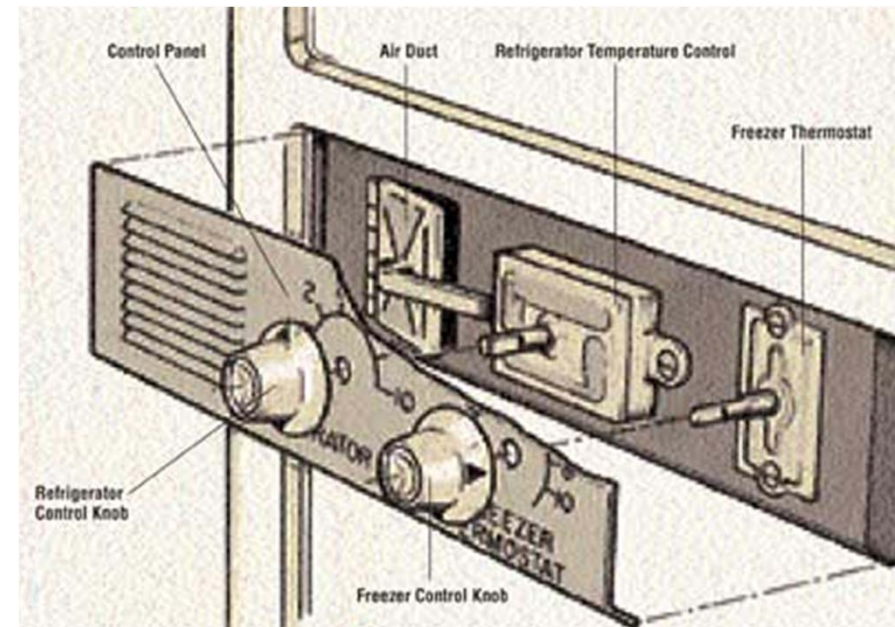


User Interface Design

Lecture 3

Finding out about tasks and work

How this refrigerator works?



Mental Models

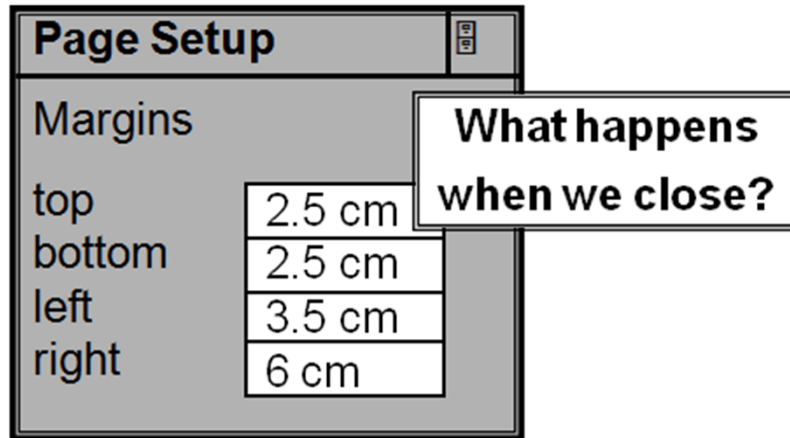
- **model of the world in our heads that enables us to negotiate unfamiliar situations**
- **The are ... the models people have of themselves, others, the environment and the things with which they interact. People form mental model through experience, training and instruction.**

(Donald Norman, 1988)

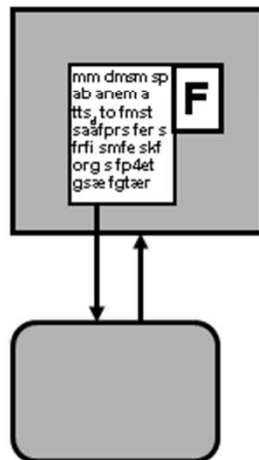
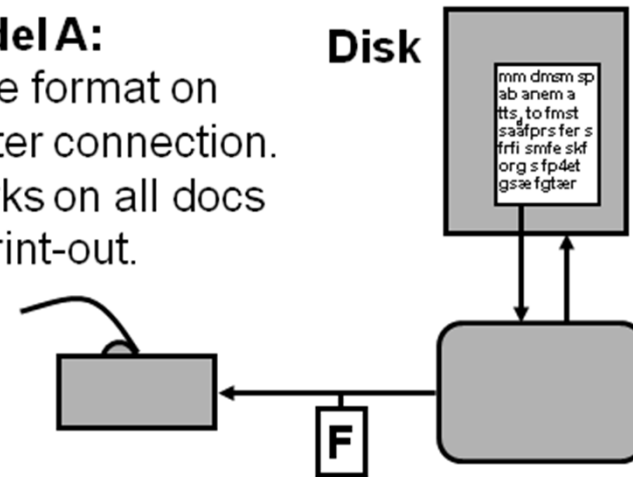
Mental Models

- **User's model**
- **constructed when we are required to make an inference or prediction in a particular situation.**
- **Think of any examples of inappropriate mental models using computer system?**

System model vs. User model

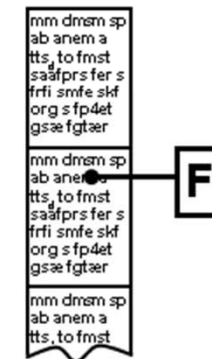


Model A:
Page format on printer connection.
Works on all docs at print-out.

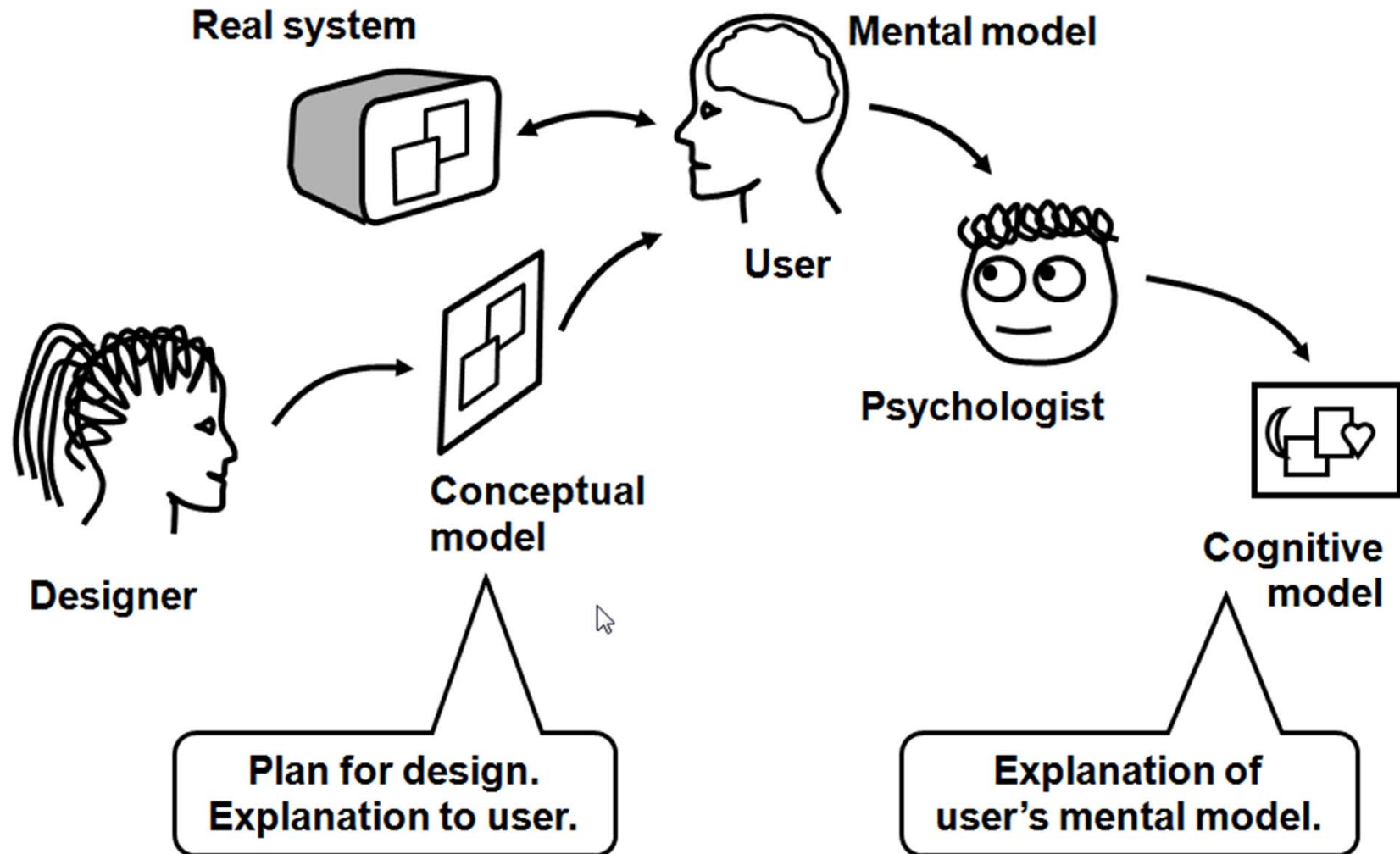


Model B:
Page format on document.
Follows document.

Model C:
Page format in text.
Works from this page on.

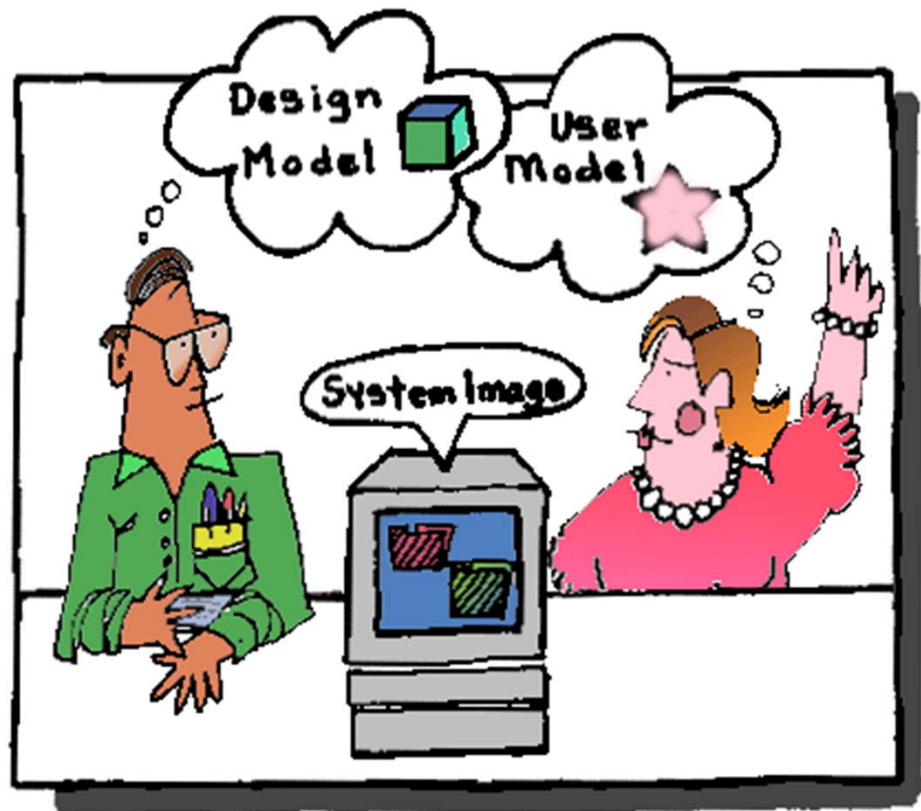


Mental, conceptual and cognitive models



Mental Models Characteristics

- people's ability to run their models is limited.
- incomplete
- unstable
- no firm boundaries
- unscientific



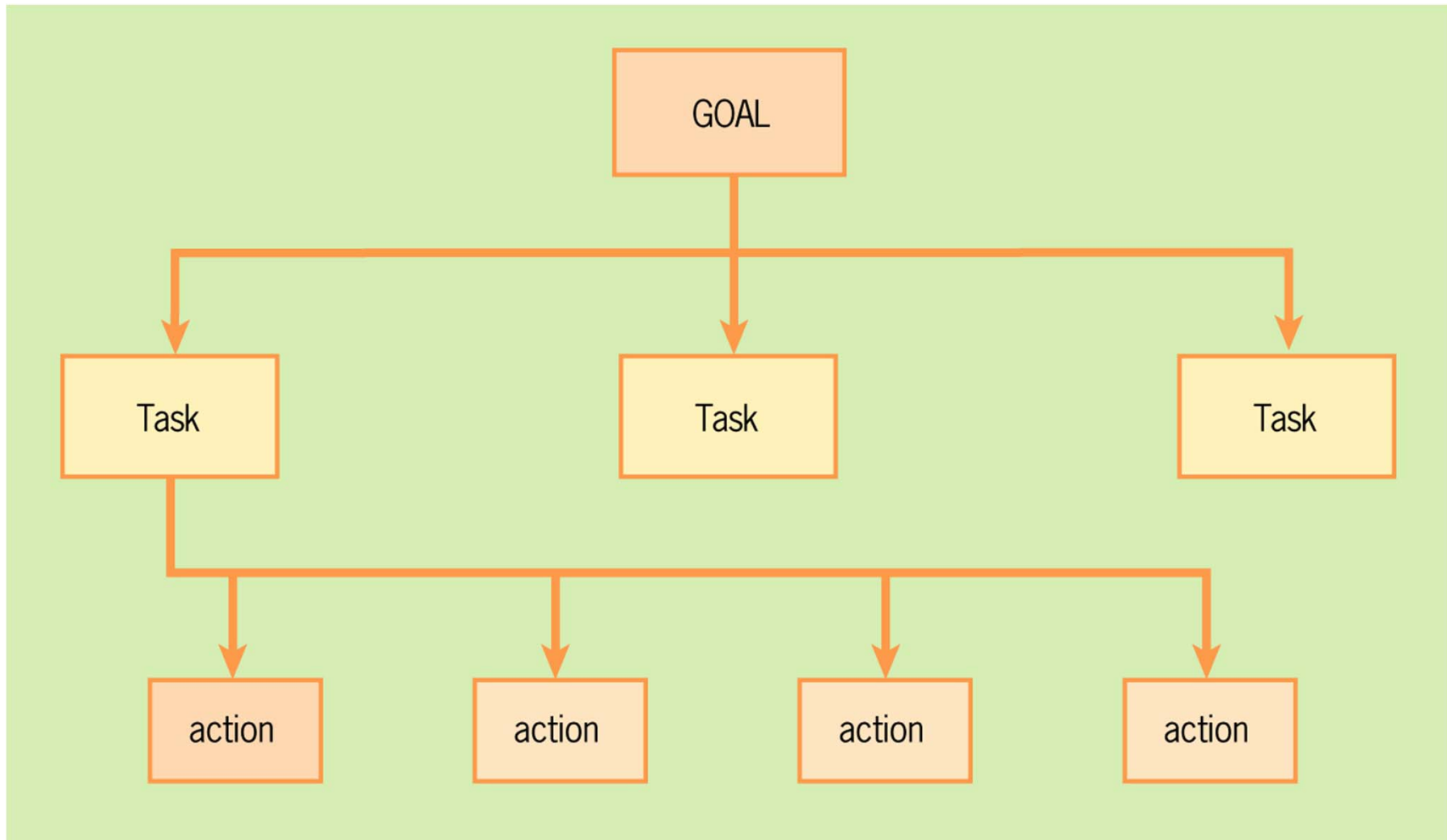
Describing Users' Work

- **Goals, Tasks, and Actions**
 - **Task Characteristics: The Nature of the Work**
 - **Task Sequences: There May Be More Than One Way to Do a Task**

Goals, Tasks, Actions

- **Goal**: the end result to be achieved
- **Task**: structured set of related activities that are undertaken in some sequence
- **Action**: an individual operation or step that needs to be undertaken as part of the task.

Goals, Tasks, Actions



Communicating With a Friend

- Goal: communicating with a friend
- Task:
 - handwritten letter or card
 - typewriter or word processor sending a text message
 - e-mail
- Actions: writing a letter
 - obtaining some writing paper and a pen or pencil
 - finding a flat surface upon which to write and a place to sit
 - using pen or pencil to write words

Task Characteristics

Variety of tasks

Frequency of tasks

Knowledge and skill required

Environmental factors

Time critical

Safety hazards

Will user work alone or with others

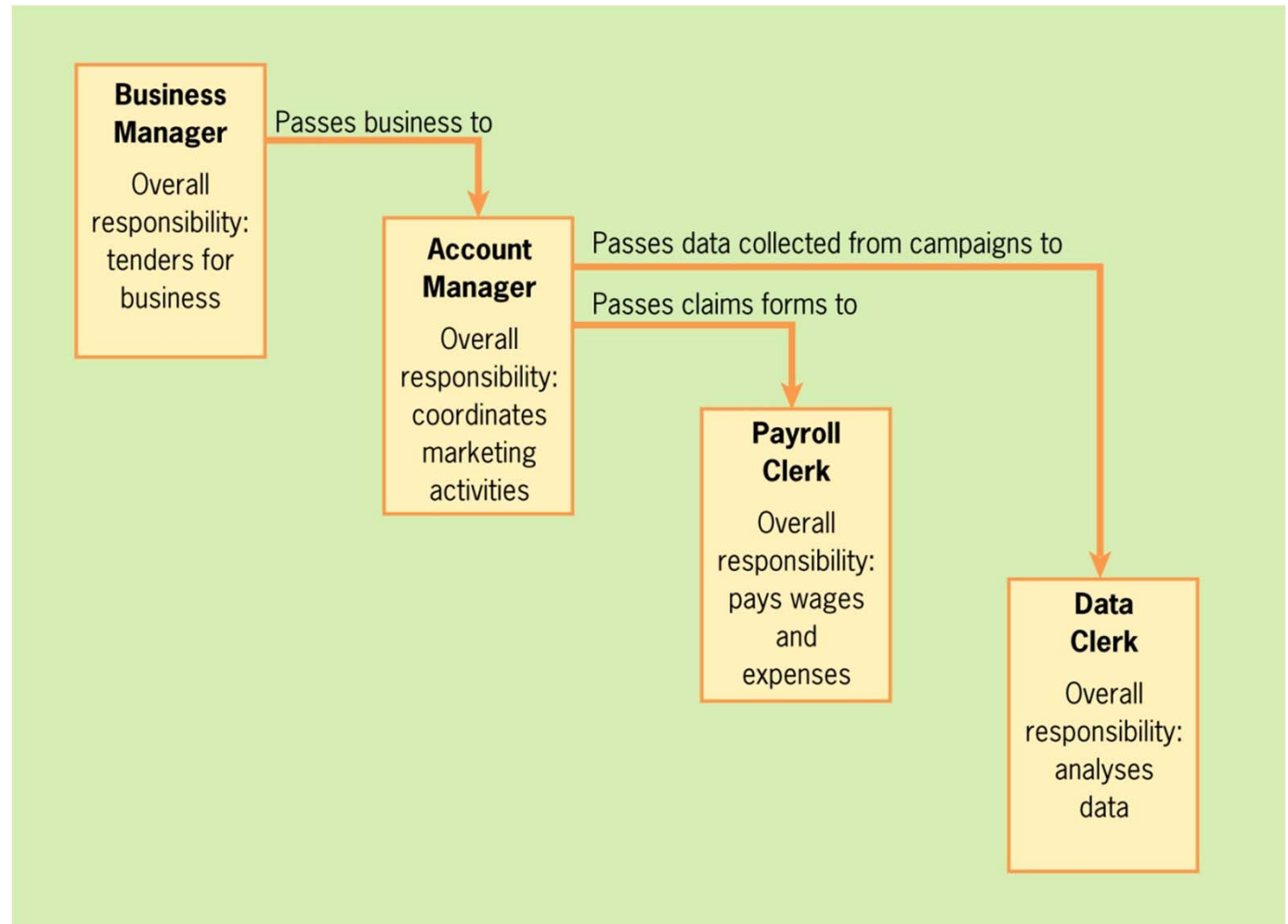
User normally switches between several tasks

Exercise

- Using the list in previous table, describe the characteristics of the tasks undertaken when using an ATM to withdraw money.
- Describe the task for writing a letter and sending to your friend.

Task Analysis

- Granularity – levels of detail
- Work-flow
- Job analysis



Describing Users' Work

- **Task Analysis**

- **Clues for Improving Design: Problems and Difficulties with the Current UI**
- **Techniques for Task Analysis**
- **Describing How to Do It: Scenarios and Use Cases**
- **Cognitive Task Analysis: Moving from Scenarios and Use Cases to Cognitive Walkthrough**

Task Analysis

- **Clues for Improving Design: Problems and Difficulties with the Current UI**
 - Analyze errors
 - Find “work arounds”
 - Observe job aids, reference manuals, etc.
 - Artifacts – object or aid

Techniques for Task Analysis

- Describe what is to be done
 - goal/objective
- Describe how a user does the task
 - what a user needs to know in order to do the task

Emily Adams has just arrived at Kuala Lumpur airport en route to a large conference. Looking around for a bank in order to get some local currency, she sees a foreign currency exchange ATM that seems similar to the one she uses at home.

She parks her suitcase takes out a credit card, and inserts it into the slot. A message is displayed on the screen:

Enter your PIN.

Emily thinks for a few moments and then types a four-digit number on the numerical pad, listening to the reassuring beep that follows each key press. The machine pauses for a few seconds and then displays:

Select currency required.

Emily pauses again. What is the currency in Malaysia? Fortunately the machine offers a default of “Ringgit,” so she guesses that must be the local currency and presses the key. The machine displays the message:

Exchange rate is 3.75 Ringgit to one dollar U.S.

Enter amount required in Ringgit in units of [10].

Press [Proceed].

Emily enters 380 and presses <Proceed>. There is a whirring noise and a few other indeterminate clunks and clicks. Her credit card is returned from the card entry slot and the money is deposited in the delivery slot, along with a print-out of the transaction

Concrete Use Case

User action	System response
User inserts credit card into the slot.	System requests PIN.
User types in 4-digit PIN number using the keypad.	System verifies user's identity. System requests foreign currency required, to be selected using menu keys.
User presses the key corresponding to the required currency.	System displays the exchange rate. System requests the user to enter the amount of foreign currency required using the keypad. The unit of currency is also displayed, as the system only deals with banknotes.
User enters amount required using the keypad.	System returns the credit card via the slot. System dispenses the currency via the currency delivery slot. System delivers a printout of the transaction via the receipt slot.

Essential Use Case

Get foreign currency

User's purpose

System responsibility

Identify self.

Validate user's identity.

Display currencies available.

Select currency required.

Display exchange rate.

Enter amount of foreign currency required.

Calculate amount multiplied by exchange rate.

Confirm amount.

Request initiation of payment.

Obtain authorization for amount.

Give money.

Take money and go.

A Task Analysis Example

- in order to clean the house
 - get the vacuum cleaner out
 - fix the appropriate attachments
 - clean the rooms
 - when the dust bag gets full, empty it
 - put the vacuum cleaner and tools away
- must know about:
 - vacuum cleaners, their attachments, dust bags, cupboards, rooms etc.

Task Decomposition

Aims:

- describe the actions people do
- structure them within task subtask hierarchy
- describe order of subtasks

Hierarchical Task Analysis (HTA)

Textual HTA Description

0. in order to clean the house
 1. get the vacuum cleaner out
 2. get the appropriate attachment
 3. clean the rooms
 - 3.1. clean the hall
 - 3.2. clean the living rooms
 - 3.3. clean the bedrooms
 4. empty the dust bag
 5. put vacuum cleaner and attachments away

... and plans

Plan 0: do 1 - 2 - 3 - 5 in that order. when the dust bag gets full do 4

Plan 3: do any of 3.1, 3.2 or 3.3 in any order depending on which rooms need cleaning

Generating the hierarchy

- 1 get list of tasks
- 2 group tasks into higher level tasks
- 3 decompose lowest level tasks further

Stopping rules

How do we know when to stop?

Is “empty the dust bag” simple enough?

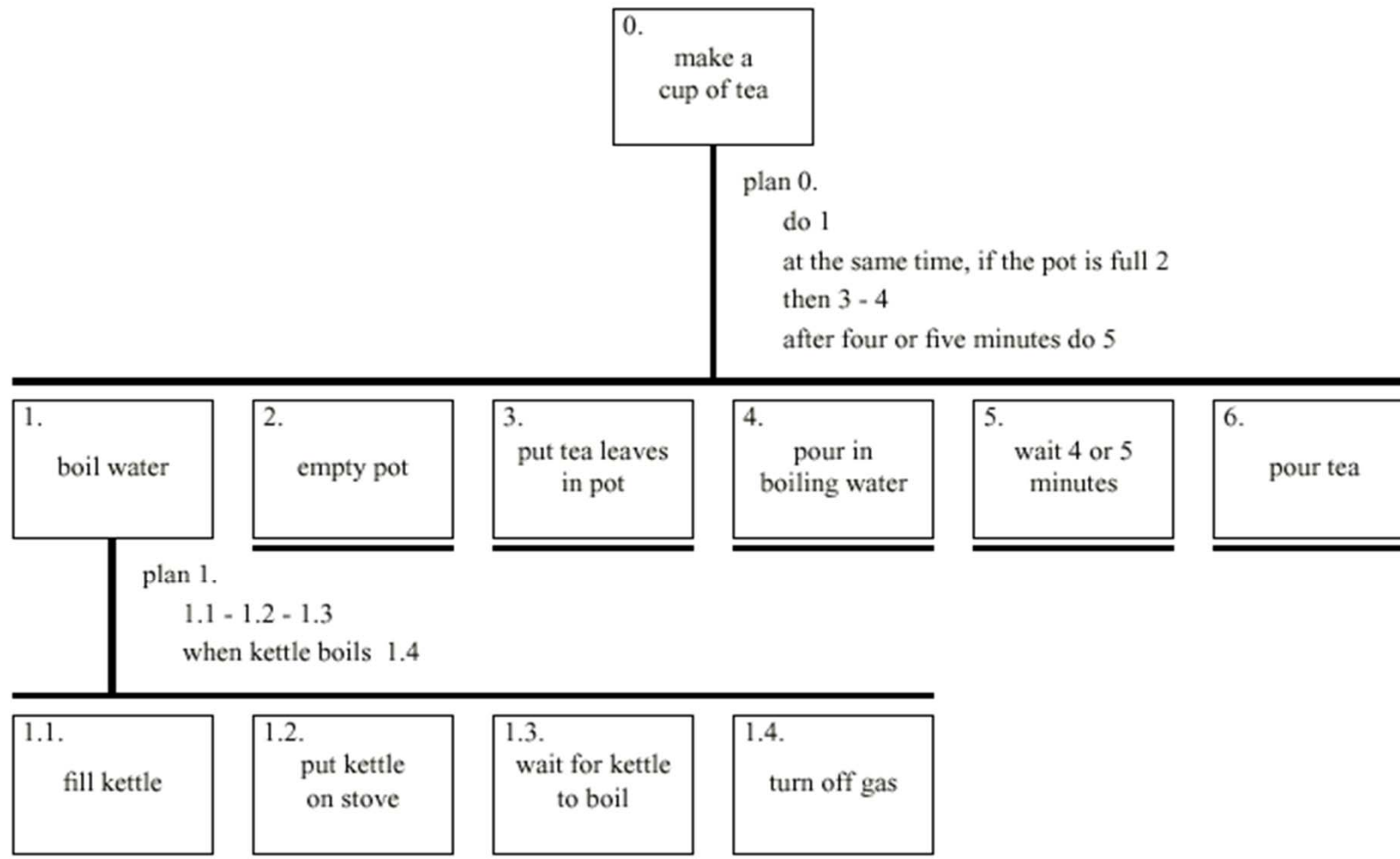
Purpose: expand only relevant tasks

Motor actions: lowest sensible level

Tasks as explanation

- imagine asking the user the question:
what are you doing now?
- for the same action the answer may be:
typing ctrl-B
making a word bold
emphasising a word
editing a document
writing a letter
preparing a legal case

Diagrammatic HTA



Exercise

- Group of 4
- Discuss about to perform HTA for doing your research (master project, thesis)

Refining the description

Given initial HTA (textual or diagram)

How to check / improve it?

Some heuristics:

paired actions e.g., where is 'turn on gas'

restructure e.g., generate task 'make pot'

balance e.g., is 'pour tea' simpler than making pot?

generalise e.g., make one cup or more

Types of plan

- fixed sequence - 1.1 then 1.2 then 1.3
- optional tasks - if the pot is full 2
- wait for events - when kettle boils 1.4
- cycles - do 5.1 5.2 while there are still empty cups
- time-sharing - do 1; at the same time ...
- discretionary - do any of 3.1, 3.2 or 3.3 in any order
- mixtures - most plans involve several of the above

Cognitive Walk-Through

- “Evaluates the steps required to perform a task and attempts to uncover mismatches between how the users think about a task and how the UI designer thinks about the task”

Cognitive Walkthrough Method

Step 0: The user selects a task to be performed and writes down all the steps (actions) in the task.

For each action in the task:

Step 1:	The user explores the artifact, prototype, or task scenario, looking for the action that might enable him or her to perform the selected task.	How does the user know what to do next? Is the correct action sufficiently evident to the user (can recognize it) or does the user have to recall what to do from memory?
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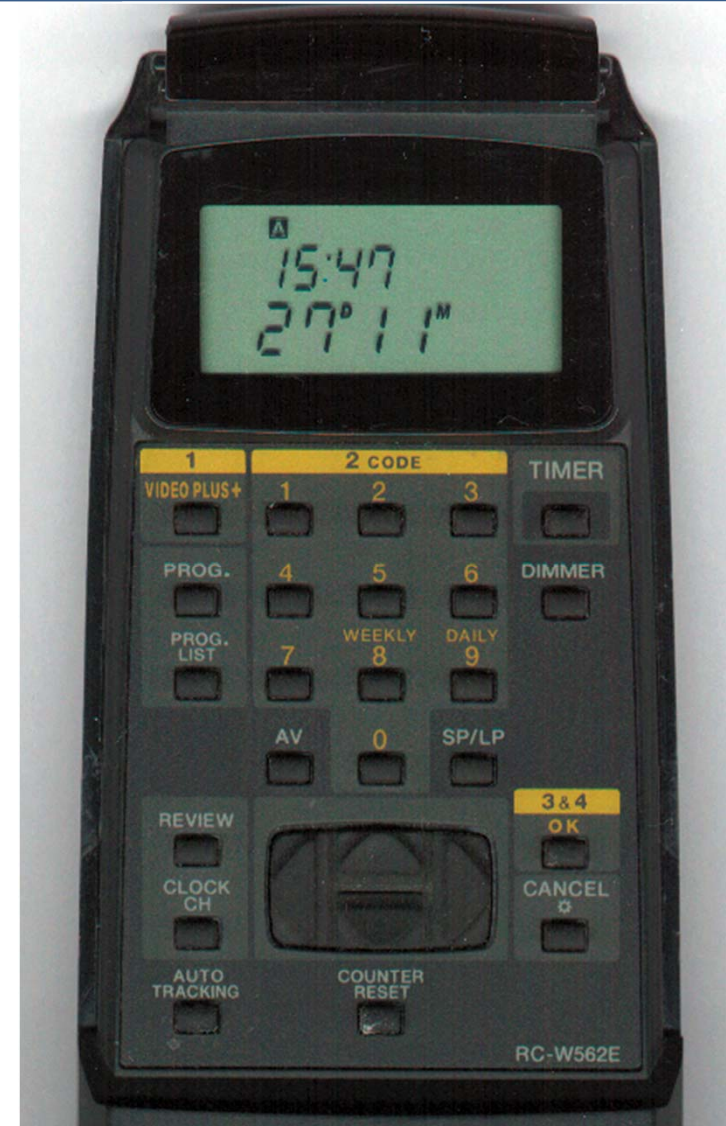
Cognitive Walkthrough Method

Step 2:	The user selects the action that appears to match most closely what he or she is trying to do.	Will the user connect the description of the correct action with what he or she is trying to do?
Step 3:	The user interprets the system's response and assesses if any progress has made toward completing the task.	Will the user know if he or she has made a right or wrong choice?

Remote

Produce a “Cognitive Walkthrough” of a TV or other remote control you may have at home.

- From “Turn ON”
- Actions in between
- To “Turn OFF”



Step 0: Select a Task

- set the VCR for a timed recording of a program start at 21:00 and finishing at 22:30 on Ch4 on August 18, 2005.
- when switched ON, the VCR displays the number of the channel it last used.
- when switched OFF, it displays a digital clock.
- To set the timed recording, the VCR must be switched ON.

User actions (UA)

System responses (SR)

UA1 Press the PROG button on the hand set.

SR1 VCR display shows a form fill-in for setting the start and stop times. These times are divided into separated sections for the hour and minute, separated by a colon. The cursor is flashing on the hour section on the start time.

UA2 Press the up arrow until the number 21 is showing.

SR2 21 is showing in the hour section of the stat time.

UA3 Press the right arrow once to move the cursor to the minute section of the stat time.

SR3 00 is showing and flashing in the minute section of the start time. This defaulted to 00 on selection of 21 in the hour section.

User actions (UA)

System responses (SR)

UA4 00 in the minute section of the start time is what is wanted. Press the right arrow once to move the cursor to the hour section of the finish time.

SR4 The cursor is flashing in the hour section of the finish time.

UA5 Press the up arrow until the number 22 is showing.

SR5 22 is showing in the hour section of the finish time.

UA6 Press the right arrow once to move the cursor to the minute section of the finish time.

SR6 00 is showing and flashing in the minute portion of the finish time. This defaulted to 00 on selection of 22 in the hour section.

User actions (UA)

System responses (SR)

UA7	Press the up arrow until the number 30 is shown.	SR7	30 is showing in the minute section of the finish time.
UA8	Press the right arrow once to move the cursor to the day section of the date field.	SR8	On the display, the full date has now defaulted to the current date. The cursor is flashing in the day section of the date.
UA9	Press the up arrow until the number 18 is showing.	SR9	18 is showing in the day section of the date field.
UA10	Press the right arrow once to move the cursor to the month section of the date field	SR10	The cursor is flashing in the month section of the date field.

User actions (UA)		System responses (SR)	
UA11	Press the up arrow until the number 8 is showing.	SR11	18 is showing in the day section of the date field, and 8 is showing in the month section of the date field.
UA12	Press the right arrow once to move the cursor to the year section.	SR12	The cursor is flashing in the year section of the date field.
UA13	Press the up arrow until the number 04 is showing.	SR13	18 is showing in the day section, 8 is showing in the month section, and 04 is showing in the year section of the date field.
UA14	Press the right arrow once to move the cursor to select the channel to record.	SR14	The cursor is flashing in the channel field.

User actions (UA)

System responses (SR)

UA15 Press the up arrow until the number 4 is showing.

SR15 4 is showing as the channel to record form.

UA16 Press the right arrow once so the system accepts the setting.

SR16 The clock returns to the display. A small 1 is displayed on the left side of the clock, which indicates one timed recording has been set.

UA17 Press the TIMER button to initiate timed recording mode.

SR17 Video switches itself off and into timed recording mode. A small red clock is displayed in the upper right-hand corner of the display to indicate that the video is set for time recording.

Question 1

Is the correct action sufficiently evident to the user?

Neither the handset nor the VCR display give any indication that the user needs to press the PROG button to do a timed recording.

Question 2

Will the user connect the description of the correct action with what he or she is trying to do?

Experienced users might associate timed recording with setting or programming (prog) the VCR. However, this is probably not the case for novice users.

Question 3

Will the user know if he or she has made a right or wrong choice on the basis of the system's response to the chosen action?

Once the PROG button is pressed, the VCR display changes to form fill-in that guides the user in entering the information (although the display on the handset does not change). Any user who notices the VCR display, or remembers where the form fill-in appears, will know that he or she has made a right choice.

Question 1

Is the correct action sufficiently evident to the user?

No. It is not evident that to set the time one can use only the four unlabeled arrow keys. In fact, the handset is confusing for the user because there is a number pad above the four arrow keys. The user might assume that he/she can use the number pad to enter the time values into the form.

Question 2

Will the user connect the description of the correct action with what he or she is trying to do?

No. There are no markings on the arrows themselves, nor anywhere near them, that might indicate that they are to be used for entering information into the programming form fill-in.

Question 3

Will the user know if he or she has made a right or wrong choice on the basis of the system's response to the chosen action?

If the user is lucky enough to discover that the arrow buttons change the times and channel, then there will be feedback on the VCR display as the form gets filled in. However, this could easily be missed if the user stops looking at the VCR display – perhaps because he/she is so engrossed (and irritated) in trying to make the handset work.

Environment and effect

Environmental characteristic *How it affects the design*

The environment is noisy.

The use of sound for alerting users to problems may not be effective

The environment is dusty or dirty.

Equipment might require some type of protective covering (e.g., a keyboard might need a membranous cover).

Users wear protective clothing such as gloves.

Input devices will need to accommodate this.

Environment and effect

Environmental characteristic *How it affects the design*

The work is highly pressured and subject to frequent interruptions.

The application must allow the user to stop his or her work and restart it later, preferably from the point where the user left off.

There is a need for workers to share information, or the work is designed so that they work in groups rather than in isolation.

The workplace will need to be laid out carefully to take this factor into consideration.