



**10th International Conference
on User Modeling**

User Modeling Meets Usability Goals

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Introduction A Haunting Question

**When my fancy novel techniques
finally work well enough to be
used in real systems . . .
will anyone want to use
these systems?**

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This Is Not All New ...

Usability threats and principles

- Ben Shneiderman,
since mid-1990s
- Pattie Maes and
coworkers, late 1990s
- Eric Horvitz, 1999
- Kristina Höök, 2000
- ...

Evaluation of user-adaptive systems

- David Chin
- Stephan Weibelzahl
- Alexandros Paramythis
- Judith Masthoff
- ...

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What Are the Messages of This Talk?

The wrong messages

1. User-adaptivity is fundamentally a great way to increase the usability of interactive systems
2. Just apply general guidelines like "Put the user in control"
3. User modeling is an alternative paradigm to mainstream human-computer interaction paradigms

The real messages

1. User-adaptivity requires careful analysis of typical usability threats
2. Because of tradeoffs, no single solution is right for all of the users all of the time
3. By *expanding the design space*, you can find ways to satisfy more of the users more of the time

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Goals and Typical Threats Controllability

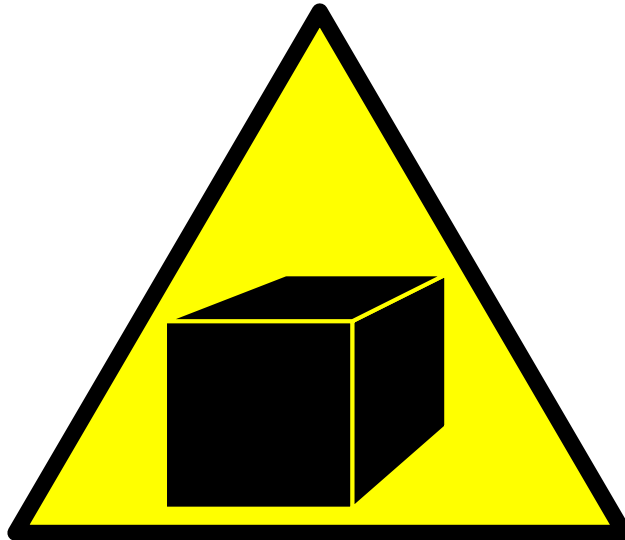


The user may not have enough control over the system

A discussion of these goals and threats will be found in Section 4 of: Jameson, A. (2003). Adaptive interfaces & agents. In J. Jacko & A. Sears (Eds.), *Human-computer interaction handbook* (pp. 305-330). Mahwah, NJ: Erlbaum. A revised version is being prepared for the 2nd edition, scheduled for 2006.



Comprehensibility

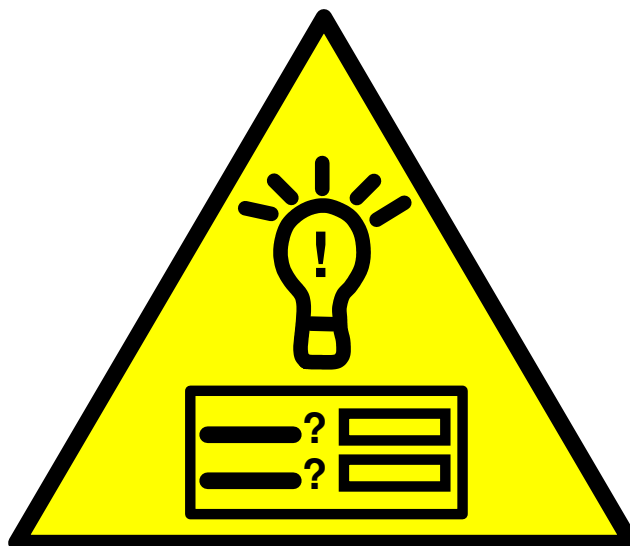


The user may not understand adequately how the system works –or be able to predict what it will do

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Unobtrusiveness

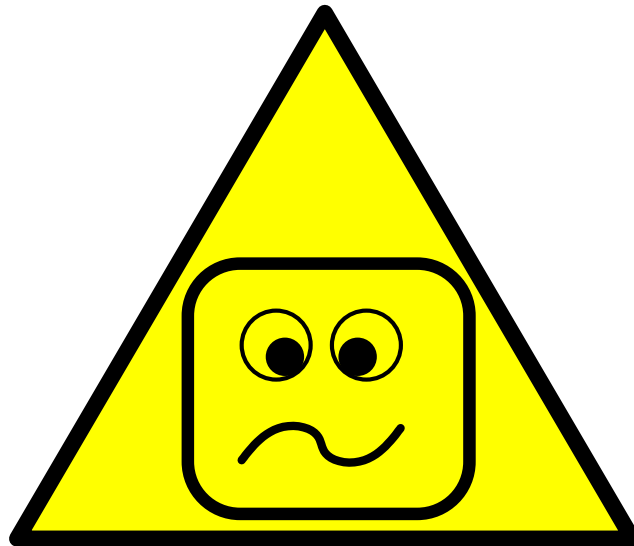


The system may distract the user with too many (or poorly timed) messages and requests for input

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System Competence



The system may perform actions that are so poorly adapted to actual facts about the user that the user is distracted and/or impeded

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Privacy



The system may create situations in which information that the user would prefer to keep private are made available to others

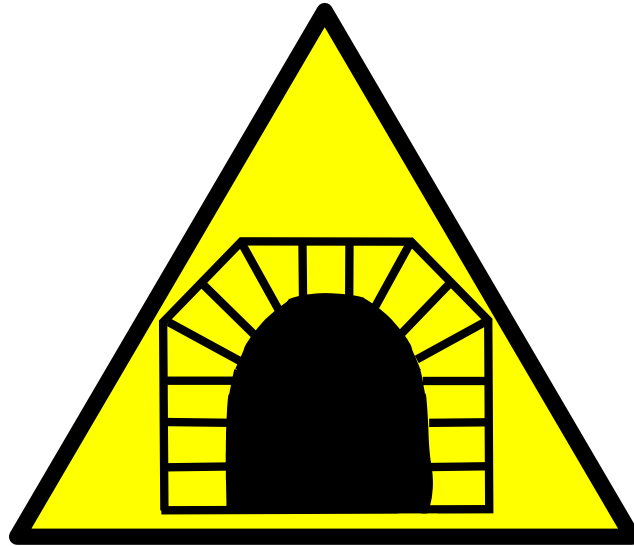
12

Privacy is not discussed in this talk, because it is the subject of the invited talk at this conference by Lorrie Faith Cranor





Breadth of Experience



The system may restrict the user's attention excessively

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Controllability vs. Obtrusiveness Intelligent Office System



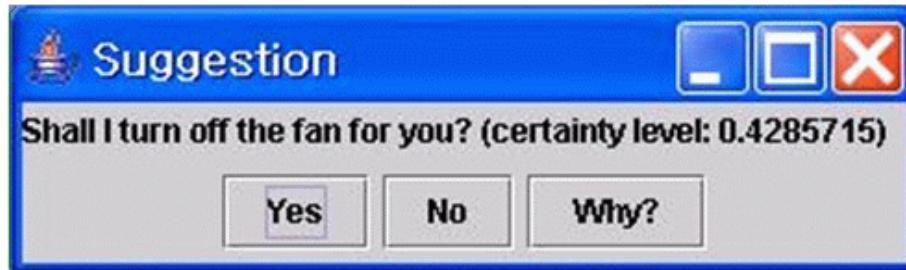
(Cheverst et al., UMUA special issue on User Modeling in Ubiquitous Computing)

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Early Version of Confirmation Prompt

On user's main workstation window:

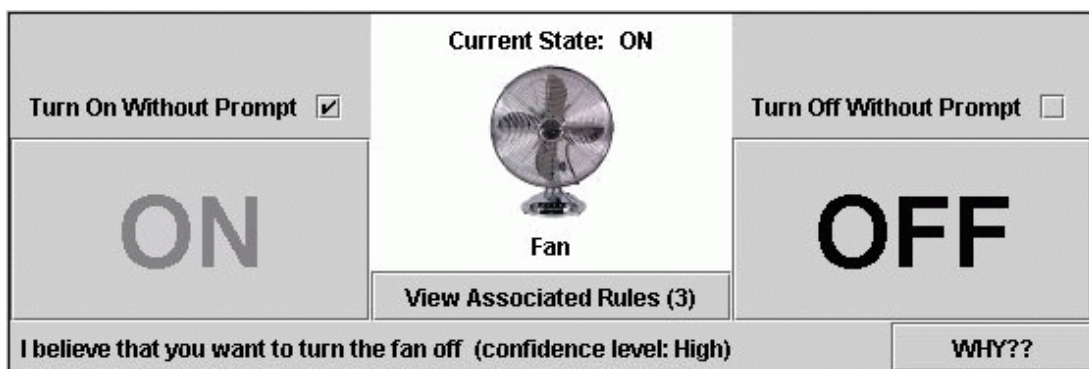


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Prompt on the Touch Screen

The word "OFF" changes color repeatedly while the prompt is being shown



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Control Panel

The screenshot shows a control panel titled "Intelligent Office - Context From User - Touch Sensitive UI". It features three rows of controls for different devices:

- Fan:** Current State: ON. Includes "Turn On Without Prompt" (checked) and "Turn Off Without Prompt" (unchecked) checkboxes. Large "ON" and "OFF" buttons are present. A "View Associated Rules (3)" link is below the device icon.
- Heater:** Current State: OFF. Includes "Turn On Without Prompt" (checked) and "Turn Off Without Prompt" (checked) checkboxes. Large "ON" and "OFF" buttons are present. A "View Associated Rules (4)" link is below the device icon.
- Desk Lamp:** Current State: OFF. Large "ON" and "OFF" buttons are present.

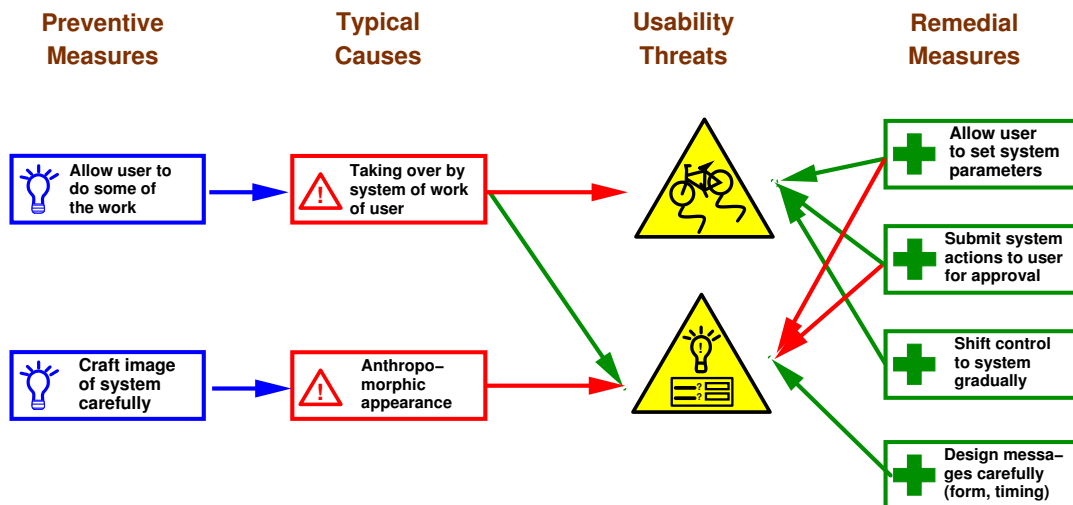
On the right side, there is a sidebar with the following information:

- Date:** 08 December 2004
- Day:** Wednesday
- Time:** 16:09
- Temperature:** 18.3°C (Cold)
- Humidity:** 26.8% (Low)
- Sound Level:** 55.0 dBa (Loud)
- Light Level:** 43.5 lux (Normal)
- Window:** Open
- Location:** IN. Includes "OUT" and "IN" buttons.
- Proactive Threshold:** Radio buttons for Low, Medium (selected), High, and Proactive off.
- Buttons for Preferences, Learn Rules, View Context History (raw), View Context History (sym), and Last Recorded Added: 12/08/04.

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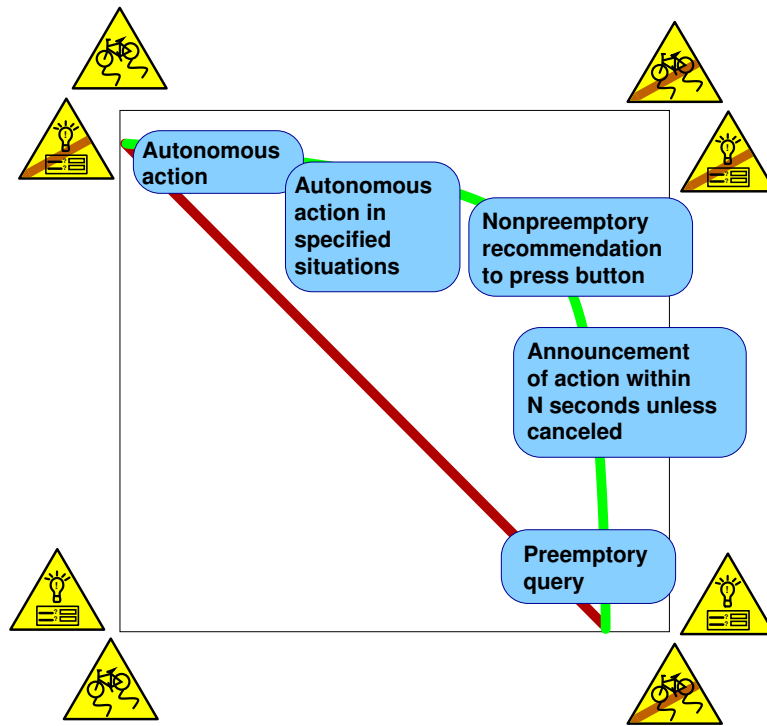
Causes and Strategies



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Expanding the Design Space



Breadth of Experience vs. System Competence A Decision-Theoretic Shopping Guide (1)

The shopping guide and user study shown in the slides in this and the following section are presented in: Bohnenberger, T., Jacobs, O., Jameson, A., & Asian, I. (2005). Decision-theoretic shopping meets user requirements: Enhancements and studies of an intelligent shopping guide. In H. Gellersen, R. Want, & A. Schmidt (Eds.), *Pervasive computing: Third international conference* (pp. 279–296). Berlin: Springer.





A Decision–Theoretic Shopping Guide (2)



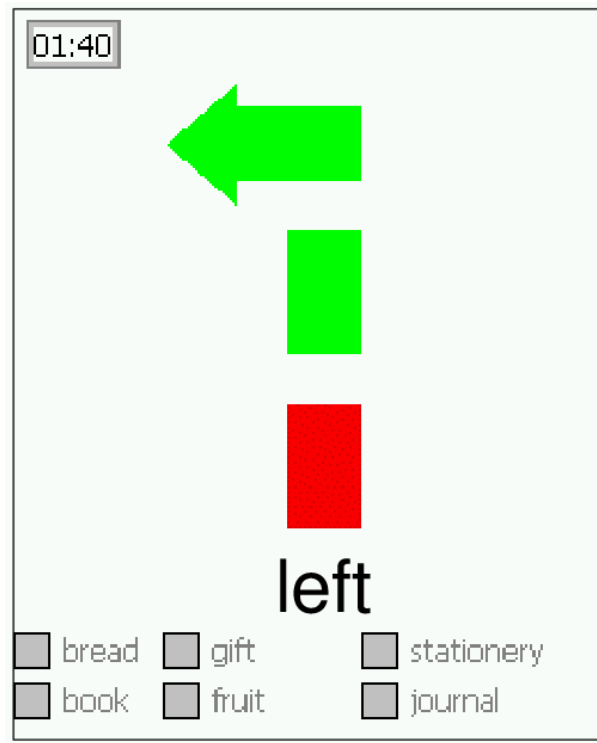
A Decision–Theoretic Shopping Guide (3)

The decision–theoretic shopping guide

- The shopper specifies at the beginning her interests in particular (types of) products
 - "A loaf of pumpkin seed bread"
 - "A novel for my teen–aged daughter"
 - ...
- The system computes a *policy*:
 - At each point in time, it directs the shopper to a promising store, taking into account:
 1. the current location
 2. the products found so far
 3. the amount of time remaining



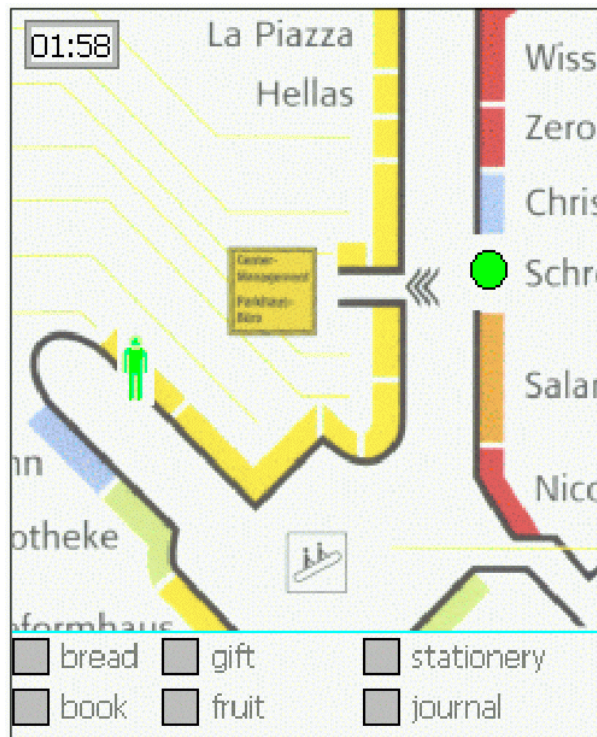
Direction to Walk In



23



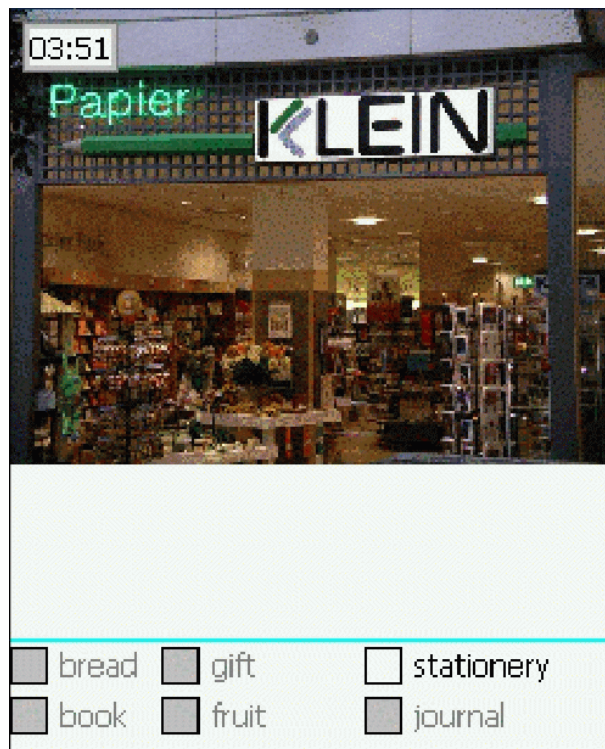
Overview Map



24



Photo of Upcoming Store



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Study in Shopping Mall: Method

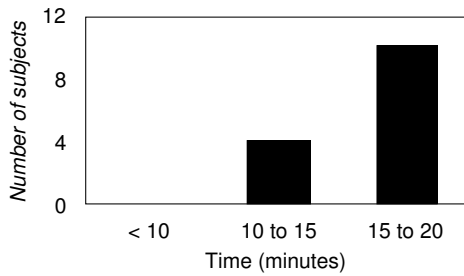
- The localization infrastructure was simulated by the experimenter (Wizard of Oz)
- 21 subjects from different social groups
- Each shopped for 20 minutes with 25 Euros after specifying what they wanted to buy in six categories:
 - Some bread, a book, a gift item, some fruit, a magazine, some stationery

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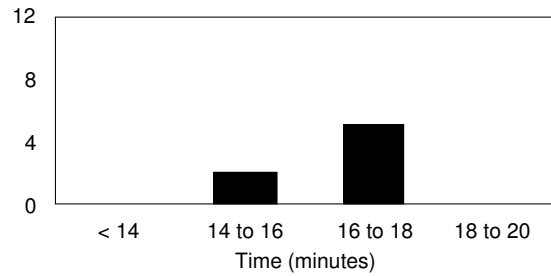


Objective Results

(a) Time needed to buy all 6 items



(b) Time to finish despite not having bought all 6 items



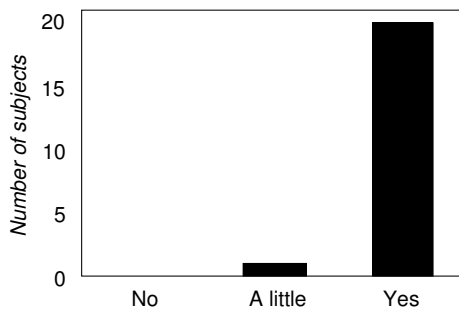
- All 21 subjects got back to the exit on time

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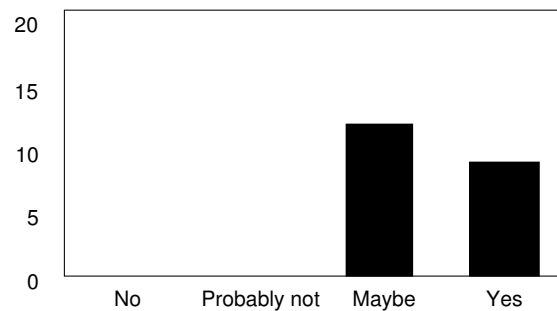


Subjective Results

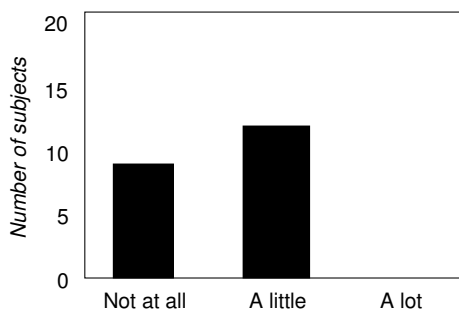
(a) Enjoyment



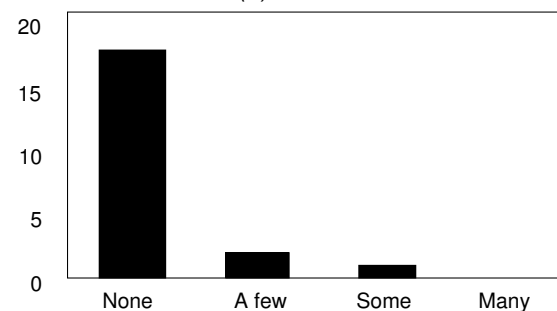
(b) Willingness to use



(c) Feeling restricted



(d) Difficulties





Breadth of Experience

Critique

- "Shoppers don't like to be led around on a fixed route
- They want to explore and buy spontaneously and have fun while doing so"

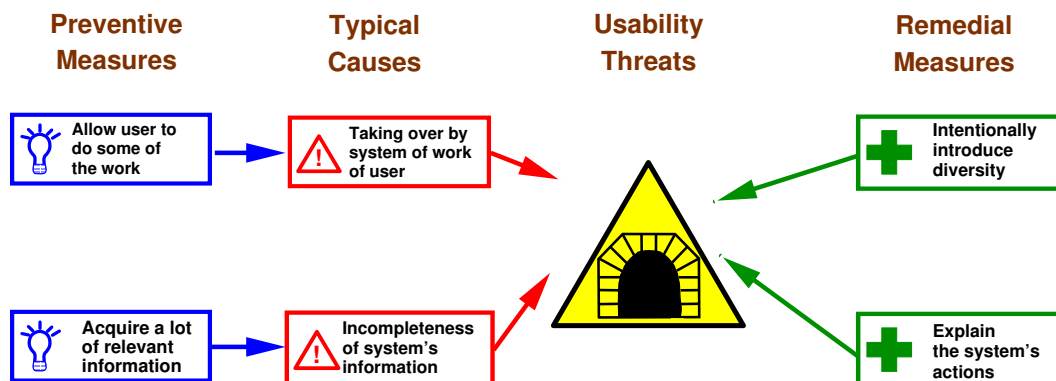
Response

- Not all shoppers are the same all of the time
- Our subjects expressed interest in using the system when ...
 - ... they are unfamiliar with the shopping mall
 - ... they want to buy a particular set of products
 - ... their time is limited

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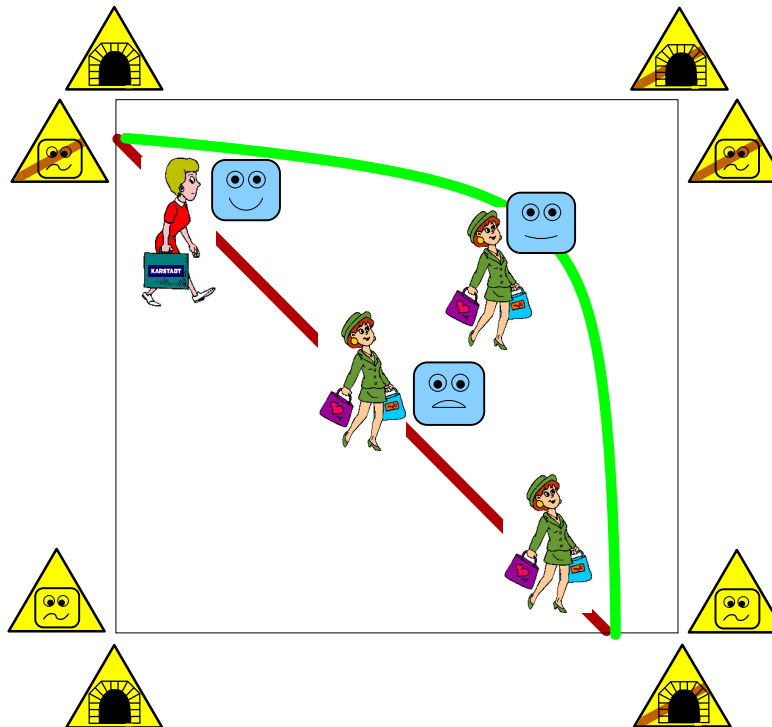
Causes and Strategies



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Expanding the Design Space



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Control and Comprehension vs. Obtrusiveness

Control and Comprehension

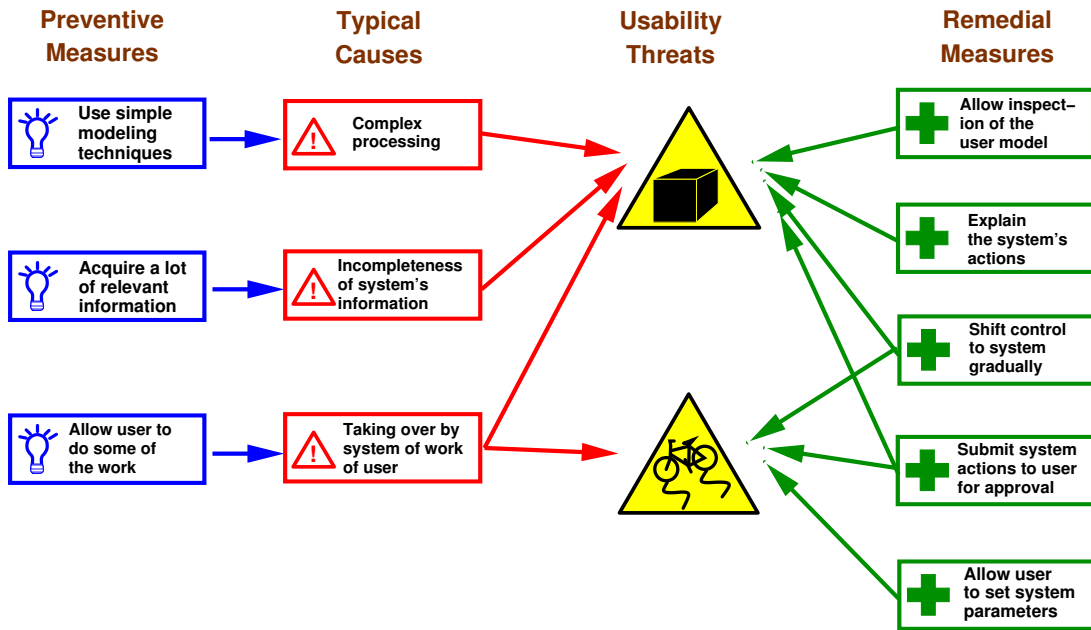
- Why do users sometimes want more control and understanding?
 - So that they can override the system's recommendations
 - They have information that the system lacks
 - They see that the system's model is too limited
- What do they need?
 - Robust response by the system when they deviate from a recommendation
 - ⇒ Given by the basic algorithm
 - Ability to second-guess the system in an informed way
 - ⇒ Requires *explanations* by the system

This section was not included in the presentation at UM 2005, because of the time limitation

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Causes and Strategies



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Explanations: Implementation

02:12 **Expected Length of Time**

19 min | 13 min | 14 min

Stores Along the Way

Wish, Kohl, Thalia, MANU-NANA, Kohl, Thalia, Kohl, MANU-NANA

Option

bread gift stationary
 book fruit journal

03:16 **Expected Length of Time**

5 min | 12 min

Stores Along the Way

MANU-NANA, Thalia

Option

bread gift stationary
 book fruit journal

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Explanations: When Presented

Difference between best and second-best options:

Small

Medium

Large

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Explanations: Results

Results

- Five subjects used the system with explanations
- They generally approved of the basic idea
- But most said that they had too little time to look at the explanations and preferred to follow the recommendations blindly

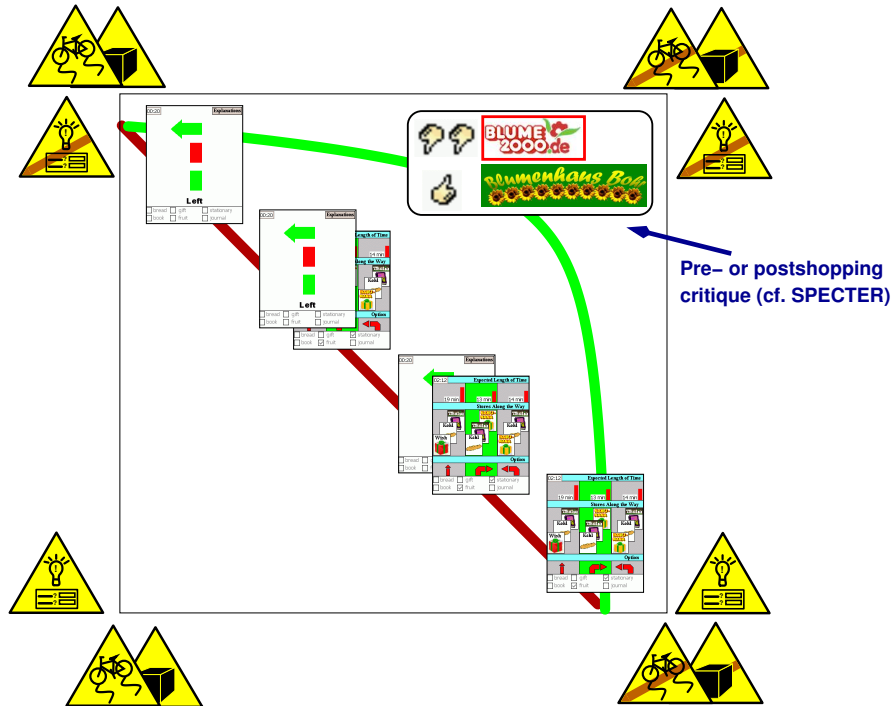
Prediction

- With more experience, each user would learn in what situations it is worthwhile to check the explanation
 - E.g., when they are tempted to second-guess the system

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Expanding the Design Space



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Comprehensibility vs. Obtrusiveness An Adaptive Hotlist for Conference Events

This system was demonstrated live during presentation at UM 2005. It is usually accessible via <http://dfki.de/um2001>. This screen shot shows an earlier version, which was used for the conference itself and for Study 1.



- Main
- News
- Conference
- Important Dates
- Schedule
- Registration
- Call For Papers
- Paper Submission
- Final Paper Preparation
- Call For Workshop Proposals
- Papers & Posters
 - **Acquiring User Models from Multi-Modal User Input**
 - Supporting User Collaboration through Adaptive Agents
 - User Models for Natural Language Interpretation, Processing and Generation
 - Learning Interaction Models
 - Adaptive Interviewing for Acquiring User Preferences / Product Customization
 - Student Modeling

• Create new UID • Anonymize Session • Show Blue Box • Hide Hotlist

Hotlist (printer friendly version) [?]		Recommendations for Hotlist: Update Hide	
Sun 10:30-11:00	Paper Christian Müller, Barbara Großmann-Hutter, Anthony Jameson, Ralf Rümmer, Frank Wittig	<i>Recognizing Time Pressure and Cognitive Load on the Basis of Speech: An Experimental Study</i>	View Session Remove
Sun 12:00-12:30	Paper Silke Höppner	<i>An Adaptive User-Interface-Agent Modeling Communication Availability</i>	View Session Accept or Reject
Mon 13:30-15:30	Poster Martha E. Crosby, Marie K. Idling, David N. Chin	<i>Visual Search and Background Complexity: Does the Forest Hide the Trees?</i>	View Session Accept or Reject
Mon 13:30-15:30	Poster Piotr J. Gmytrasiewicz, Christine L. Lisetti	<i>Emotions and Personality in Agent Design and Modelling</i>	View Session Remove
Tue 12:00-12:30	Paper Gerhard Fischer, Yunwen Ye	<i>Personalizing Delivered Information in a Software Reuse Environment</i>	View Session Remove

Session 1: Acquiring User Models from Multi-Modal User Input (Sun July 15, 9:30 – 11:00 AM)

Harnessing Models of Users' Goals to Mediate Clarification Dialog in Spoken Language Systems [\(Add to Hotlist\)](#)

Authors: Eric Horvitz, Tim Paek

Time: Sun July 15, 9:30 – 10:00 AM

Hotlist Recommender Concepts (with your estimated interest levels) [?]: Natural language dialog (-), Decision-theoretic methods (+)

Abstract: Speaker-independent speech recognition systems are being used with increasing frequency for command

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Overview of Studies

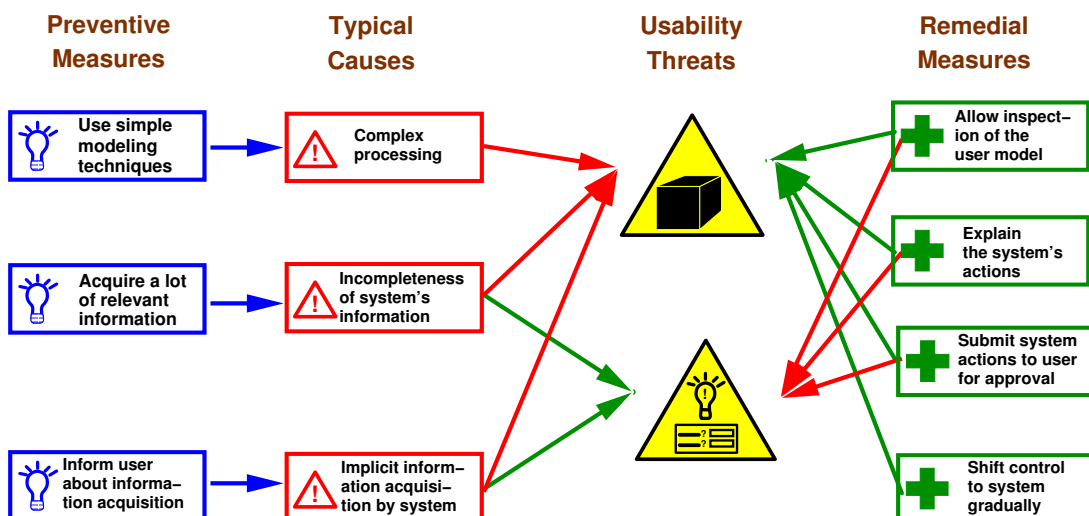
Study 1 is reported in: Jameson, A., & Schwarzkopf, E. (2002). Pros and cons of controllability: An empirical study. In P. De Bra, P. Brusilovsky, & R. Conejo (Eds.), *Adaptive hypermedia and adaptive web-based systems: Proceedings of AH 2002* (pp. 193–202). Berlin: Springer.
<http://dtki.de/~jameson/> A publication that includes a report on Study 2 is currently in preparation.

- Experiment with original version (see previous slide)
 - 18 student subjects
 - Made to act like UM researchers (How? ⇒ Discussion)
 - Comparison between controlled and automatic updating
- Experiment with improved (current) version
 - Same as above, but:
 - 28 student subjects
 - 12 without the ++s and --s

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Causes and Strategies



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Comprehensibility of the Hotlist

- Theory: The explanations can help the user to understand ...
 - Why this particular recommendation was made
 - What the system's basic procedure for making recommendations is
 - How accurate the system's user model is at the present time
- The user should then be better able to predict
 - Whether this particular event will turn out to be interesting to the user
 - What sorts of recommendations the system will make in the future
 - How valuable these recommendations will be

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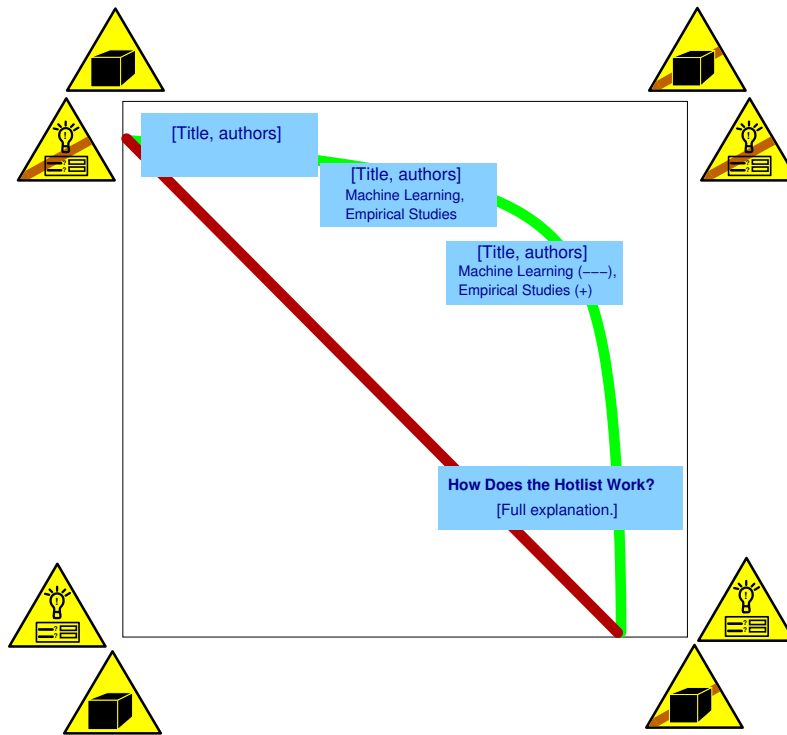


Impact of Explanations

- Those with explanations did a bit better ($p < .05$) on a "comprehension test":
 - "Does the system take into account ...
 - ... 1. what talks you have added to the hotlist?
[correct: 'Yes']
 - ... 2. what pages you have looked at? ['Yes']
 - ... 3. how long you looked at each page? ['No']"
- Most found them "somewhat useful" or "useful to a small extent"

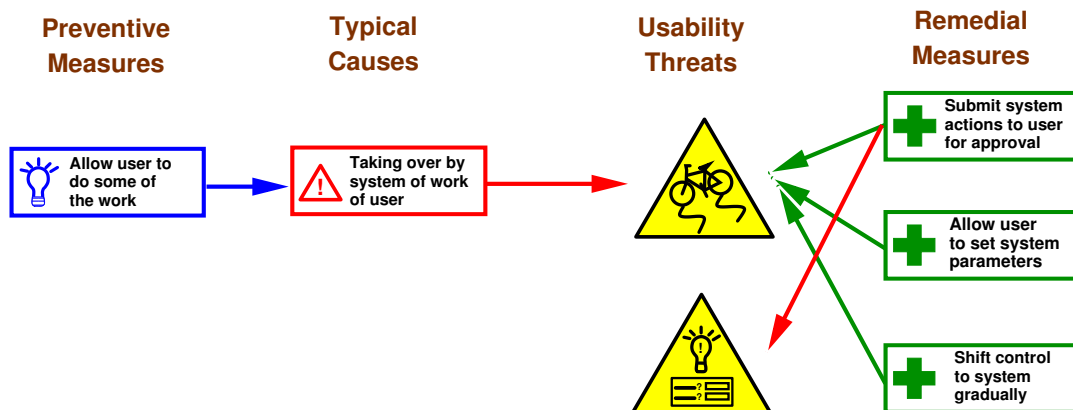


Expanding the Design Space



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Controllability vs. System Competence Causes and Strategies



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Some Results (Study 1)

	Would definitely not use	Would not use	Probably would not use	Would not care	Probably would use	Quite willing to use	Very eager to use	
Very eager to use			P Q		L	F	A	Very eager to use
Quite willing to use					M	G H	B	Quite willing to use
Probably would use			R		N		C	Probably would use
Would not care						I J		Would not care
Probably would not use							D E	Probably would not use
Would not use					O			Would not use
Would definitely not use						K		Would definitely not use
	Would definitely not use	Would not use	Probably would not use	Would not care	Probably would use	Quite willing to use	Very eager to use	

With automatic updating?

With controlled updating?

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Advantages of Two Updating Styles (1)

Controlled updating:

1. The user's feeling of control over the interaction with the system is enhanced
2. The user can follow up on more than one recommendation in a given set
3. System response times can be faster because of less frequent updating
4. The user can restrict updates to situations in which the system's model of her interests is assumed to have useful accuracy
5. A smaller amount of irrelevant text appears in the hotlist.

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Advantages of Two Updating Styles (2)

Automatic updating:

1. The user cannot overlook the availability of the recommendation feature
2. The user is regularly reminded that new recommendations are available
3. The user is spared the effort of clicking on a button to obtain new recommendations
4. The recommendations displayed always reflect the system's most complete model of the user's interests

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Improved Interface

Hotlist ([printer friendly version](#)) (?)

Update recommendations Execute changes

Sat 14:00-18:00	Tutorial	Mark Maybury	<i>User Modeling for Adaptive User Interfaces</i>	View session	◆ Accept ◆ Reject
Sat 14:00-18:00	Tutorial	Anthony Jameson	<i>Personalization for E-Commerce</i>	View session	<input type="checkbox"/> Remove
Sun 08:30-09:30	Invited Talk	Alfred Kobsa	<i>Tailoring privacy to the user's needs</i>	View session	◆ Accept ◆ Reject
Mon 09:00-10:00	Invited Talk	Joseph A. Konstan	<i>Heavyweight Applications of Lightweight User Models</i>	View session	<input type="checkbox"/> Remove

Alfred Kobsa: "Tailoring privacy to the user's needs" (Recommendation to include in Hotlist: Accept or Reject)

You can now download the [slides](#) from this talk.

Time: Sun 15 July, 8:30 - 9:30 AM

Hotlist Recommender Concepts (with your estimated interest levels) [2]: Information retrieval (++), E-commerce (+++)

Abstract: This article discusses how the deployment of personalized systems is affected by users' privacy concerns

This interface achieves the second advantage of controlled updating (see the earlier slide) while still allowing automatic updating. (With automatic updating, the button "Update recommendations" is not available.)

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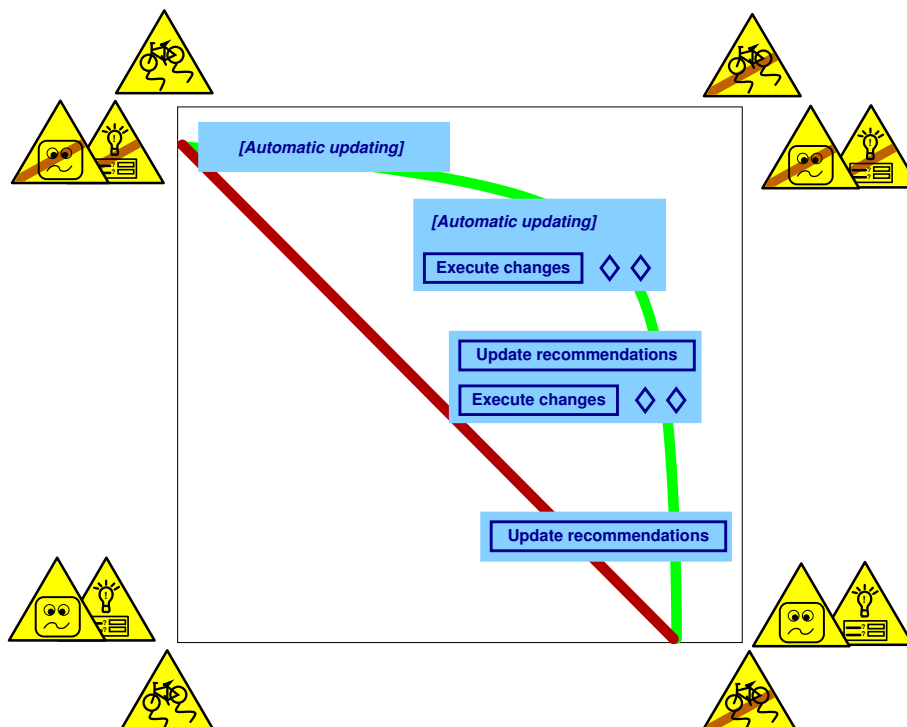
Some Results (Study 2)

- Some drawbacks of automatic updating were eliminated through the interface improvements
- Preferences generally shifted toward automatic updating
- But there were still large differences in preferences concerning almost all aspects of the interaction

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Expanding the Design Space



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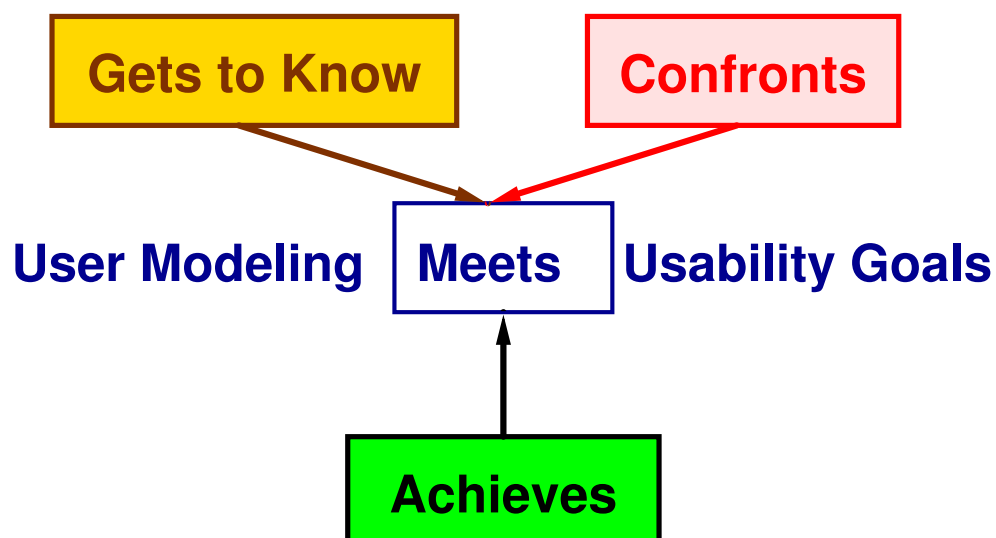
Concluding Remarks The Messages Again

1. User–adaptivity requires careful analysis of typical usability threats
2. Because of tradeoffs, no single solution is right for all of the users all of the time
3. By *expanding the design space*, you can find ways to satisfy more of the users more of the time

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What Does the Title Mean?



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