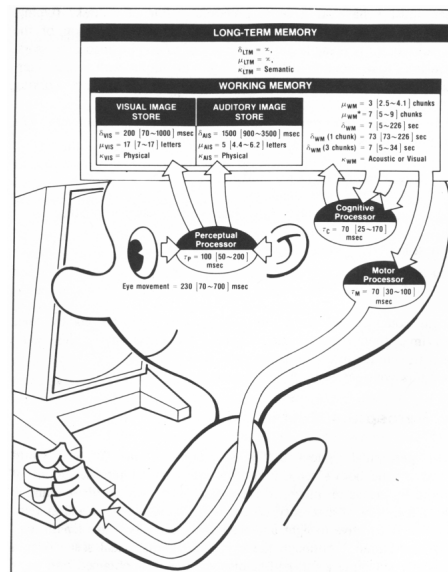


# Conceptual Modeling

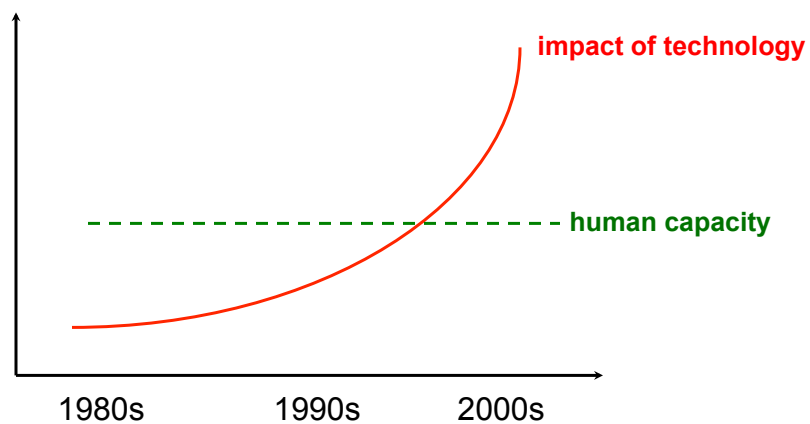
(part of phase 2 in design cycle)

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## human processor



## technology and human capacity



## impact of technology

### Measures :

- Number and type of devices
- Types of applications
- Number and complexity of functions
- Information volume
- Duration of use
- Level of interaction between users

## utilisability, usability

*« The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use »*  
(ISO 9241)

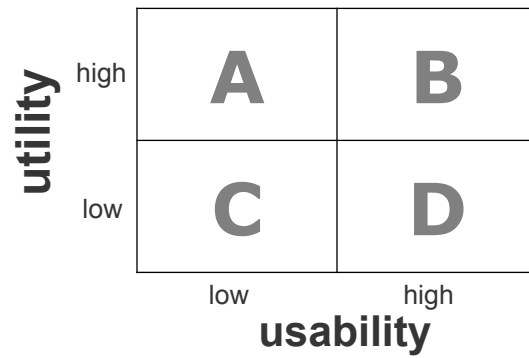
A usable system is: easy to learn, efficient, visually pleasing and allows easy error correction

## utility

Meet specific needs and support real tasks

## utility

Meet specific needs and support real tasks



is D better than A ?

## what do you think?

remote control

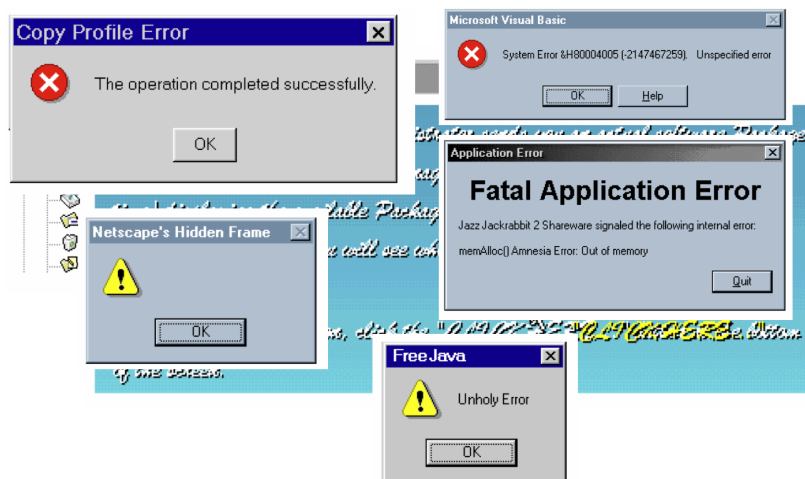


what do you think?

photocopier



why do we get bad designed UI?



## *The design of everyday things* (Norman, 1990)

Everyday objects reflect the problems of interface design

- Door handles
- Washing machines
- Telephones
- etc.

Introduces the notion of affordance, metaphor, conceptual model

Gives design guidelines



## mental model

What is it? How does it work?



## mental model

Mental representation of operation in reality  
e.g. indications on how to go home

Gives structure for linking cause and effect

What do I see?

What does it mean/do?

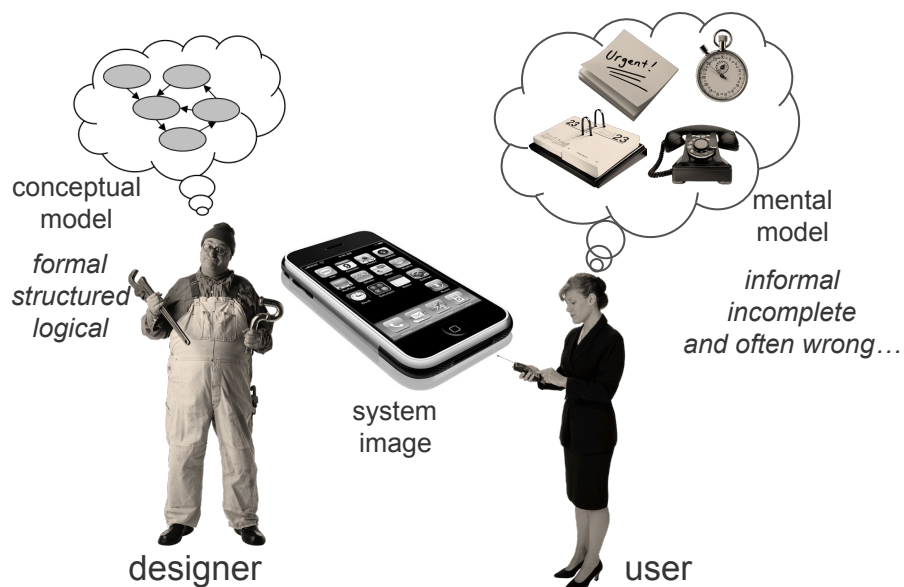
What did I do to cause this effect?

Allows us to predict

What more can I do now?

What will happen if I do this?

## conceptual and mental model



## conceptual modeling

### Conceptual model

- The way the designer wants the user to see the system
- Should hide technical aspects
- Should refer to what the user wants to do in the system

### System image

- What the user sees from the system  
(including documentation)
- What helps her construct her mental model

### User's mental model

- Constructed based on her understanding of the system image, her use of the system, what she has read, etc

## conceptual modeling

### Match between conceptual and mental model

- Improved by appropriate use of *metaphors*
- Improved by taking advantage of *affordances*
- Improved by following *design guidelines*

### In case of bad match

- Manipulation errors
- Frustration
- Low productivity



## metaphor

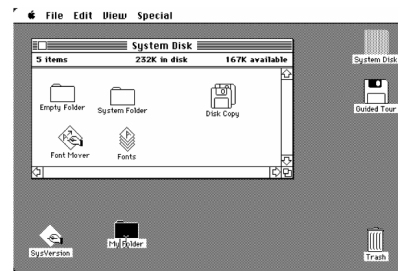
Transfer of a relation between objects to another set of objects



office & desktop



folders



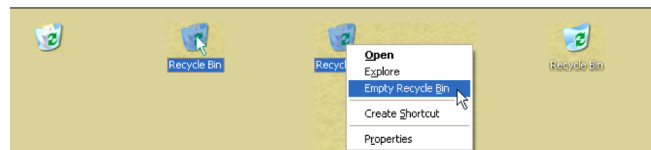
virtual office

## metaphor

Transfer of a relation between objects to another set of objects

We transfer to the new set of objects properties from the original one

Open a folder, put in trash, etc.



## metaphor

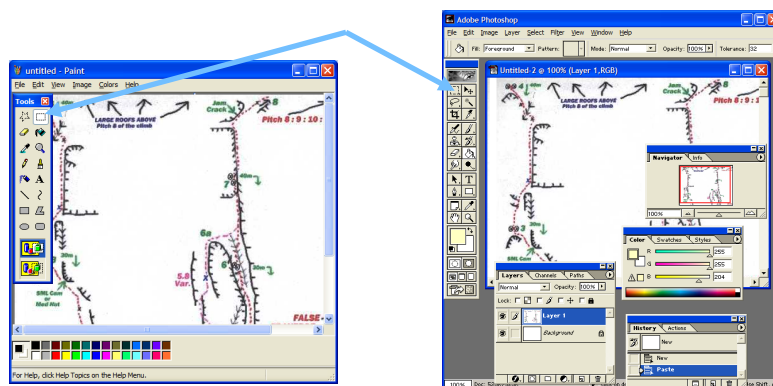
Goals :

Save on learning  
 Capitalize on existing knowledge  
 Exploit known properties of the real world

The goal is not to simulate a true office but to  
 exploit our knowledge of a true office

## metaphor and positive transfer

Past experiences apply to new situations



## metaphor and negative transfer

Past experiences do not apply to new situations

Avoid a literal implementation of a metaphor

- Constraints and expectations
- Conflicts with design principles
- Functionalities are not always applicable

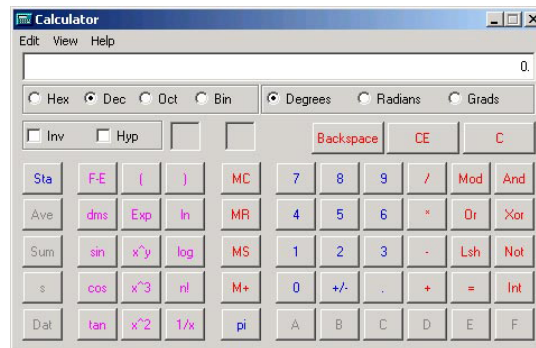
## metaphor and negative transfer

Microsoft Bob (1995) : failure



## metaphor and negative transfer

the calculator



## metaphor and inconsistency

Delete the disk ...



Disk



Trash

...or eject it?

## affordances



## affordances

Possibilities for actions on objects perceived immediately

The shape, size, and other visual aspects of an object suggest what we can do with it

« *Much of everyday knowledge resides in the world, not in the head* » (Norman, 1988)

## affordances

Push ?  
Pull ?



## affordances

Push ?  
Pull ?

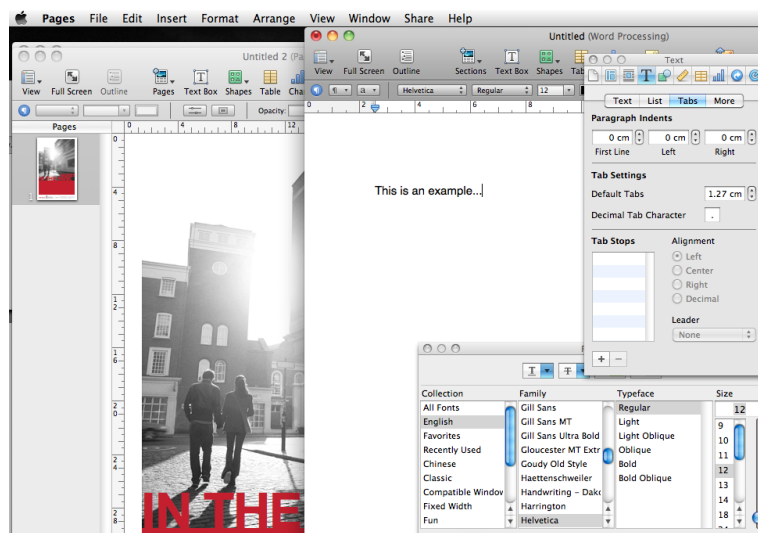


## affordances

hmmm...



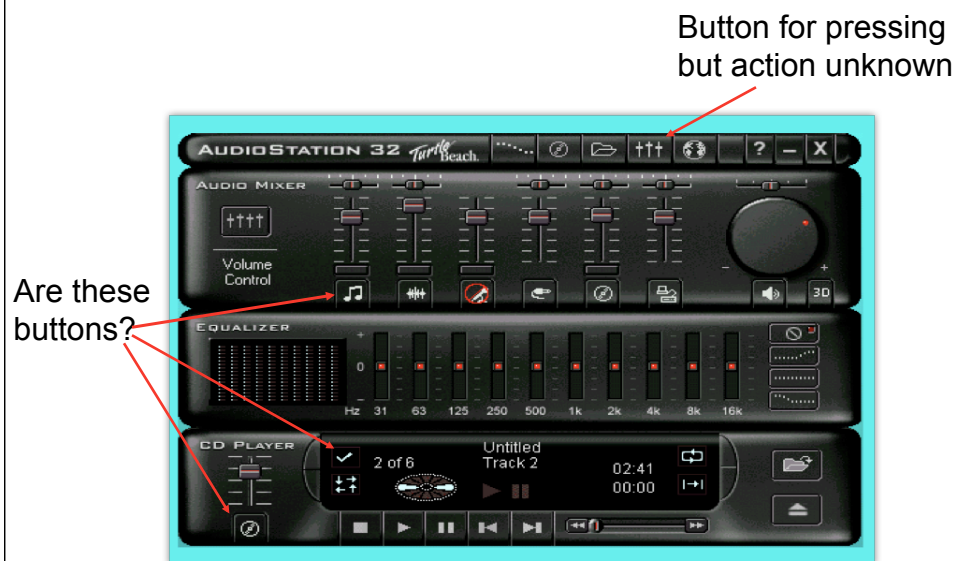
## affordances



## affordances



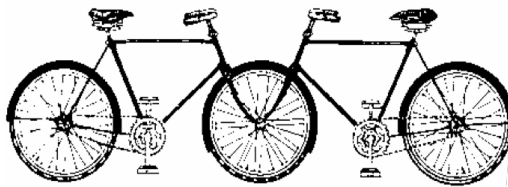
## affordances





## constraints

Our mental models of physics and mechanics allows to predict and simulate the operation of an object



## constraints

Too many constraints?  
Are these interfaces efficient?

**Form1**

Date: [ ] [ ] [ ]

Month Day Year

May 22 1997

Month Day Year

May 22 1997

**Appointment**

General Attendees Notes Planner

When

Start: 8:30 AM Wed 5 /14 /97

End: 4:30 PM Wed 5 /14 /97

☐ All day

Description:

Smart Technology Sen

May 1997

| S  | M  | T  | W  | T  | F  | S  |
|----|----|----|----|----|----|----|
| 27 | 28 | 29 | 30 | 1  | 2  | 3  |
| 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |

Where: [ ]

## mappings

Example : Find the correspondence between these heating elements and their controllers



## mappings

Example : Find the correspondence between these heating elements and their controllers

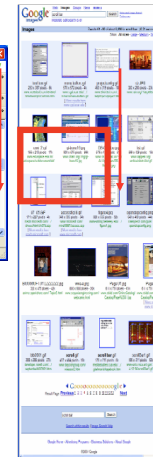
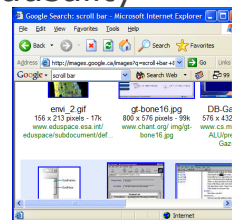
... and now?



## mappings

Set of possible relations between objects

- Controller (widget) and result
- Linked to feedback and causality



## causality (and feedback)

The state of the system immediately after an action is perceived as the result of the action

- interpretation of feedback

False causality:

- When invoking an unknown function the PC crashes

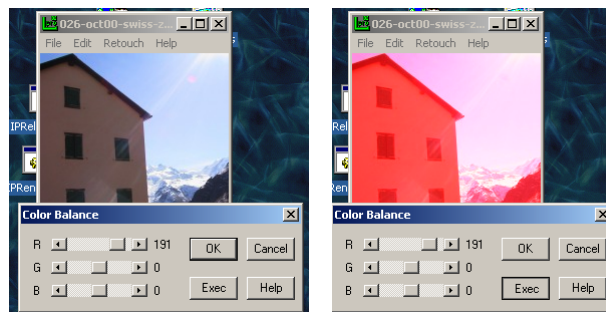
Effect/result of action not visible:

- Commands without visible effect are repeated
- e.g. mouse click on a link when the system is not responding

## false causality

Here the effects of the user's actions are visible only after the  
« Exec » button is pressed  
OK does nothing!

Difficult to find the color needed



## exercise: scissors

Conceptual model ?

Affordances ?

Mappings ?

Feedback ?

Constraints?

Transfers?



## exercise: watch

Conceptual model ?

Affordances ?

Mappings ?

Feedback ?

Constraints?

Transfers?



## design principles by Norman (1990)

### 1. Make things visible

We can know the state of the system by observing the UI

### 2. Use clear Mappings

### 3. Use Feedback

Inform the user

## structuring the conceptual model

Identify objects :

What the user manipulates or is interested in

Identify operations :

What the user can do with the objects

Identify the commands :

How should the user manipulate the objects

## structuring the conceptual model

Organize info in 2 tables:

| <b>Objects</b> | <b>Representations</b>                                   | <b>Properties</b>                   | <b>Operations</b>   |
|----------------|--|-------------------------------------|---|
| Contact        | A line in the contacts list                              | -name<br>-alias<br>-status          | -add<br>-delete<br>-chat<br>-stop chat                              |
| Me             | First line in contact list                               | -my name<br>-my alias<br>-my status | -change my status<br>-change my alias                               |
| Chat           | Window with text of discussion and a place to enter text | -sequence of exchanged msg          | -add msg<br>-copy msg<br>-add contacts to chat<br>-remove from chat |

+ Operations and how to use them (interaction)

## evaluation of conceptual model

With *scenarios / storyboards*

Describe realistic interaction sequences  
Verify that they are covered by the model

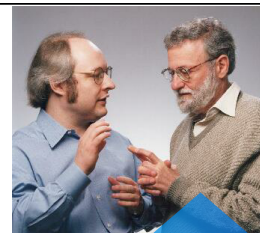
With *walkthroughs*

Verify (and ask others to verify) the principles  
(later in evaluation)

With *prototypes*

Implement the interaction techniques that  
you are not confident with to test them

## Design Principles (Norman): When creating a conceptual model



Remember

1. **Visibility** : state of the system observed in the UI
2. **Affordances** : perceived actions
3. **Mapping** : correspondence between action and result
4. **Feedback** : inform the user
5. **Metaphors and transfers** : help learn/discover
6. **Constraints** : use to avoid errors

## Design Principles

### When creating a conceptual model

Don't forget:

- Target users (e.g. children, users from Thailand)
- Individual users (novice, expert)



Trashcan in  
Thailand



?



## Conclusion

The conceptual model is crucial for an IS

Conceptual design is a creative process

We cannot just apply the rules

User-centered design

Analyze interaction from the user's point of view

Participatory design

Work with users to understand their needs, validate your choices, and always learn and take advantage of their ideas