Usability Engineering

Overview

- Key ideas and terms
  - Mental models
  - System image
  - Conceptual models
  - User Models

Mental models

Definitions, links to most other parts of HCI, valuable language and mental tools

http://magamaps.com/mental-models/

Craik KJW. The Nature of Explanation. Cambridge University Press; Cambridge, UK: 1943.

Mental models

http://www.nngroup.com/articles/mental-models/

- **Summary:**
  - What people believe
    - Users
    - System designers
  - Strongly impacts all aspects of interaction
  - Mismatched mental models are common, especially with designs that try something new
- Note:
  - Beliefs …. Not facts
  - Mental models drive predictions, planning actions
  - Individual MMs differ …. Designer MM versus "user" MM
  - MMs change…. *Implications for One Sentence Statement*

http://normfujisaki.com/wp-content/uploads/2013/09/mental-model.jpg
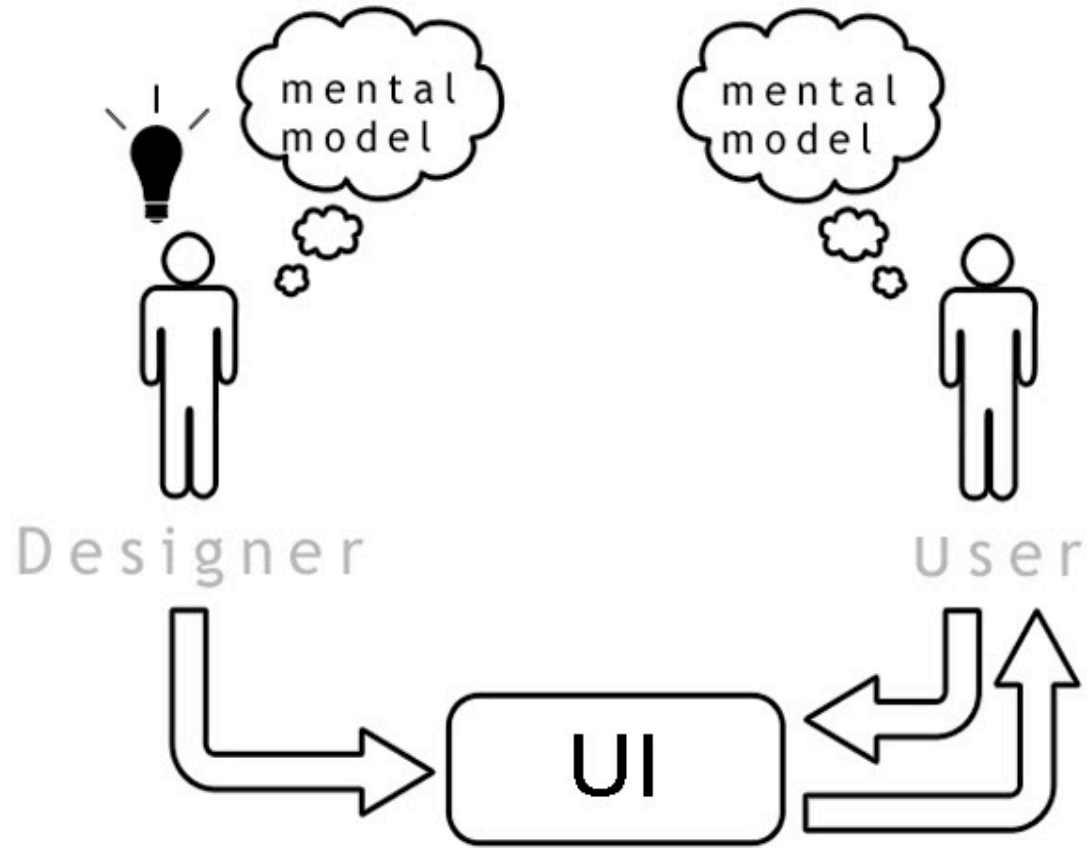
System image

- Aspects the user can actually perceive
- Part of the explanation for differences between user's and designer's mental models
- And has done so at this time
  - Aspects they are potentially aware of
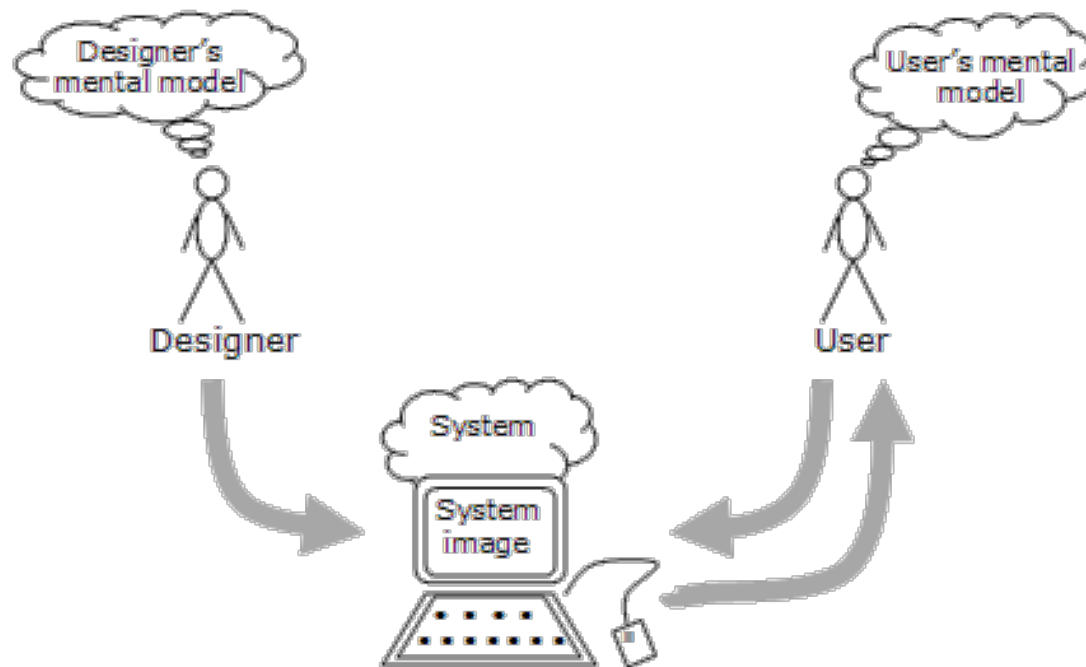
(2015): Mental models. In: Soegaard, Mads and Dam, Rikke Friis (eds.). "The Glossary of Human Computer Interaction". Aarhus, Denmark: The Interaction Design Foundation. Available online at https://www.interaction-design.org/encyclopedia/mental_models_glossary.html

Some illustrative mental models

classics

Example: "Cannot save file.... No space"

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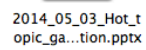opic_ga...tion.pptx
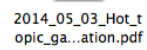
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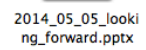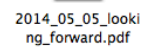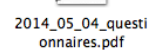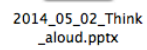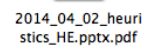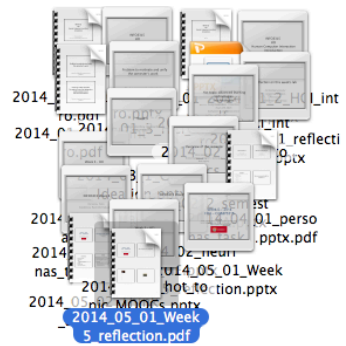
Mental models….

- What was the user's mental model?
- What is the designer's (actual) system model
- Cause of the problem???
- How to overcome it???

- In this case
- In general

The refrigerator challenge

- Your refrigerator's freezer section is not cold enough
- You find a dial at the back of the freezer labelled as below and set on 3
  - warmer 1 2 **3** 4 5 6 7 colder
- What will you do? Will it work? What is your mental model?

How to address mental model problems

- **Fix the system** – make it match users' mental models
  - eg If people look for something in the wrong place, then move it to the place where they look for it.
- **Fix the user** - improve users' mental models so that they more accurately reflect your system.
  - eg explaining things better
  - making labels clearer to make the UI more transparent (even though the underlying system remains unchanged)
  - Help that insists that the user pays attention

Some useful distinctions

- Slips:
  - correct user model, inadvertent incorrect action
  - eg car "malfunction", tap caps lock accidentally

- Mistakes: incorrect mental model

- Use this tightened vocabulary for your think-aloud reports

Conceptual model

- Representation of the system
  - Captures key concepts, processes
  - Helps a person build a mental model
- Depiction of the system
- What is the potential role of personalisation in conceptual models?

User model

- A set of beliefs about the user
- In HCI, the designers record of the important aspects of the user
  - written down to help designers ensure they are considered throughout design
- In personalisation, the machine's model of the user
  - Based on rich data such as click streams, user-elicited information, expert domain knowledge

How do you define a user model?

Studies of users? How to do that? Why? How to take account of the context?

User model case study: online dating

- How to make good recommendations?
  - The user model is core
  - What system believes about the user
- Individual user model
  - Explicit
    - Information about me (eg age, height, weight, portrait…)
    - Information about the person I want to me
  - Observations of the user
    - My history of interactions with system: my likes and dislikes + who likes and dislikes me
- Knowledge base and group user models
  - Stereotypes (eg males aged 18-30)
  - Known inaccuracies (eg males tend to over-estimate height, females underestimate weight, scammers….)
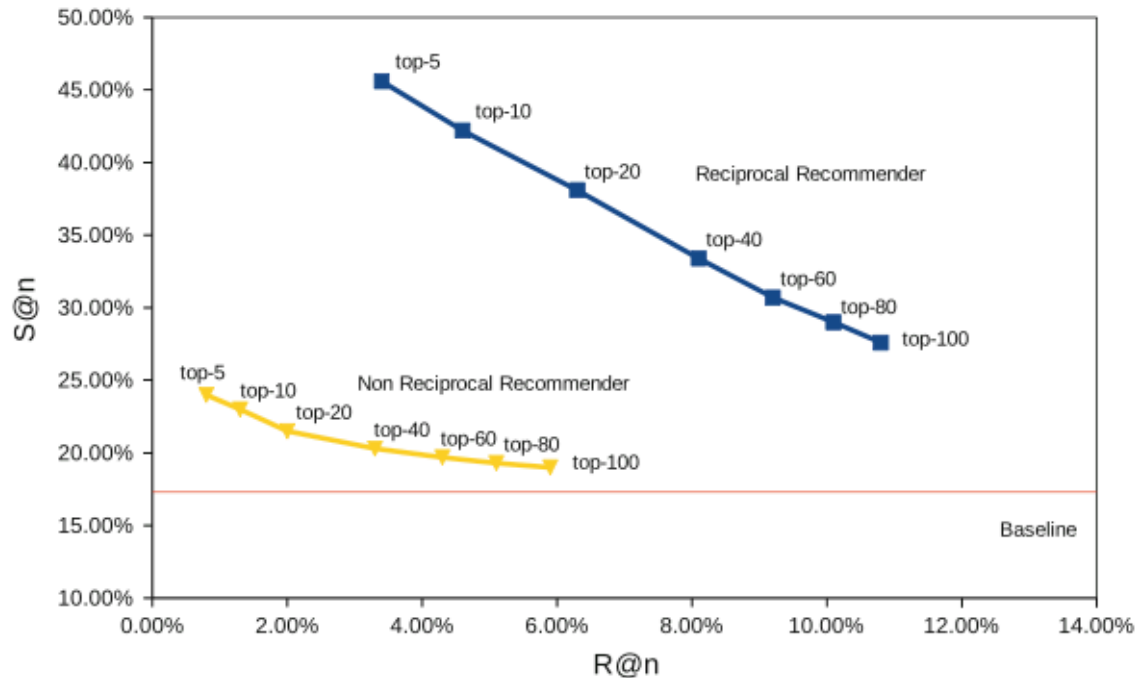 - Collaborative filtering (eg people who liked XXX also liked YYY)

Fig. 1 Success rate and recall comparison between reciprocal recommender, non-reciprocal recommender and the current search made by users (*baseline*)

Effect of user model that includes who will like/reject the user

Pizzato, L., Rej, T., Akehurst, J., Koprinska, I., Yacef, K., & Kay, J. (2013). Recommending people to people: the nature of reciprocal recommenders with a case study in online dating. *User Modeling and User-Adapted Interaction*, *23*(5), 447-488.
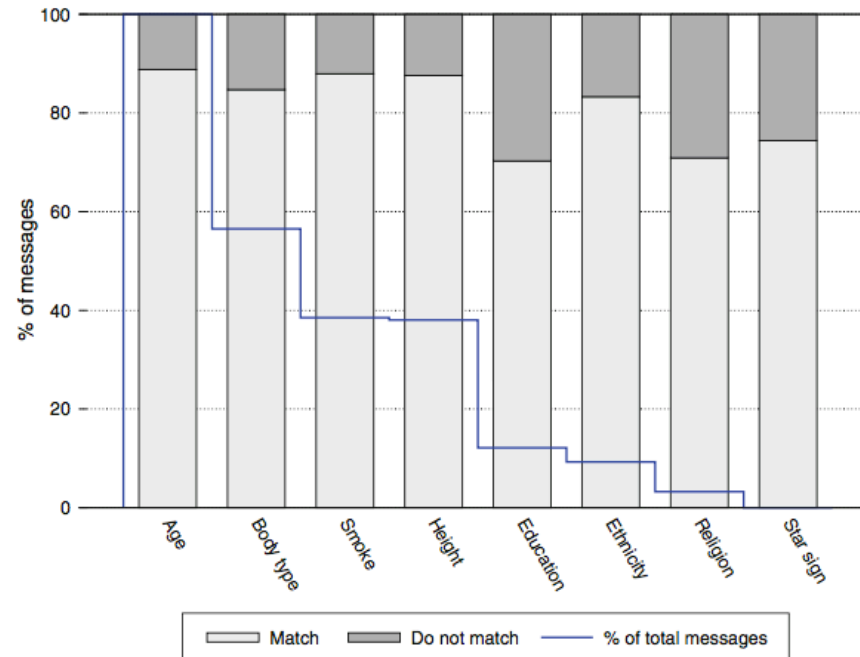
Fig. 3 Proportion of EOIs where the object matches the subject's explicit preference model

How accurately does explicit user model match the inferred user model, based on what people actually do?