopsy game wants to make an incision but clicks on the MagicMarker tool, thinking it is a scalpel.
2. She finally selects the scalpel but while making the incision (using mouse click-and-drag) her pet cat startles awake and yelps, causing the distracted user to make the cut in the wrong place.
3. The user wants to amputate a limb. Not knowing what tool to use, she randomly selects the scalpel.

Frameworks for conceptualizing "interaction"

- Benyon examples
- Norman: psychopathology of everyday things
- Interaction styles
- Interaction paradigms

Benyon

- HIP

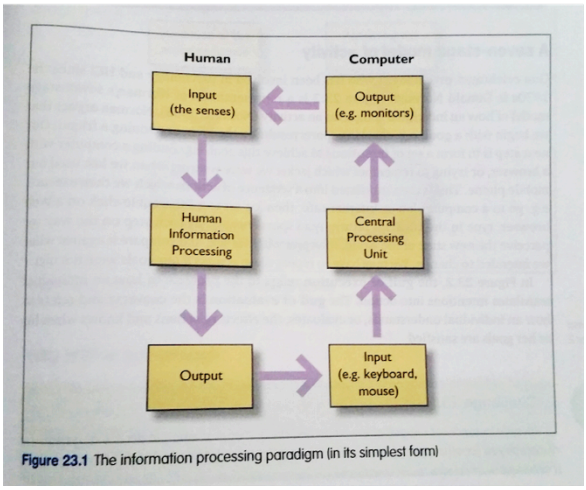


Figure 23.1 The information processing paradigm (in its simplest form)

HIP

- Shortcomings?
  - Oversimplified
  - No context (examples?)
  - Asocial
  - No affect, embodiment

Distributed cognition

- Cognitive processes and knowledge are often distributed across multiple people, tools and representations.
- Examples?

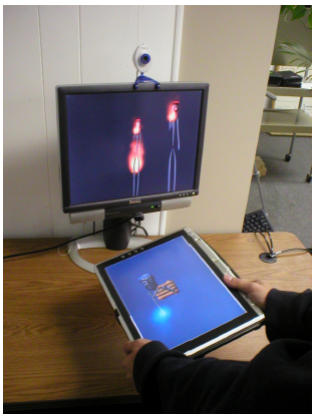
Distributed Cognition

- Internal representation
- External representation

Activity Theory

- Human activity is the unit of analysis
- Defines aspects (facets)
  - Subject
  - Object
  - Mediating artifacts
  - Community
  - Social rules
  - Division of labor

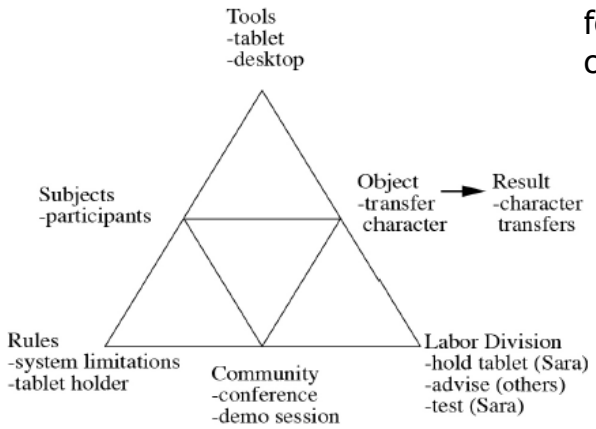
Activity Theory & Distributed Cognition shootout



Baumer & Tomlinson, CHI'11

Activity Theory

"Activity Triangle" for transferring a character.



Distributed Cognition

	Event (time)	Sara	Blake	Tony	Tablet	LCD	Desktop	Character
rep state	First event: tilting demonstration (3:03)	hold/tilt tablet	speech, tilt tablet	speech, gesture	orientation	raft moving	fire crackling	on raft
medium		body, tablet	voice, body	voice, body	tablet	LCD	speakers	program
processing / type		propagate / motor, aural	create / verbal, motor	create / verbal, motor	propagate / physical	propagate/ physical to graphical	propagate / physical to audio	create / virtual
rep state	Second event: how to transfer (3:19)	speech		speech	orientation	character on raft	fire crackling	on raft
medium		voice		voice	tablet	LCD	speakers	program
processing / type		create / aural		create / aural	propagate / physical	propagate / virtual to graphical	propagate/ physical to audio	create / virtual
rep state	Third event: character leaves tablet (3:23)	speech			position	character jumps	creaking sound	in transit
medium		voice			tablet	LCD	speakers	program
processing / type		propagate / visual to verbal			propagate / physical	propagate / virtual to graphical	propagate / physical to audio	create / virtual

Frameworks for conceptualizing "interaction"

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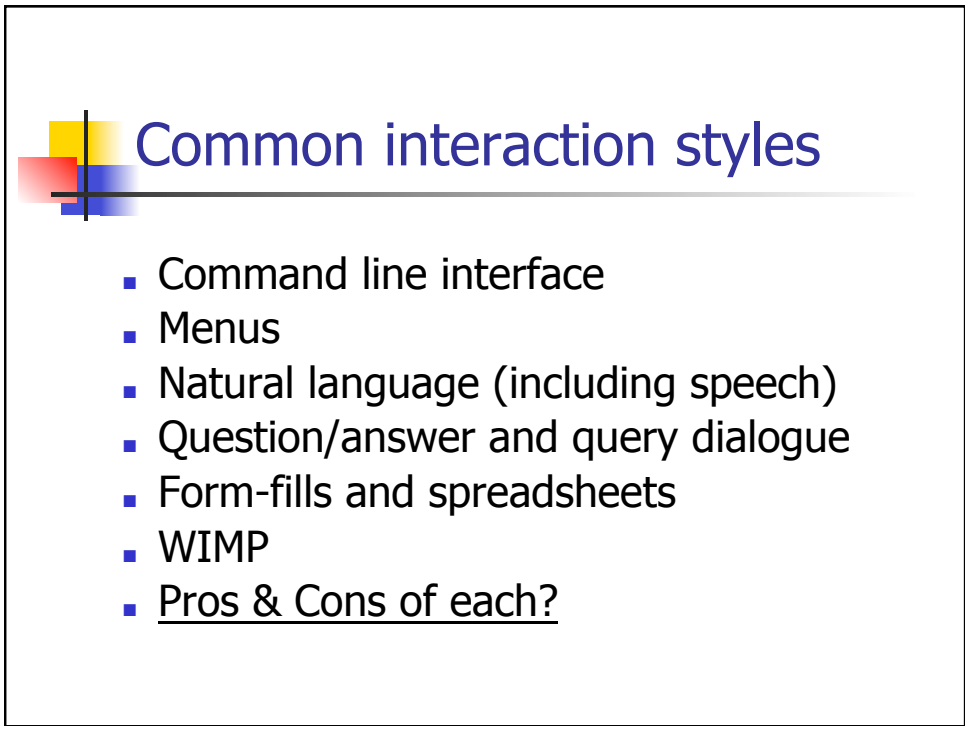
- Interaction styles
- Interaction paradigms


Interaction styles

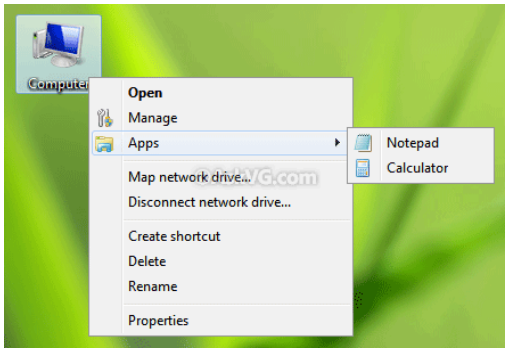

Common interaction styles
Command line interface
Menus
Natural language (including speech)
Question/answer and query dialogue
Form-fills and spreadsheets
WIMP
Pros & Cons of each?

Common interaction styles

- Command line interface

Common interaction styles

- Menus

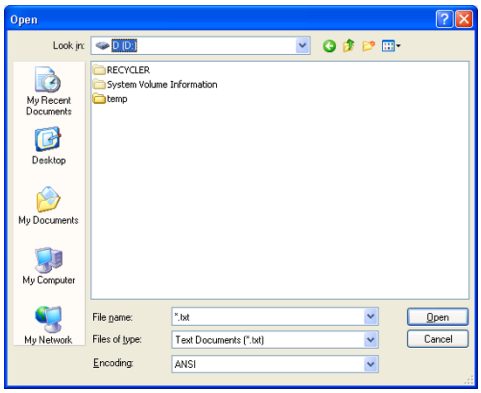


Common interaction styles

- Natural language (including speech)

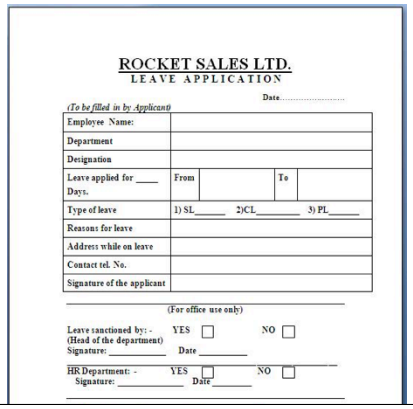
Common interaction styles

- Question/answer and query dialogue



Common interaction styles

- Form-fills and spreadsheets



ROCKET SALES LTD.
LEAVE APPLICATION

Date.....

(To be filled in by Applicant)

Employee Name:				
Department				
Designation				
Leave applied for ____ Days.	From		To	
Type of leave	1) SL_____ 2)CL_____ 3) PL_____			
Reasons for leave				
Address while on leave				
Contact tel. No.				
Signature of the applicant				

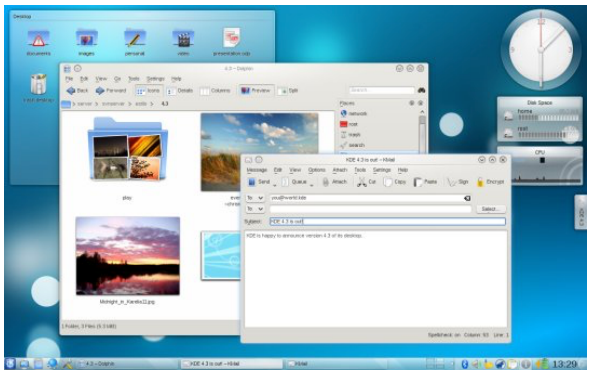
(For office use only)

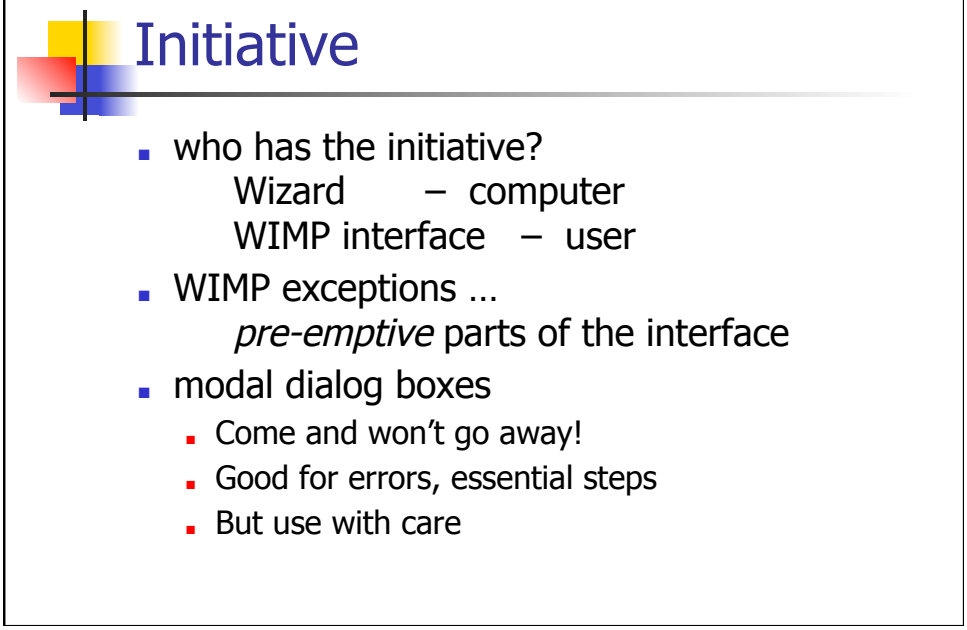
Leave sanctioned by: - YES ☐ NO ☐
(Head of the department)
Signature: _____ Date _____

HR Department: - YES ☐ NO ☐
Signature: _____ Date_____

Common interaction styles

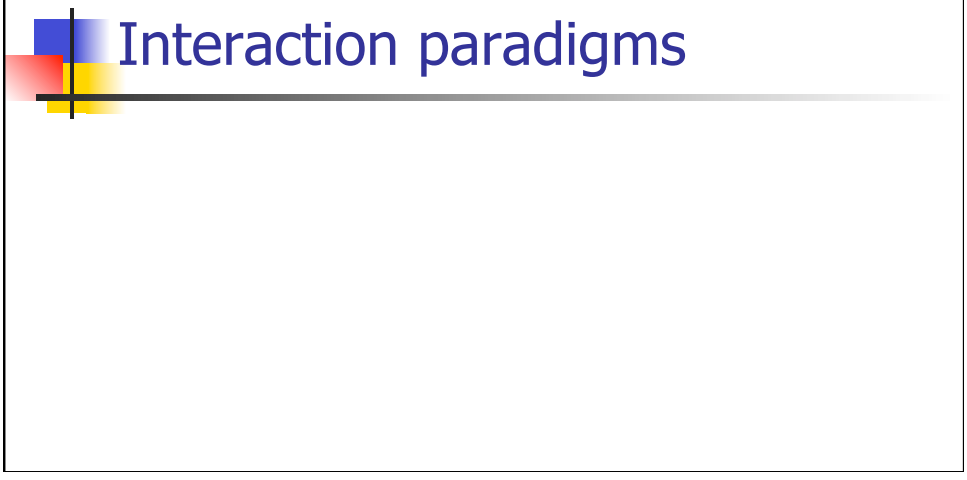
- WIMP





Initiative

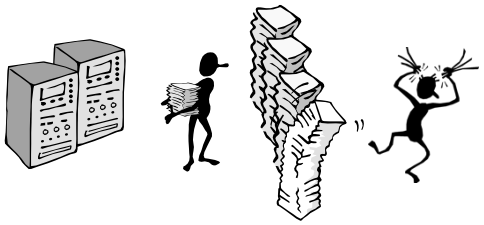
- who has the initiative?
  - Wizard – computer
  - WIMP interface – user
- WIMP exceptions …
  - *pre-emptive* parts of the interface
- modal dialog boxes
  - Come and won't go away!
  - Good for errors, essential steps
  - But use with care



Interaction paradigms

The initial paradigm

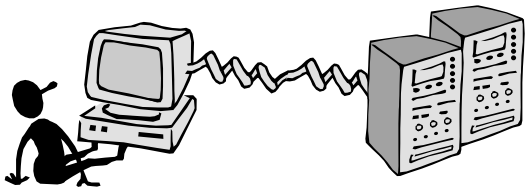
- Batch processing



Impersonal computing

Example Paradigm Shifts

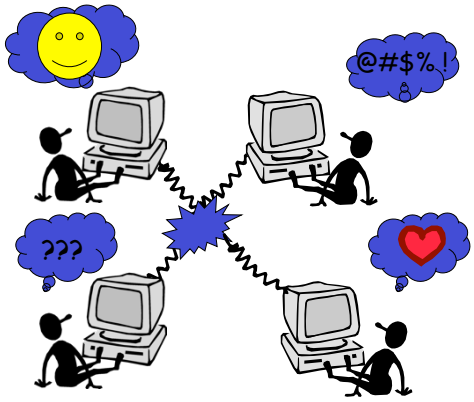
- Batch processing
- Timesharing



Interactive computing

Example Paradigm Shifts

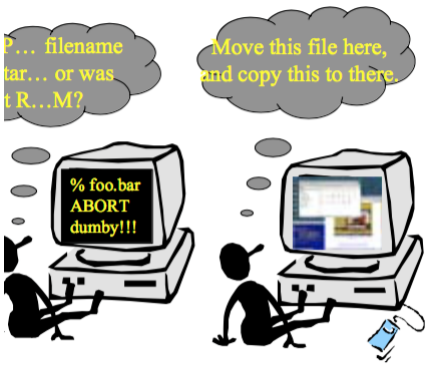
- Batch processing
- Timesharing
- Networking



Community computing

Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical displays



Direct Manipulation

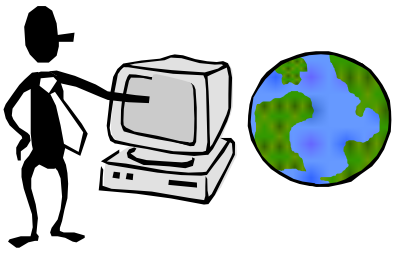
Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical display
- Microprocessor

Personal computing

Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical display
- Microprocessor
- World Wide Web

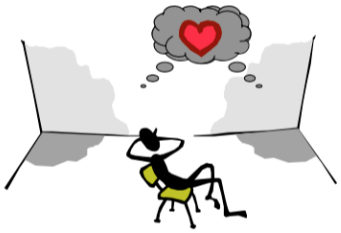


Global Information

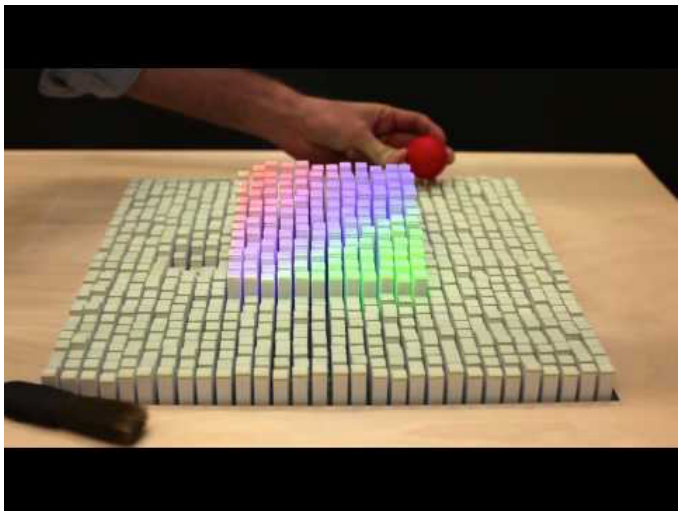
Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical display
- Microprocessor
- WWW
- Ubiquitous Computing

A symbiosis of physical and electronic worlds in service of everyday activities.

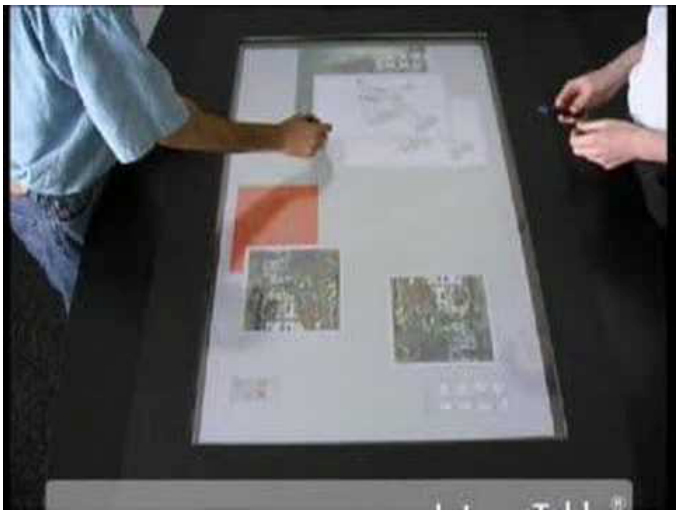


Tangible Computing



Ambient Computing

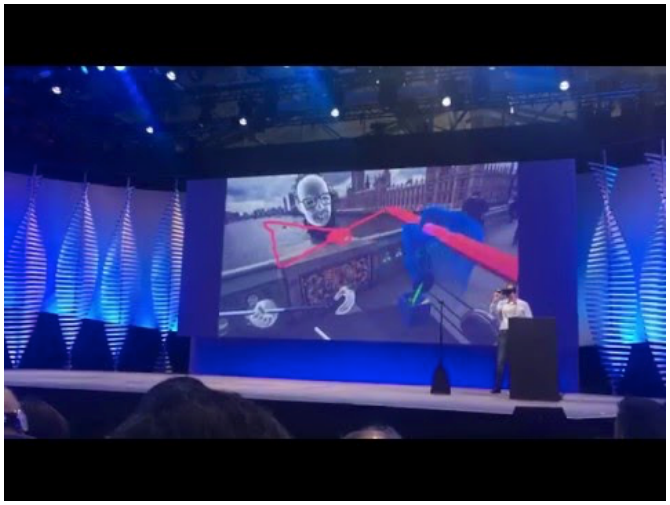
Ubiquitous Computing



Augmented Reality

Augmented Reality

Virtual Reality



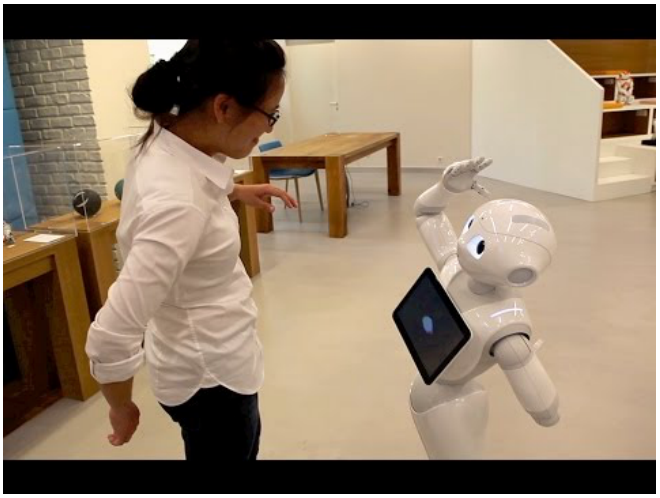
Embodied Conversational Agent

Embodied Conversational Agent

Human Robot Interaction

Human Robot Interaction

Human Robot Interaction



Exercise

- Group in 2-3 people
  - Pick your favorite website
  - Perform a task on the website (etc. login)
    - What is the interaction style?
    - Who has the initiative?
    - What are the possible slips or mistakes?
    - How does the interface prevent/react to errors?
    - What (else) would you recommend to better prevent/react to potential errors?
- Present your reports

Frameworks for conceptualizing "interaction"

- Benyon examples
- Norman: psychopathology of everyday things
- Interaction styles
- Interaction paradigms

Take-aways

- Norman concepts & interaction framework
- Describe and cite 2-3 examples of
  - Interaction styles
  - Interaction paradigms

To do…

- Read
  - Requirements analysis: Users & Tasks (Benyon Ch 11)
  - Intro to Usability (Benyon Ch 4)
  - Rosson excerpt (online)
- Final Project Proposals (next class)
- Continue I3 ethnography homework (due in 1 wk)