

04.09.18 //

# INTRODUCTION & EPISTEMOLOGY

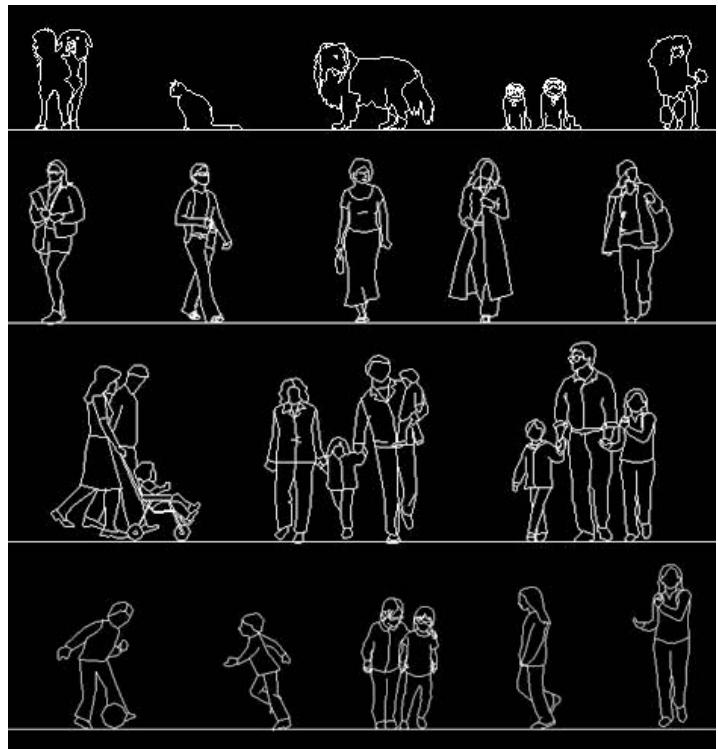
DART 631  
RILLA KHALED

# DESIGN VALUES EXERCISE (INDIVIDUAL)

What are three values that motivate your design work?

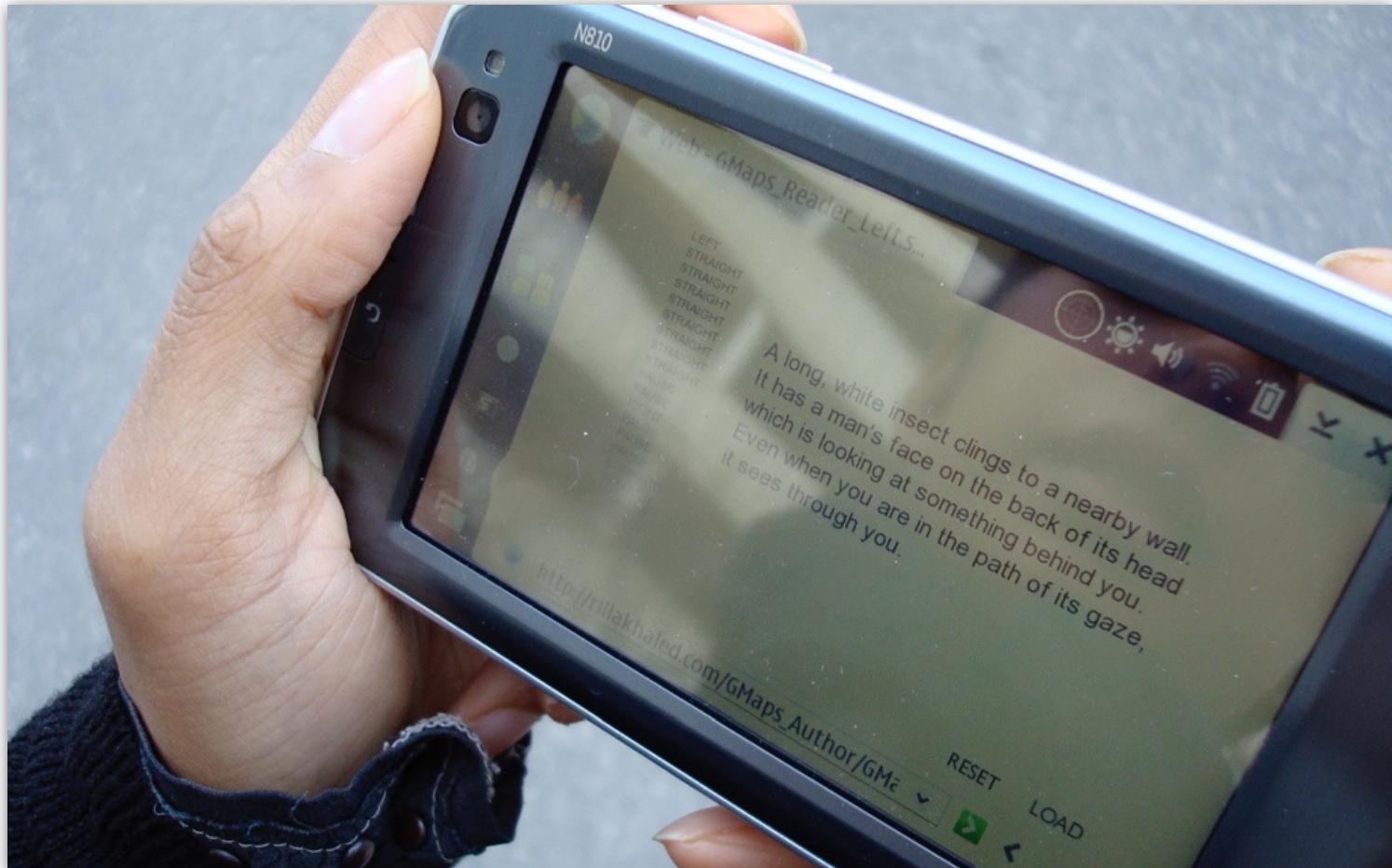
Time: **2 minutes**

(be prepared to share)



**WHO AM I?**

# A COMPUTER SCIENTIST



# INTERESTED IN CULTURE AND VALUES IN GAMES AND OTHER TECHNOLOGIES



# REFLECTIVE AND SPECULATIVE DESIGN



NEO//QAB

# COURSE OUTLINE

**READINGS: WHO? WHICH?**

# WHAT IS INTERACTION DESIGN?

# INTERACTION DESIGN (IXD) IS:

- “designing interactive products to support the way people communicate and interact in their everyday and working lives” (Preece, Rogers, and Sharp, 2011)
- “the art of facilitating interactions between humans through products and services” (Saffer, 2010)
- “the why as well as the how of our daily interactions using computers” (Thackara, 2001)
- “designing spaces for human communication and interaction” (Winograd, 1997)

**BUT WHAT IS INTERACTION?  
WHAT IS INTERACTIVITY?**

# DIFFERENT FLAVOURS OF INTERACTIVITY

processes that take place  
between receivers and a  
media message

Communication

Media Studies

the relationship between  
two or more people who  
contextually mutually  
adapt their behavior &  
actions to each other

the process that takes place when  
a human user operates  
a machine

Human-Computer Interaction

# SENSORY



- How interactive does something feel?
- Affordances as well as reminders of possible actions.

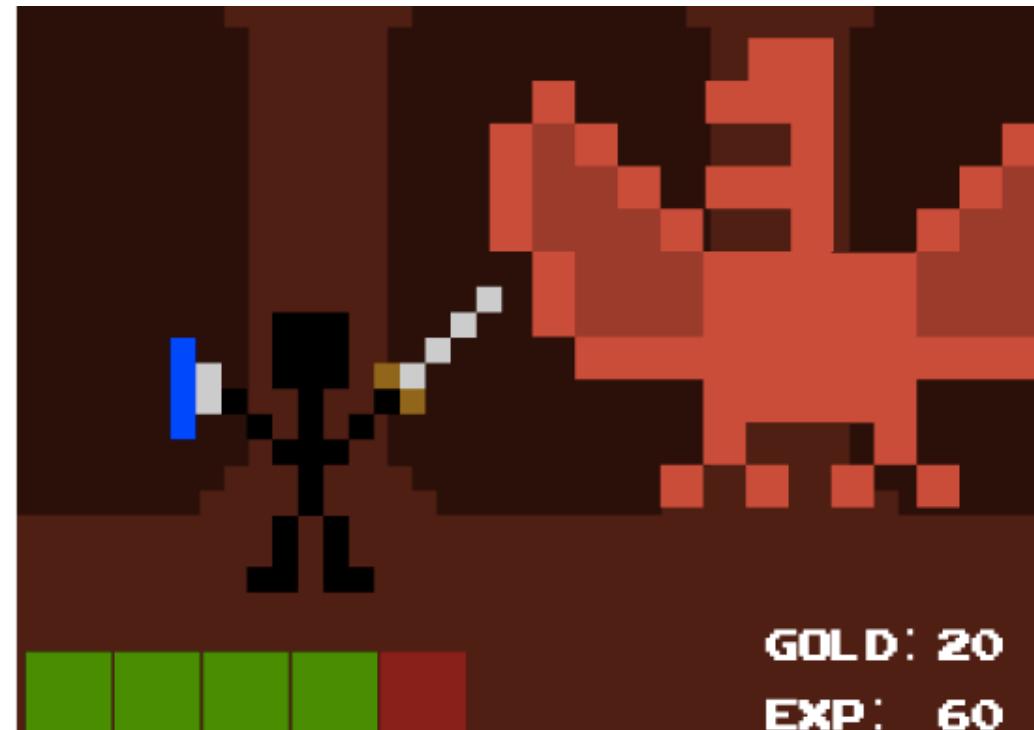
# SEMANTIC

More Top Picks for You



- Do we get a relevant response to our input?
- Do we feel that there is some mutual recognition taking place (rather than just a response that seems accidentally relevant)?

# BEHAVIOURAL

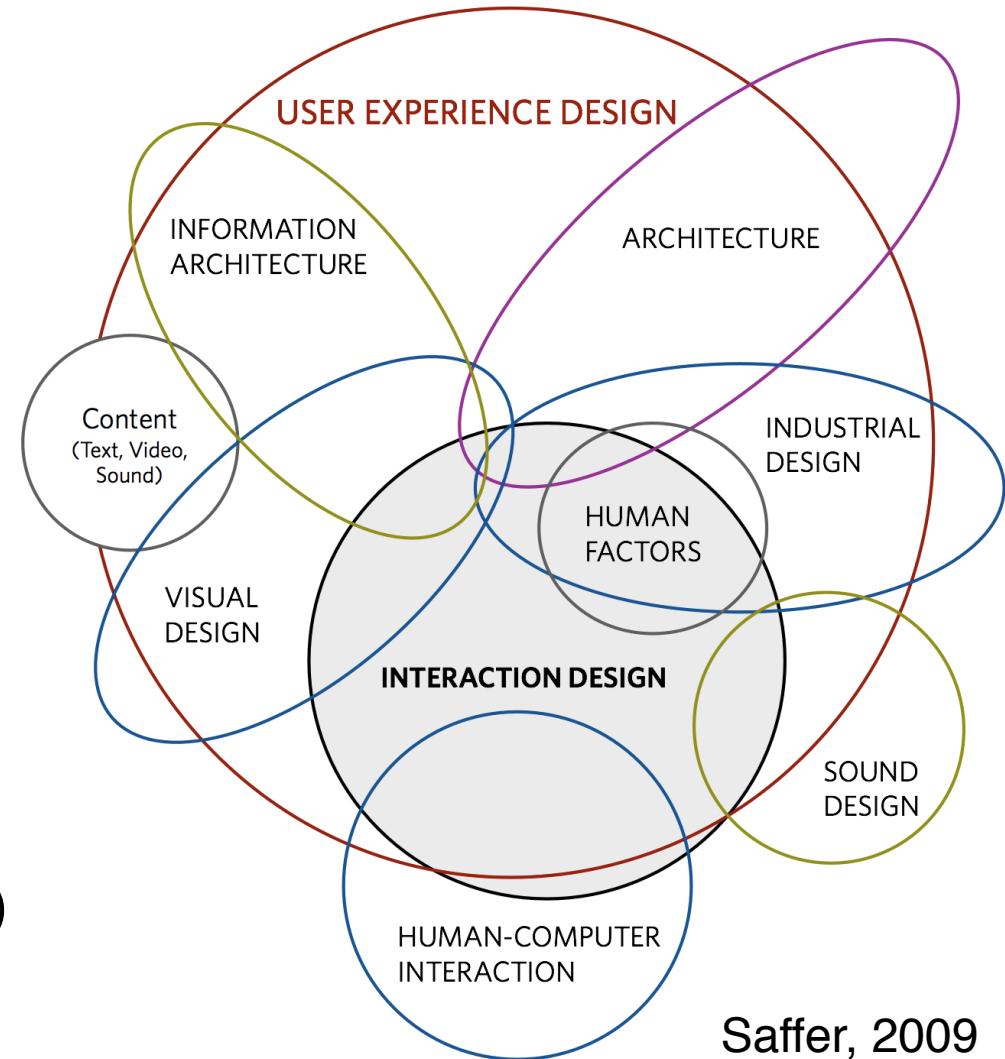


SUPER PRESS SPACE TO WIN ACTION RPG

- Is it possible to behaviourally engage?
- How much control do we exert?
- Do we perceive that we are allowed to take a particular action? If we can't perceive the action, it may as well not be there.

# BACK TO INTERACTION DESIGN

- informed by many different disciplines
- eclectic range of ways to conduct design – different methods, techniques, frameworks
- accordingly, IxD is often conducted by teams
- IxD != software engineering
- IxD is related to Human-Computer Interaction (HCI) but wider in scope



Saffer, 2009

# USER EXPERIENCE (UX) IS

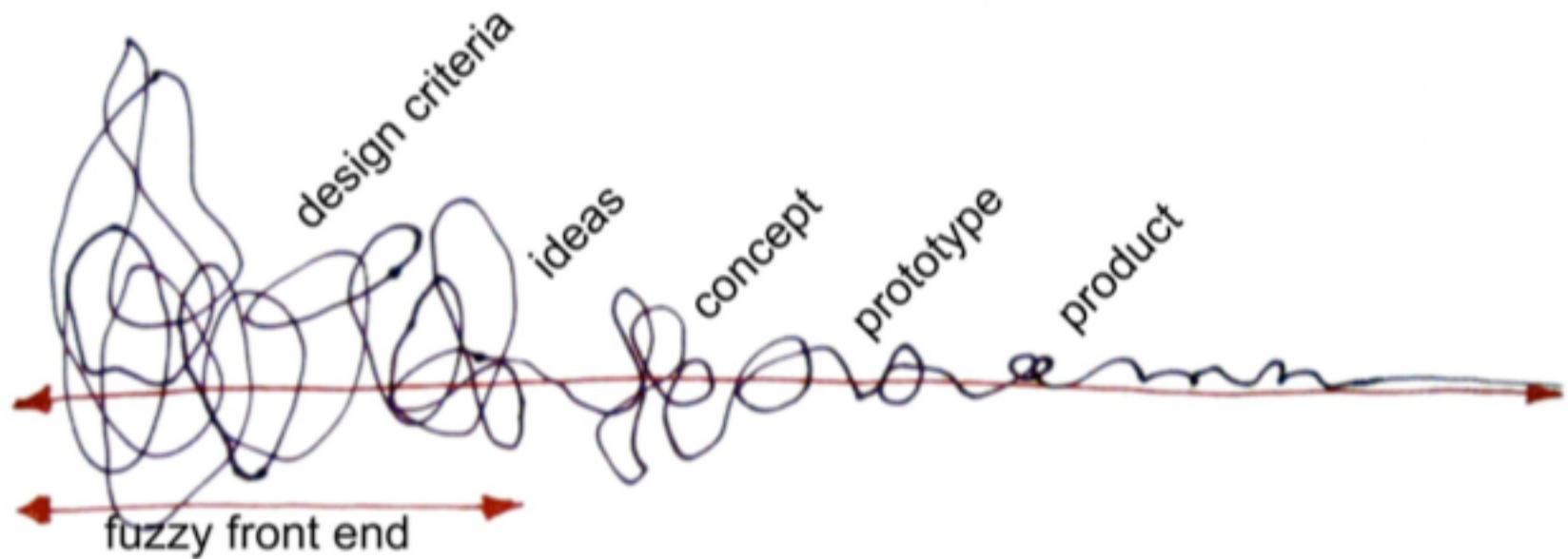
- focusing on experiences rather than things
- a shift from techno-centric views to human-centric concerns for all levels of a service
- UX became popularised as a term after IxD
- in fact, HCI —> IxD —> UX
- HCI more academic, IxD and UX more industry
- some argue that you can't "design" an experience, but can design "for" an experience



# THE GENERAL IXD PROCESS

- ① Establishing requirements
- ② Designing alternatives
- ③ Prototyping
- ④ Evaluating

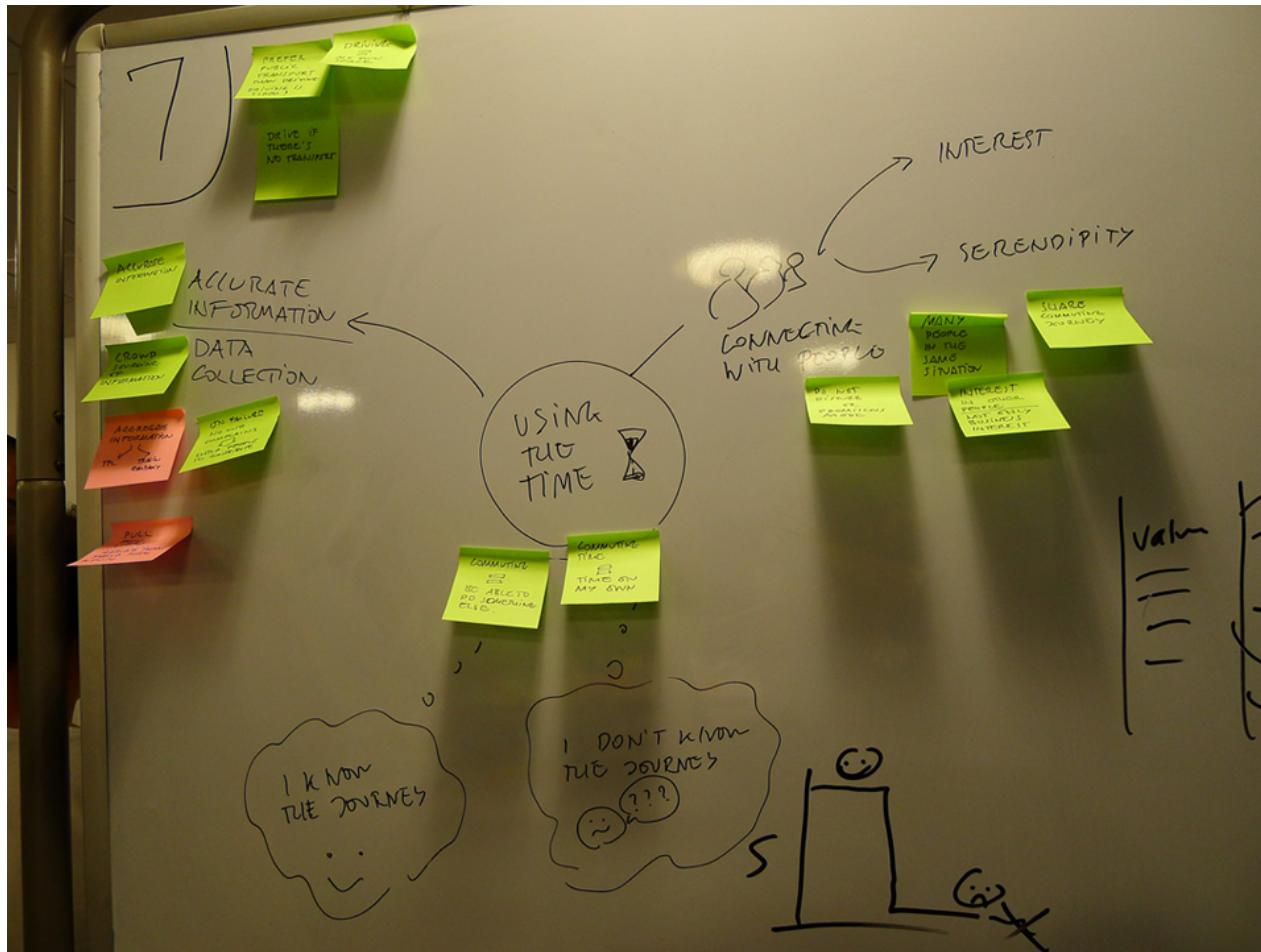
# A REALISTIC PROCESS



Sanders, E., and Stappers, J. 2006. *Co-creation and the new landscapes of design*.

**WHAT IS YOUR  
DESIGN PROCESS?**

# BEFORE YOU BEGIN IDEATING

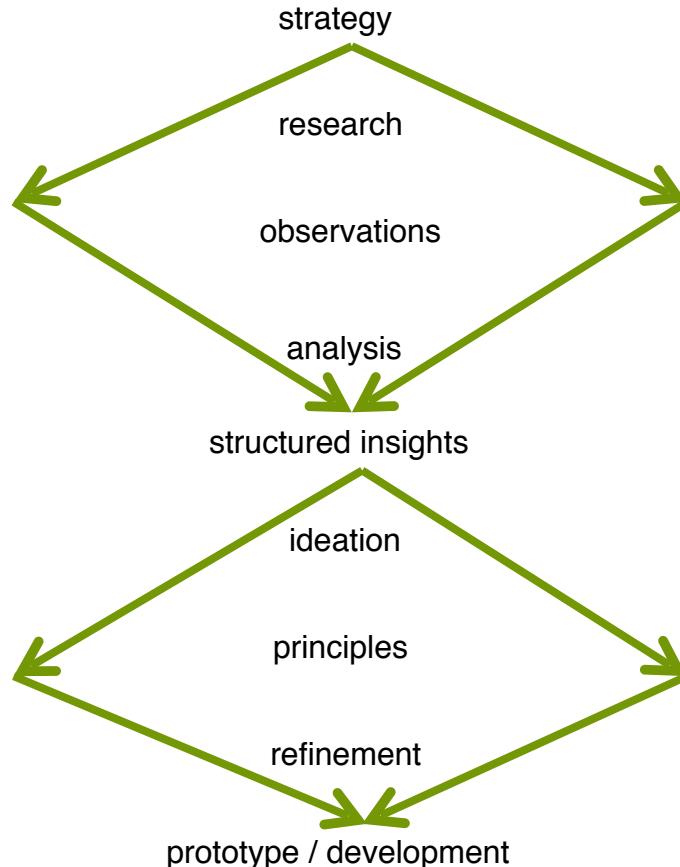


you need to know the problem space

# ARTICULATING THE PROBLEM SPACE

- user requirements (what is needed by the users?)
- UX goals (goals of the user experience, e.g. fun, thought provoking, enhancing sociability, satisfying, not patronising, not frustrating)
- looking to existing products
- explicit underlying assumptions
- claims (that something is true that may not be)
- NB: not all problems are based on *needs*, sometimes the “problem” is not one that is more one that we *choose* so solve, rather than being a pressing *need* - e.g. game design

# MOVING TO THE DESIGN SPACE: CONVERGENCE AND DIVERGENCE



Saffer, 2007

# 4 CLASSES OF INTERACTIONS

- **instructing**: users give instructions to machines: e.g. typing commands, selecting from menu, gesturing, pressing buttons, function key combinations...
- **conversing**: having a dialogue with the system: e.g. speaking via an interface, typing questions, system responds via text or speech...
- **manipulating**: users interact with objects in virtual or physical space by manipulating them: e.g. open, close, hold, release, zoom, shrink, place, stack, rotate, break, draw...
- **exploring**: where users move through a virtual environment (game environment, 3D environment, AR and VR systems) or physical space: often start from real world movement knowledge (walking, looking around, walls as barriers, flying, etc.), may use sensor-based technology e.g. IoT

# (OLD SCHOOL) COGNITION

- many different kinds of cognition: thinking, learning, remembering, daydreaming, decision making
- two general modes that we use everyday  
(Norman, 1993)
  - experiential: perception, action, (immediate) reaction – requires expertise and engagement
  - reflective: thinking, comparing, decision making – leads to new ideas and creativity
- can also think of it as processes, e.g. attention, perception, memory, learning, speaking, listening, problem solving, planning, etc.



# DIFFERENT COGNITIVE FRAMEWORKS

- 2nd wave HCI: internal
  - mental models
  - gulfs of execution and evaluation
  - information processing
- 3rd wave HCI: external & contextual
  - embodied interaction
  - distributed cognition

# MENTAL MODELS

- people develop mental models of systems to reason how they work and establish what to do
- the more you know about a system, the more developed your mental model becomes
- people often use erroneous mental models to guide behaviour
- solution: greater transparency?



# GULFS OF EXECUTION AND EVALUATION

- the gaps between the user and interaction (Norman, 1986)
- gulf of execution: the gap between a user's goal for action and the means to execute that goal
  - translating the goal into a task or a set of tasks
  - planning an action sequence
- gulf of evaluation: the gap between system state and interpretation by user of what that state means
  - perceiving what happened
  - interpreting the outcome according to the users' expectations
  - evaluating what happened against what was intended

# USING LATEX SOFTWARE

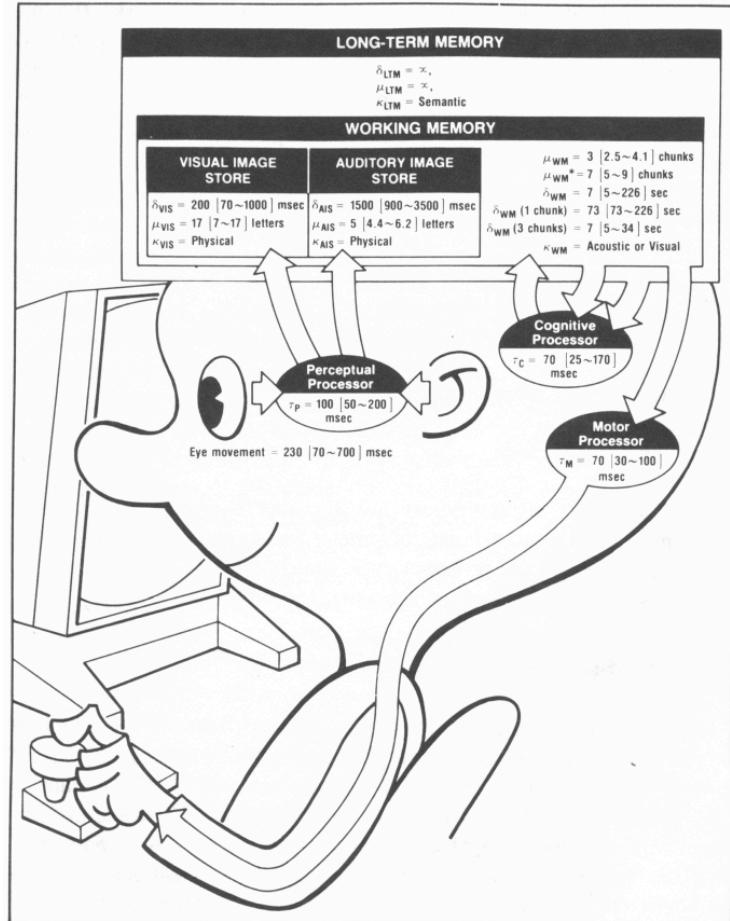
The image shows a LaTeX editor interface with a code editor and a terminal window.

**Code Editor:** The main window displays a LaTeX document with various code snippets. Lines 68-72 show configuration for submission: `\institution{for Submission}`, `\city{City}`, and `\email{email}`. Line 73 is a comment: `% The default list of authors is too long for headers.`. Lines 74-75 define a new command: `\newcommand{\shortauthors}{A. Anonymous et al.}`. Lines 76-77 begin an abstract section: `\begin{abstract}`. Lines 78-500 provide the content of the abstract, discussing game research and analysis. Lines 501-510 end the abstract section: `\end{abstract}`. Lines 511-520 are comments about generating code. Lines 521-530 are instructions to copy and paste the code. Lines 531-540 are more comments. Lines 541-550 begin a CCSXML section: `\begin{CCSXML}`. Lines 551-560 show a concept entry: `<ccs2012>`, `<concept>`, `<concept_id>10003120.10003123.10010860</concept_id>`, `<concept_desc>Human-centered computing~Interaction design process and methods</concept_desc>`, and `<concept_significance>500</concept_significance>`. Lines 561-570 end the concept section: `</concept>`. Lines 571-580 show another concept entry: `<concept_id>10003120.10003123.10011758</concept_id>`, `<concept_desc>Human-centered computing~Interaction design theory, concepts and paradigms</concept_desc>`, and `<concept_significance>500</concept_significance>`. Lines 581-590 end the second concept section: `</concept>`. Lines 591-592 end the CCSXML section: `</ccs2012>` and `\end{CCSXML}`. Lines 593-600 show two `\ccsdesc` entries: `\ccsdesc[500]{Human-centered computing~Interaction design process and methods}` and `\ccsdesc[500]{Human-centered computing~Interaction design theory, concepts and paradigms}`.

**Terminal Window:** A separate window titled "sample-sigconf console" shows the output of running the LaTeX file. It includes the command used (`cpstopdf -basytex`), the path to the TeX distribution files, and the log output. The log shows an error from the `textcomp` package at line 110: "Package textcomp Error: Symbol \textrightarrow not provided by (textcomp) (textcomp) font family ptm in TS1 encoding. Default family used instead." It also provides instructions for handling the error.

# INFORMATION PROCESSING

- the mind as an information processor: reservoir, digital computer, phone network
- information enters and exits through a series of processing stages
- processing stages involve acting on mental representations



Card et al., 1983

# EMBODIED INTERACTION

- older views of cognition within HCI have been criticised for not taking social and physical context into account
- embodiment: the property of being manifest in and as a part of the world
- the setting of an activity is not just background, but a component of the activity itself
- relates embodied cognition: the nature of the human mind is largely determined by aspects of the body
- covers a range of concerns:
  - emotion and technology
  - technology use in physically shared spaces

# EMBODIED STORYTELLING IN STORYTREK



# DISTRIBUTED COGNITION

- people often perform cognitive activities by using external representations
- cognition stretches beyond people; is embodied within location, tools, individuals
- design principles:
  - people establish and coordinate different types of structures in their environment
  - it takes effort to maintain coordination
  - people off-load cognitive effort to the environment whenever practical
  - there are improved dynamics of cognitive load-balancing in social organisation

# COLUMBIA SPACE SHUTTLE DISASTER & POWERPOINT (TUFTE)

On this one Columbia slide, a PowerPoint festival of bureaucratic hyper-rationalism, 6 different levels of hierarchy are used to display, classify, and arrange 11 phrases:

- Level 1      Title of Slide
- Level 2      ● Very Big Bullet
- Level 3      – big dash
- Level 4      • medium-small diamond
- Level 5      • tiny square bullet
- Level 6      ( ) parentheses ending level 5

The analysis begins with the dreaded Executive Summary, with a conclusion presented as a headline: "Test Data Indicates Conservatism for Tile Penetration." This turns out to be unmerited reassurance. Executives, at least those who don't want to get fooled, had better read far beyond the title.

The "conservatism" concerns the *choice of models* used to predict damage. But why, after 112 flights, are foam-debris models being calibrated during a crisis? How can "conservatism" be inferred from a loose comparison of a spreadsheet model and some thin data? Divergent evidence means divergent evidence, not inferential security. Claims of analytic "conservatism" should be viewed with skepticism by presentation consumers. Such claims are often a rhetorical tactic that substitutes verbal fudge factors for quantitative assessments.

As the bullet points march on, the seemingly reassuring headline fades away. Lower-level bullets at the end of the slide undermine the executive summary. This third-level point notes that "Flight condition [that is, the debris hit on the Columbia] is significantly outside of test database." How far outside? The final bullet will tell us.

This fourth-level bullet concluding the slide reports that the debris hitting the Columbia is estimated to be  $1920/3 = 640$  times larger than data used in the tests of the model! The correct headline should be "Review of Test Data Indicates Irrelevance of Two Models." This is a powerful conclusion, indicating that pre-launch safety standards no longer hold. The original optimistic headline has been eviscerated by the lower-level bullets.

Note how close readings can help consumers of presentations evaluate the presenter's reasoning and credibility.

The Very-Big-Bullet phrase fragment does not seem to make sense. No other VBB's appear in the rest of the slide, so this VBB is not necessary.

Spray On Foam Insulation, a fragment of which caused the hole in the wing

A model to estimate damage to the tiles protecting flat surfaces of the wing

## Review of Test Data Indicates Conservatism for Tile Penetration

- The existing SOFI on tile test data used to create Crater was reviewed along with STS-87 Southwest Research data
  - Crater overpredicted penetration of tile coating significantly
    - Initial penetration is described by normal velocity
      - Varies with volume/mass of projectile (e.g., 200ft/sec for 3cu. In)
    - Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating
      - Test results do show that it is possible at sufficient mass and velocity
  - Conversely, once tile is penetrated SOFI can cause significant damage
    - Minor variations in total energy (above penetration level) can cause significant tile damage
- Flight condition is significantly outside of test database
  - Volume of ramp is 1920cu in vs 3 cu in for test

BOEING

Here "ramp" refers to foam debris (from the bipod ramp) that hit Columbia. Instead of the cryptic "Volume of ramp," say "estimated volume of foam debris that hit the wing." Such clarifying phrases, which may help upper level executives understand what is going on, are too long to fit on low-resolution bullet outline formats. PP demands the shorthand of acronyms, phrase fragments, and clipped jargon in order to get at least some information into the tight format.

# 3 PARADIGMS OF HCI (HARRISON ET AL.)

- A “paradigm” in this context essentially means a wave of scientific research, and relates to scientific revolutions (Kuhn, 1970).
- The paradigm you’re in shapes the tools you have ready to hand, the questions you are able to ask, what constitutes valid, responsible research
- P1: Man-machine coupling
- P2: Mind and computer as coupled information processors
- P3: Situated perspectives
- Problems arise when we try to evaluate research/work grounded in one paradigm through the lens of another!