

# Critiquing-based Recommender Systems and User Experiences

Dr. Li CHEN

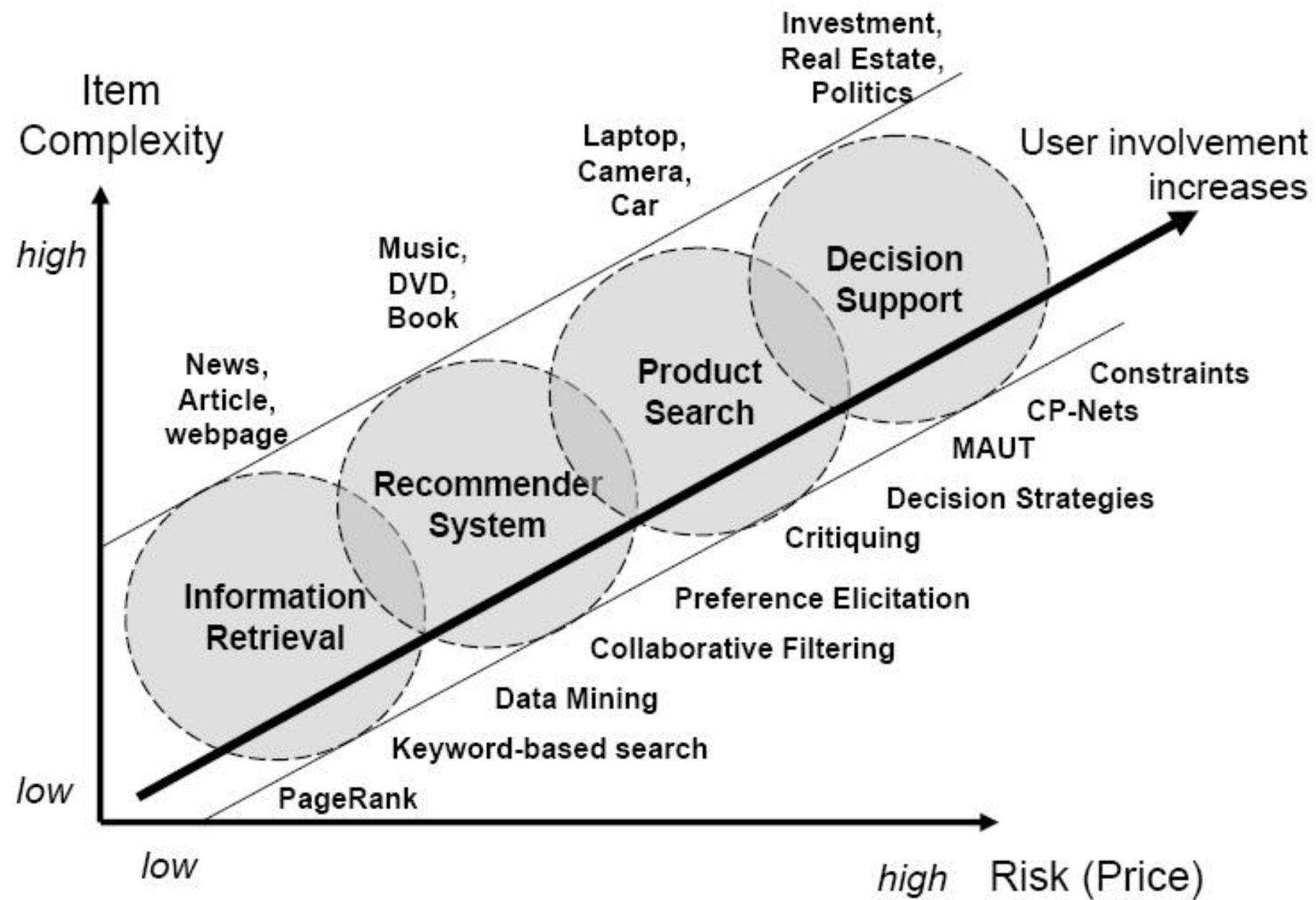
Department of Computer Science  
Hong Kong Baptist University

Homepage: <http://www.comp.hkbu.edu.hk/~lichen/>

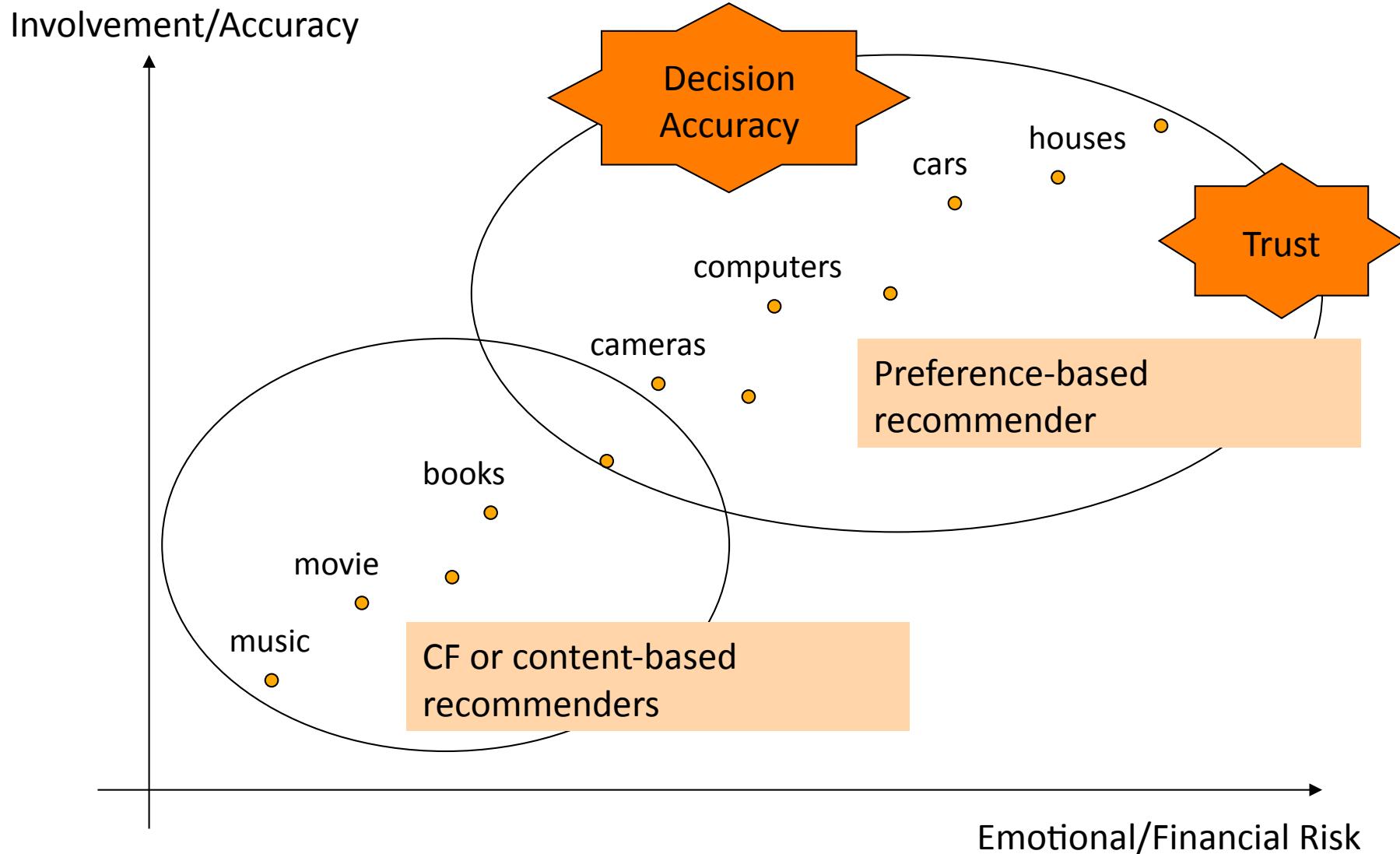
Email: [lichen@comp.hkbu.edu.hk](mailto:lichen@comp.hkbu.edu.hk)

# Outline

- What is critiquing-based recommender system and Why?
- Development history
- User experiences
- Conclusion



# For high-risk products



# Challenge 1 – Adaptive decision maker

**Unfamiliar** product domain



**Complex** decision environment with overwhelming information

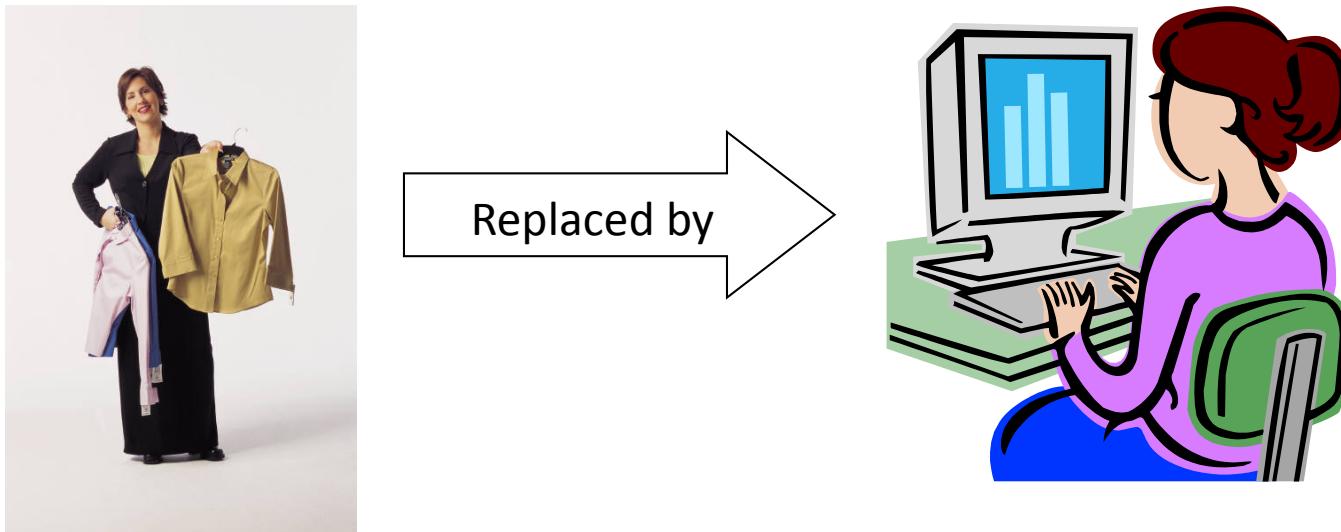


## How do people make decisions in unfamiliar and complex environment?

- Adaptive and constructive nature of user preferences (Payne *et al.*, 1993)
- Tend to use non-compensatory decision strategies (e.g., elimination-by-aspects)
- Tradeoff avoidance due to emotional and cognitive reasons (Hogarth, 1987; Payne *et al.*, 1999)
- Decision meta-goals: maximize the accuracy and minimize the effort (Bettman *et al.*, 1998)

<http://www.youtube.com/watch?v=CKM9u65kZHg>

# Challenge 2 – Trust building in online environment

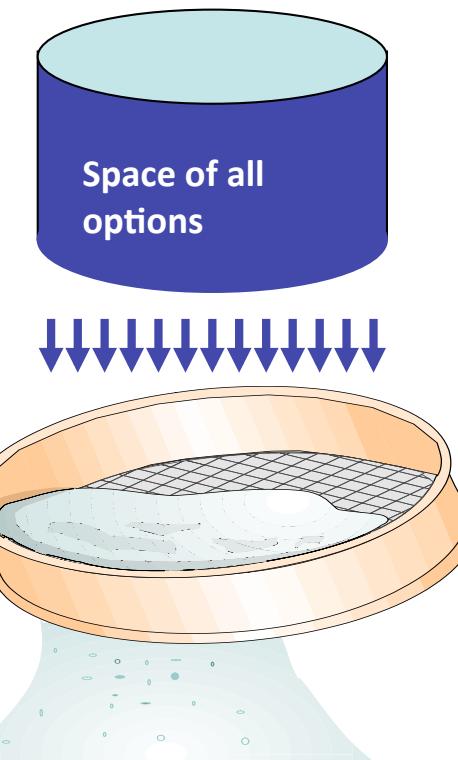
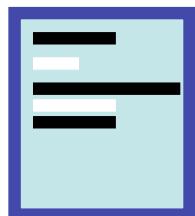


## Trust is difficult to build and easy to lose

- Lack of face-to-face interaction in the online environment
- Impede customers from performing particular actions (like continue to transact, purchase, return, etc.) (Jarvenpaa *et al.*, 2000)
- Key factor to the success of e-commerce (Gefen, 2000)

# Critiquing-based interaction: A user-feedback mechanism

**Step 1: User states initial preferences**



Preference Model

**Step 3:  
User revises preferences  
via critiquing**

## Help users

- Construct preferences
- Perform compensatory decision strategy
- Increase decision accuracy and save efforts
- Inspire trust

**Step 2:  
System recommends multiple examples**

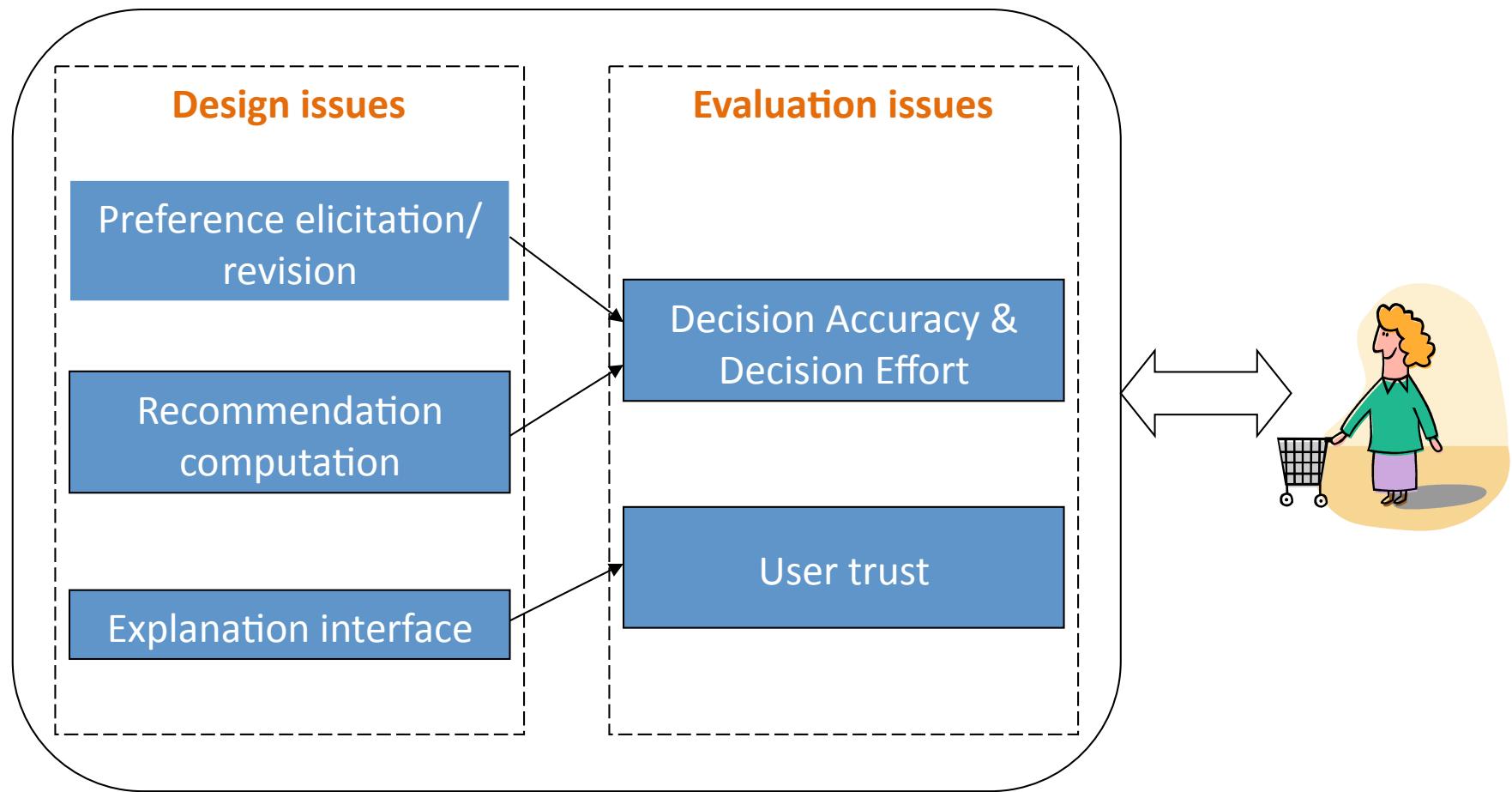
**Step 4:  
User picks the final choice**



# *Why critiquing support?*

- Particularly assist users in handling with two preference conditions
  - Preference incompleteness
    - Users are usually unable to accurately state their preferences up front (“*Adaptive decision maker*”, Payne *et al.* 1993)
    - **Solution:** to elicit users’ preferences on attributes via stimulating them to provide feedback (in form of critiques)
  - Preference conflict
    - No product satisfies all of the user’s stated preferences, e.g., “cheaper, faster and longer battery life”
    - **Solution:** to support users to make tradeoffs, i.e., obtaining the gains on important attributes while accepting the losses on less important ones
    - Making tradeoffs is a crucial aspect of high-quality, rational decision making (Frisch and Clemen, 1994) - **compensatory decision strategy**
    - Tradeoff making can **increase** users’ decision accuracy up to **57%** (Pu and Chen, EC’05)

# Research Issues



# Outline

- What is critiquing-based recommender system and Why?
- Development history (1997-2013)
- User experiences
- Conclusion

# Representative Works

- Natural language dialog
- Graphical user interfaces
  - System-suggested critiques
  - User-initiated critiquing
  - Hybrid critiquing

# 1<sup>st</sup> type: Natural Language Dialog

- **ExpertClerk** (Shimazu, IJCAI'01)
- **Adaptive Place Advisor** (Thompson *et al.*, 2004)
- **Speech-based Critiquing** (Grasch et al., ACM RecSys'13)

# ExpertClerk (Shimazu, IJCAI'01)

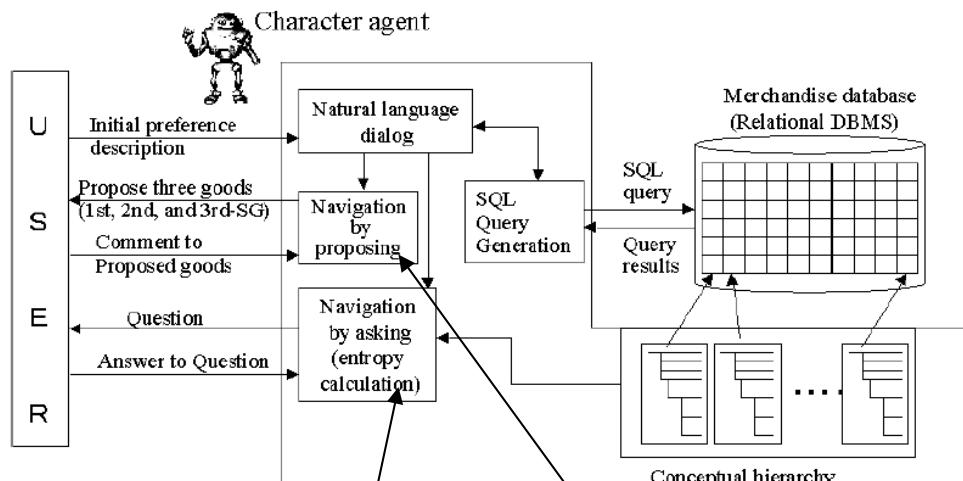


Figure 3: The ExpertClerk System

Switch between **navigation by proposing** and **navigation by asking**



Figure 4: The ExpertClerk screen image

# Cont.

- Method
  - First ask a few questions to identify shopper's initial preference (buying points)
  - **Navigate by proposing**
    - Show three contrasting samples with explanations of their selling point
    - e.g., "this is twice as expensive as those because it is made of silk and the other two made of polyester"
  - Observe shopper's reactions on likes/dislikes and why
    - e.g., "this one is too dark for me compared with the other two"
  - **Navigate by asking**
    - If too many matching goods, narrow down them by asking appropriate questions using entropy
    - Pick new samples fit shopper's responses
    - Repeat until shopper finds an appropriate good

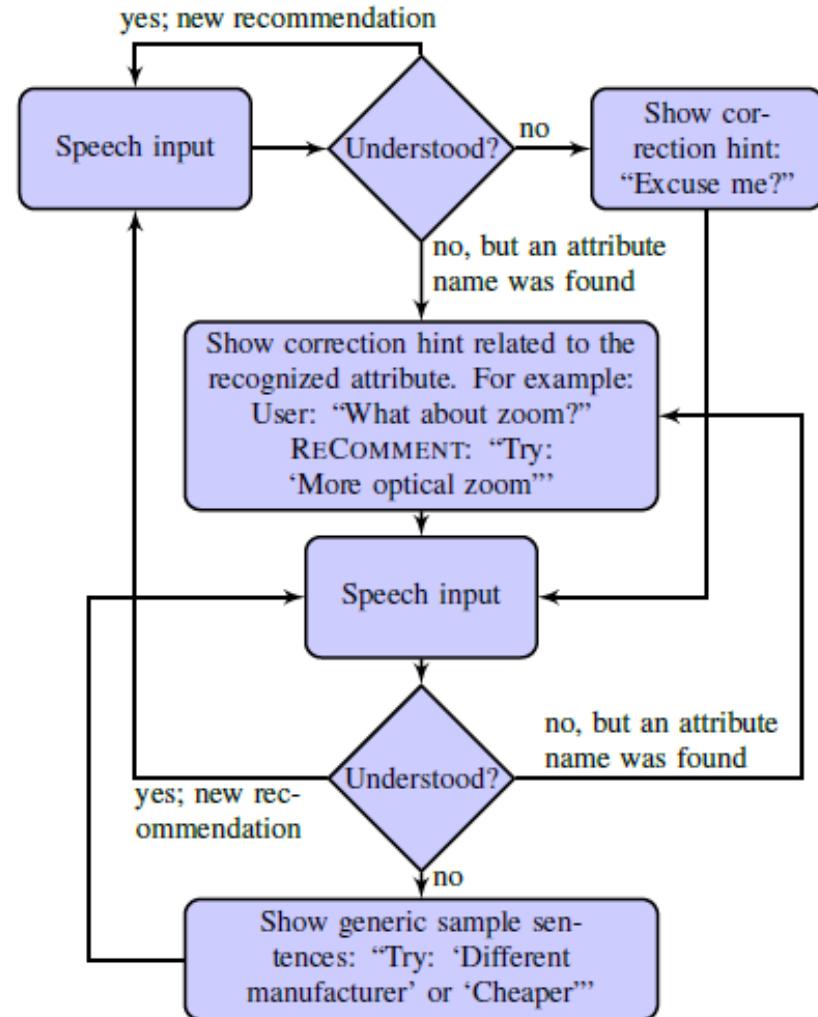
# Adaptive Place Advisor (Thompson *et al.*, 2004)

1. Inquirer: Where do you think I should eat tonight?
2. Advisor: What type of food would you like?
3. Inquirer: What types are there?
4. Advisor: You can say things like Chinese, Indian, and Mediterranean.
5. Inquirer: Oh, maybe a cheap Indian place.
6. Advisor: What kind of parking would you like?
7. Inquirer: I don't care, as long as it's in Palo Alto.
8. Advisor: I'm sorry, I don't know of any restaurants like that, would you like to search for any price?
9. Inquirer: No, I think I'd like Chinese instead.
10. Advisor: I know three inexpensive Chinese restaurants in Palo Alto. One is Mandarin Gourmet on 420 Ramona. How does that sound?<sup>7</sup>
11. Inquirer: No, what else do you have?
12. Advisor: How about Jing-Jing Szechwan Hunan Gourmet on 443 Emerson Street?
13. Inquirer: Sure, that sounds fine.

## Method

- A probabilistic representation of the user's preferences, i.e., the query, is expanded
- The system incrementally refines this query, based on the user's critiques to the attributes and items offered during a conversation

# Speech-based Critiquing (Grasch et al., RecSys'13)



## 2<sup>nd</sup> type: System-Suggested Critiques

- **FindMe** (Burke *et al.*, 1997)
- **Dynamic Critiquing** (McCarthy *et al.*, IUI'05)
- **MAUT-based Compound Critiques** (Zhang *et al.*, AH'06)
- **Preference-based Organization** (Chen and Pu, UM'07)

# FindMe (Burke *et al.*, 1997)

UKRAINIAN VILLAGE. TWO bedroom rehab garden apartment. Lr, Euokichen, hwfl, excellent security, forced air, lots of closets, laundry in building. Garage space included. Dogs OK. Available immediately. \$600/ mo. 312-489-1554./

Phone: 312-489-1554	2-bedrooms	\$600	60622 (West Town Bucktown)
---------------------	------------	-------	-------------------------------

*This apartment is OK, but make it...*

bigger    cheaper    nicer    safer

*This neighborhood could be more...*

convenient    conservative    dynamic



Figure 1: Tweaking an apartment in RENTME

## Method

- The entry point is the user's initial query, e.g., [600<price<650,neighborhood = 'Bucktown', size=2]
- Each tweak is treated as a constraint with the highest priority
- A SQL query is passed to database
- If no enough entities return, drop lower priority constraint

These apartments have a cheaper rent.

UKRAINIAN VILLAGE SPECIAL. 2 bedroom. Hardwood floors, pocket doors, tin ceiling, pantry. Storage and parking included. Very sunny. \$520. Available immediately. 278-6064./

Phone: 278-6064	2-bedrooms	\$520	60622 (West Town Bucktown)
-----------------	------------	-------	-------------------------------

Yes, but...    Add to list

These apartments are cheaper, but are in other neighborhoods.

VERY COZY ROGERS Park two bedroom (Jarvis/ Damen). Hardwood floors, miniblinds, completely remodeled kitchen, huge closets, updated bath, freshly painted, cable ready, small deck, 24 hour maintenance, laundry, storage. \$510 includes heat. Marion 312-338-0199 or Jill 708-679-5512./

Phone: 312-338-0199	2-bedrooms	\$510	60626
---------------------	------------	-------	-------

Yes, but...    Add to list

Figure 2: The result of applying the "cheaper" tweak

# Dynamic Critiquing (McCarthy *et al.*, IUI'05)

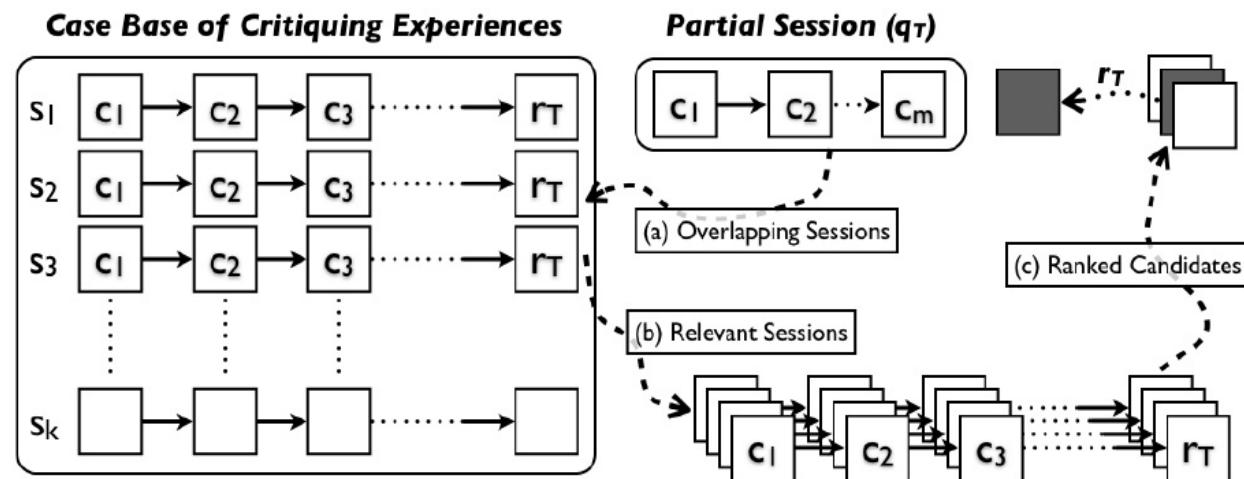
The screenshot shows a web page for Quicksite.com. At the top, there's a navigation bar with links to HOME, ABOUT THIS PROJECT, and CONTACT. Below that, a banner says "Shop for: Digital Cameras, Holidays, PCs". A large image of a Canon EOS 300D digital camera is on the left. To its right, a box says "Item Found: CASE2" and lists "Specifications": 6.3 Megapixel CMOS Sensor, 7-point wide-area AF, High-performance DIGIC Processor, 100-1600 ISO speed, Compatible with all Canon lenses and EX Speedlites, PictBridge, Canon Direct Print, Bubble Jet Direct compatible, PC required. A yellow arrow points from this section down to a box labeled "Compound Critiques". In the center, a box titled "Unit Critiques" contains a table of product attributes with input fields and arrows pointing to specific values like "EOS-300D" and "6.29". Below this is a list of "Matching products": 1. Less Optical Zoom & More Digital Zoom & A Different Storage Type (139), 2. A Lower Resolution & A Different Format & Cheaper (169), 3. A Different Manufacturer & Less Optical Zoom & More Storage (167). Each item has "PICK" and "EXPLAIN" buttons. At the bottom, it says "COPYRIGHT 2004 ©".

## Method

- Dynamically generate a set of compound critiques (each over multiple attributes) through frequent pattern mining
- The recommended item should satisfy the user picked critique as well as being most similar to the previous recommendation

# Cont.: two extensions

- Incremental Critiquing (Reilly *et al.*, 2005)
  - The recommended item must be additionally compatible with the user's previously selected critiques
- Experience-based Critiquing (McCarthy *et al.*, ICCBR'10)



# MAUT-based Compound Critiques

## (Zhang et al., AH'06)

The screenshot shows a web interface for a shopping cart. At the top, there's a navigation bar with links for Home, Computers, Apartment, Electronics, shopping cart, account, and logout. Below the navigation, it says "Current reference product for you:" followed by an image of a laptop and its details: "Sony VAIO R505TL Notebook", "Configuration: 650MHz Intel Celeron, 384MB Memory, 15GB Harddisk, 12" TFT", and "Price: 959USD". There's also a link "Information about this product" and an "Add to cart" button.

The main area is titled "Your Preferences" and contains dropdown menus for Computer Type (Laptop), Manufacturer (Sony), Processor Type (Intel Celeron), Processor Speed (650 MHz), Monitor Size (12 inches), Memory (384 MB), Hard Disk (15 GB), and Price (\$). To the right of these preferences, there's a list of compound critiques:

- Same Brand with Lower Price**  
(but slower CPU Speed, smaller screen, smaller memory, and smaller harddisk)  
[see the detail product](#)
- Faster CPU, Bigger Screen Size, and Bigger Harddisk**  
(but different brand, smaller memory, and more expensive)  
[see the detail product](#)
- Better CPU, Bigger Screen Size and Lower Price**  
(but different brand, smaller memory, and smaller harddisk)  
[see the detail product](#)
- Bigger Screen Size and Lower Price**  
(but different brand, different CPU Type, smaller harddisk)  
[see the detail product](#)
- Better CPU and Bigger Screen Size**  
(but different brand, smaller memory, and more expensive)  
[see the detail product](#)

At the bottom, there's a link "See more products..." and footer links for About Us, Help, and Feedback.

## Method

- Model the user's preferences based on the Multi-Attribute Utility Theory (MAUT)

$$U(\langle x_1, \dots, x_n \rangle) = \sum_{i=1}^n w_i V_i(x_i)$$

- Rank products according to their utilities and the top-k ones are presented as compound critiques (except the ranked first one)

# Extension: visual critiquing (Zhang et al., EC'08)

More Recommendations

	Brand	Processor Type	Processor Speed	Screen Size	Memory	Hard Drive Capacity	Weight	Battery Life	Price	
1.	Apple Authorized Service Provider	intel Core 2 Duo	GHz ↓	monitor ↓	RAM ↑	HDD ↑	Kg ↓	\$↓	view detail	I like this
2.	lenovo	intel Core 2 Duo	GHz ↓	monitor ↓	RAM =	HDD ↑	Kg ↓	\$↑	view detail	I like this
3.	lenovo	intel Core 2 Duo	GHz =	monitor =	RAM =	HDD =	Kg =	\$ =	view detail	I like this
4.	SONY	intel Core 2 Duo	Ghz =	monitor ↓	RAM =	HDD =	Kg =	\$ =	view detail	I like this
5.	SONY	intel Core 2 Duo	Ghz =	monitor =	RAM =	HDD =	Kg =	\$ =	view detail	I like this

positive  
negative

↑ increase  
= no change  
↓ decrease

Product Details (Drag to move)



lenovo  
Lenovo ThinkPad X61

Main Features:

ProcessorType:Core 2 Duo  
ProcessorSpeed(GHz):2.0  
ScreenSize(inches):12.1  
Memory(MB):2048.0  
HardDriveCapacity(GB):160.0  
Weight(lbs):1.75  
BatteryLife(hours):7.8  
Price(\$):1799.99

[Close this window](#)

Text-only critiques are replaced with meaningful icons

# Preference-based Organization (Chen and Pu, UM'07)

The top candidate according to your preferences									
Manufacturer	Price	MegaPixels	Optical zoom	Memory type	Flash memory	LCD screen size	Depth	Weight	
Canon	\$242.00	5.0 MP	3x	CompactFlash Card	32 MB	1.8 in	1.37 in	8.3 oz	<a href="#">choose</a>
<b>We have more products with the following they are cheaper and lighter, but have fewer megapixels</b>									
Nikon	\$167.95	4 MP	3x	SD Memory Card	14 MB	1.8 in	1.4 in	4.6 oz	<a href="#">choose</a>
Canon	\$230.00	4.1 MP	3x	CompactFlash Card	32 MB	1.5 in	1.09 in	6.53 oz	<a href="#">choose</a>
Canon	\$180.00	2.2 MP	2x	SD Memory Card	16 MB	2 in	0.83 in	4.06 oz	<a href="#">choose</a>
Canon	\$219.18	4.2 MP	4x	MultiMedia Card	16 MB	1.8 in	1.51 in	6.35 oz	<a href="#">choose</a>
Canon	\$163.50	3.2 MP	4x	MultiMedia Card	16 MB	1.8 in	1.5 in	6.3 oz	<a href="#">choose</a>
Canon	\$199.40	3.2 MP	2.2x	SD Memory Card	16 MB	1.5 in	1.4 in	5.8 oz	<a href="#">choose</a>
<b>they have more megapixels and bigger screens, but are more expensive</b>									
Sony	\$365.00	7.2 MP	3x	Internal Memory	32 MB	2.5 in	1.5 in	6.9 oz	<a href="#">choose</a>
Canon	\$439.99	7.1 MP	3x	SD Memory Card	32 MB	2 in	1.04 in	6 oz	<a href="#">choose</a>
Fuji	\$253.00	6.3 MP	4x	XD-Picture Card	16 MB	2 in	1.4 in	7.1 oz	<a href="#">choose</a>
Sony	\$336.00	7.2 MP	3x	Internal Memory	32 MB	2 in	1 in	5 oz	<a href="#">choose</a>
Nikon	\$304.18	7.1 MP	3x	Internal Memory	13.5 MB	2 in	1.4 in	5.3 oz	<a href="#">choose</a>
Olympus	\$334.00	7.4 MP	5x	XD-Picture Card	32 MB	2.0 in	1.7 in	7.1 oz	<a href="#">choose</a>
<b>they are lighter and thinner, but have less flash memory</b>									
Pentax	\$230.99	5.3 MP	3x	Internal Memory	10 MB	1.8 in	0.9 in	3.7 oz	<a href="#">choose</a>
Canon	\$273.18	4.0 MP	3x	SD Memory Card	16 MB	2 in	0.82 in	4.59 oz	<a href="#">choose</a>
Nikon	\$329.95	5.1 MP	3x	Internal Memory	12 MB	2.5 in	0.8 in	4.2 oz	<a href="#">choose</a>
Canon	\$316.18	5.3 MP	3x	SD Memory Card	16 MB	2 in	0.81 in	4.59 oz	<a href="#">choose</a>
Casio	\$386.00	7.2 MP	3x	Internal Memory	8.3 MB	2.5 in	0.88 in	4.48 oz	<a href="#">choose</a>
Fuji	\$309.18	6.3 MP	3x	XD-Picture Card	16 MB	2.5 in	1.1 in	5.5 oz	<a href="#">choose</a>
<b>they have more optical zoom with different memory type, but are thicker and heavier</b>									
Panasonic	\$386.00	5.0 MP	12x	SD Memory Card	16 MB	1.8 in	3.34 in	11.52 oz	<a href="#">choose</a>
Konica Minolta	\$349.99	5.0 MP	12x	SD Memory Card	16 MB	2 in	3.3 in	12 oz	<a href="#">choose</a>
Fuji	\$259.18	4.23 MP	10x	XD-Picture Card	16 MB	1.5 in	3.1 in	11.9 oz	<a href="#">choose</a>
Olympus	\$253.00	4.0 MP	10x	XD-Picture Card	16 MB	1.8 in	2.7 in	9.9 oz	<a href="#">choose</a>
Olympus	\$284.99	4.0 MP	10x	XD-Picture Card	16 MB	1.8 in	2.7 in	10.6 oz	<a href="#">choose</a>
Nikon	\$259.18	4.2 MP	8.3x	Internal Memory	13.5 MB	1.8 in	2.2 in	9 oz	<a href="#">choose</a>

Critique suggestion

Satisfying items

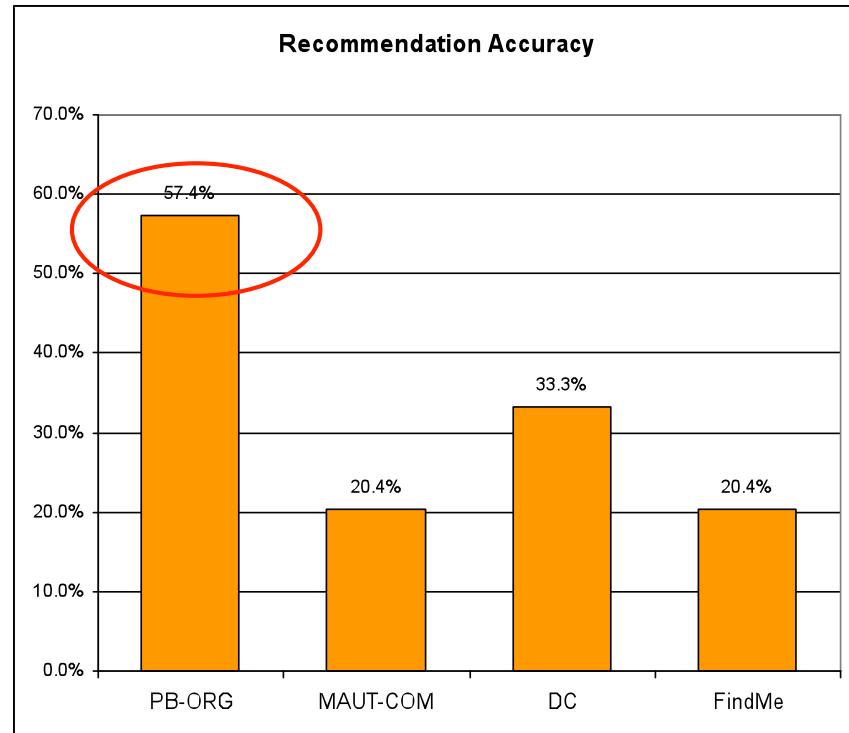
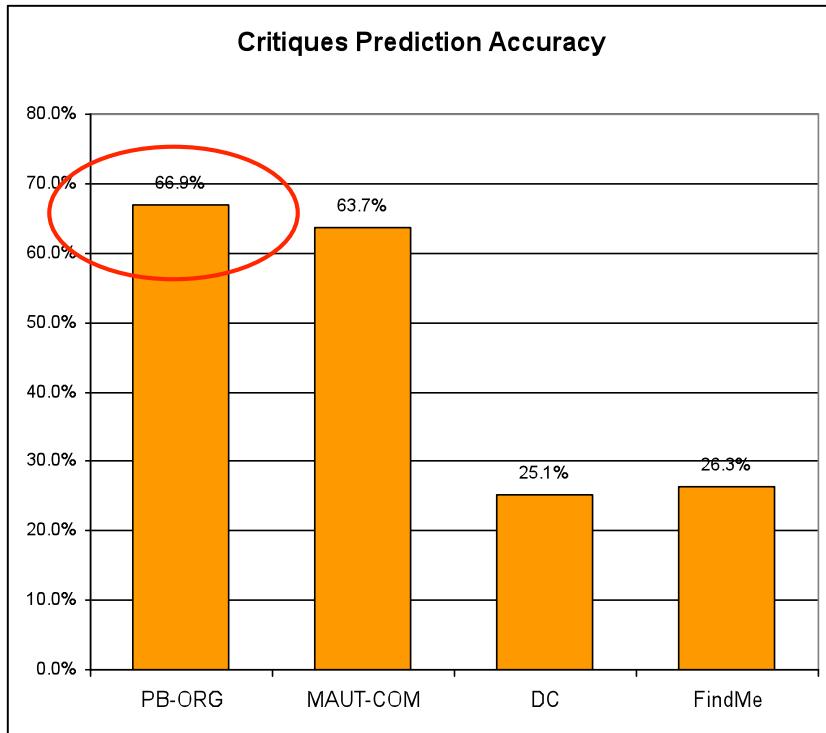
# Interface design guidelines

1. Propose improvements and compromises (i.e., attributes tradeoff) in the critique
2. keep the number of attributes in the critique under five to avoid information overload
3. Include actual products (up to six) under each critique
4. Diversify the proposed critiques and their contained products

# Comparison with others

	Dynamic critiques	Critiques typical of the remaining products	Critiques adaptive to user preferences	Diversity within critiques and their contained products
Preference-based organization	✓	✓	✓	✓
MAUT-based compound critiques	✓	✗	✓	✗
Dynamic critiquing	✓	✓	✗	Partially (only critiques)
FindMe	✗	✗	✗	Partially (only critiques)

# Experiment

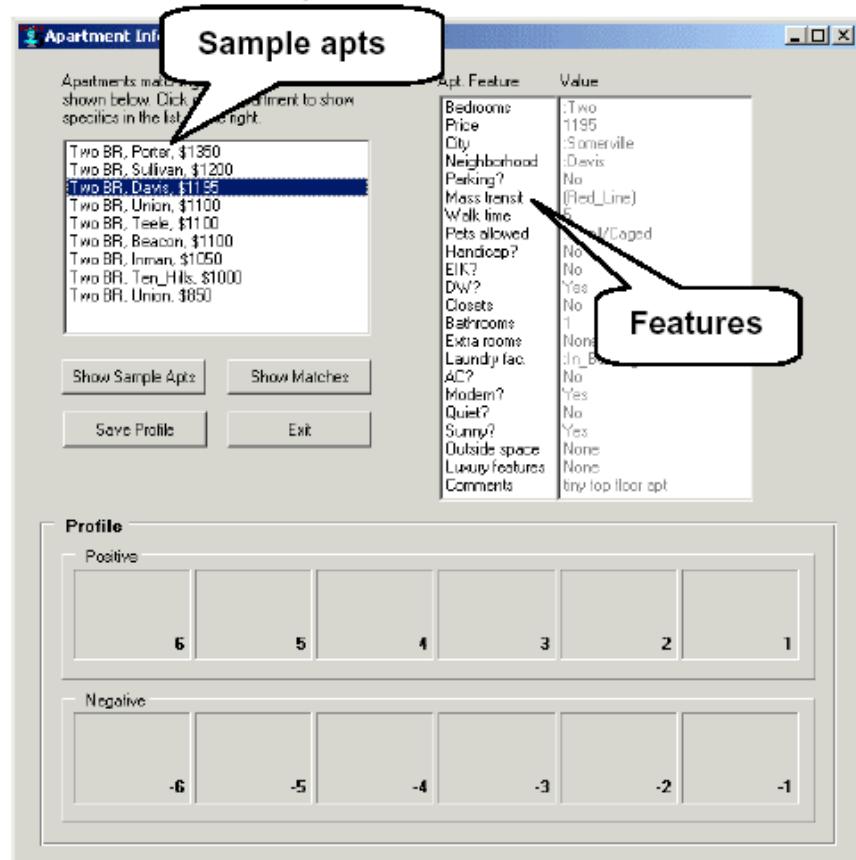


→ The preference-based organization algorithm achieves **the highest accuracy** (significantly) in terms of both critique predication and recommendation computation

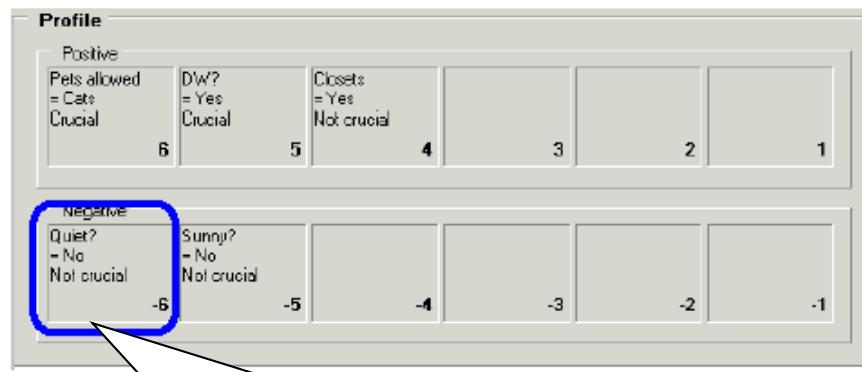
# 3<sup>rd</sup> type: User-Initiated Critiquing

- **Apt Decision** (Shearin and Lieberman, IUI'01)
- **Example Critiquing** (Pu and Chen, EC'05; Chen and Pu, AAAI'06)
- **Flat Finder** (Viappiani *et al.*, 2007)

# Apt Decision (Shearin and Lieberman, IUI'01)



Drag features onto slots in the profile, which contains twelve weight slots: six positive weights (1 to 6) and six negative weights (-1 to -6)



For example, the leftmost negative slot indicates that the user feels very strongly about the fact that this selected apartment is not quiet

User profile: weighted feature vector, e.g., {**(pets allowed, cats, 6(must have))**, **(closets, yes, 4(neutral))**,...,}

# Cont.

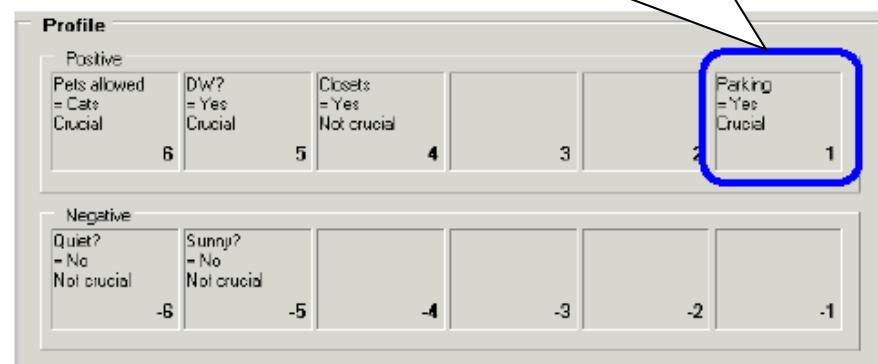
**Sample Apartments**

Decide which apartment you prefer, then press the button underneath the apartment.

Apt. Feature	Apartment A	Apartment B
Bedrooms	:Two	:Two
Price	1100	1050
City	:Somerville	:Somerville
Neighborhood	:Beacon	:Inman
Parking?	Yes	No
Mass transit	(Red_Line)	(Bus)
Walk time	10	Any
Pets allowed	:Cats	:Any
Handicap?	No	Yes
EIK?	Yes	No
DW?	Yes	Yes
Closets	Yes	No
Bathrooms	1	1
Extra rooms	None	None
Laundry fac.	:In_Unit	:In_Building
AC?	Yes	No
Modern?	Yes	Yes
Quiet?	No	No
Sunny?	Yes	Yes
Outside space	None	(Yard)
Luxury features	None	None
Comments		

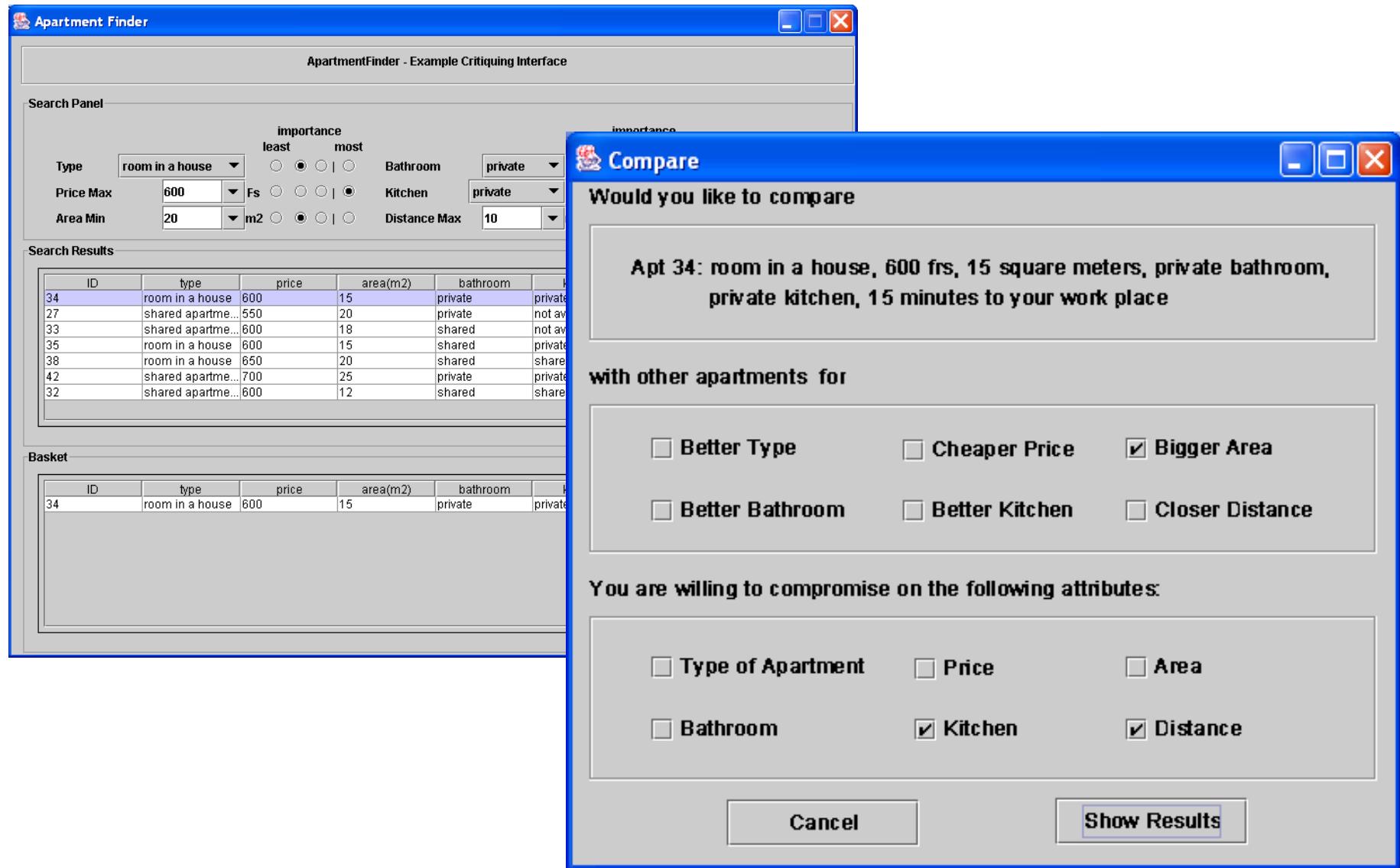
**Prefer A**      **Prefer B**

User chooses an apartment, and the features unique to the chosen apartment but not present in the profile will be added to the right side of the profile



Profile expansion: pairwise preference among pairs of sample apartments

# Example Critiquing (Pu and Chen, EC'05)



# Cont.

- Initial preference elicitation
  - Any preferences
  - Default preferences
- *How many examples to show?*
  - Multiple items for users to select the final choice or the one to be critiqued
  - For a moderate number of preferences, the amount falls between 5 and 20 (Faltings *et al.*, 2004)
- *What example to show?*
  - Combined strategy: Elimination-by-Aspect (EBA) (for hard constraints) plus Multi-Attribute Utility Theory (MAUT)
  - Show partial satisfaction set to help resolve preference conflicts

# Cont.

- *How to support tradeoff making?*
  - Three types
    - Value tradeoff: change a particular attribute's preference value
    - Utility tradeoff: change the weight of a preference
    - Outcome tradeoff: add new preferences
  - Complexity of tradeoff task: (*optimize, compromise*)
    - Simple tradeoff: (1,1)
      - e.g., ({price}, {size of room})
    - Complex tradeoff: (m,n) (m or n > 1)
      - e.g., ({price}, {size of room, distance to work}) (three different ways to compromise two attributes in order to gain on one attribute)

# Extension: Chen and Pu, AAAI'06

**Multiple recommended items**

Showing 7 products most matching your preferences

	<b>Canon PowerShot S1 IS Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>
	<b>Canon PowerShot S500 Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>
	<b>Canon PowerShot S2 IS Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>
	<b>Canon PowerShot G6 Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>
	<b>Canon PowerShot SD200 Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>
	<b>Canon PowerShot Pro1 Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>
	<b>Canon Powershot S60 Digital Camera</b>	<a href="#">Add to saved list</a>	<a href="#">Value Comparison</a>

**The product chosen to be critiqued**

To find similar products with better values than this one

**Canon PowerShot S2 IS Digital Camera** \$424.15

would you like to improve some values?

	Keep	Improve	Take any suggestion	
Manufacturer	<input checked="" type="radio"/> Canon	<input type="radio"/> Sony	<input type="radio"/>	
Price	<input type="radio"/> \$424.15	<input checked="" type="radio"/> less expensive	<input type="radio"/>	
Resolution	<input checked="" type="radio"/> 5.3 M pixels	<input type="radio"/> \$100 cheaper	<input type="radio"/> \$200 cheaper	<input type="radio"/> \$300 cheaper
Optical Zoom	<input checked="" type="radio"/> 12x	<input type="radio"/>	<input type="radio"/>	
Removable Flash Memory	<input checked="" type="radio"/> 16 MB	<input type="radio"/> more memory	<input type="radio"/>	
LCD Screen Size	<input checked="" type="radio"/> 1.8 in	<input type="radio"/> larger	<input type="radio"/>	
Thickness	<input checked="" type="radio"/> 2.97 in	<input type="radio"/> thinner	<input type="radio"/>	
Weight	<input checked="" type="radio"/> 404.7 g	<input type="radio"/> lighter	<input type="radio"/>	

Show Results    Reset

**User-initiated critiquing facility**

# Flat Finder (Viappiani *et al.*, 2007)

**Preferences**

Price <input type="text" value="450"/>	<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="button" value="Remove"/>	Bathroom <input type="text" value="private"/>	<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="button" value="Remove"/>
Search according to these preferences: <input type="button" value="Search"/>					
<input type="button" value="Add preferences"/> Type <input type="button" value="Add"/>					

**Results**

There are a total of **187** options, of which **8** fully match your preferences.

*These are the best solutions that match your query.*

ID	Type	Price	Rooms	Furnished	Smoking	Bathroom	Kitchen	Transportation	Distance to Uni	Distance to Centre	Choose
8142	room in a house	300	1.0	true	non smoking	private	shared	bus	10	12	<input checked="" type="radio"/>
7849	room in a house	400	1.0	true	either	private	shared	none	18	16	<input type="radio"/>
8080	room in a house	410	1.0	true	either	private	not available	bus	19	19	<input type="radio"/>

*In the dataset you can also find...*

ID	Type	Price	Rooms	Furnished	Smoking	Bathroom	Kitchen	Transportation	Distance to Uni	Distance to Centre
8122	studio	420	1.0	false	either	private	private	bus	7	5
8046	shared apartment	450	1.0	true	either	shared	shared	bus	9	8
8027	shared apartment	400	1.0	true	either	shared	shared	metro	12	6

Look at the solutions displayed. If you realize that you did not state some of your preferences you can do it now.

Type

**My Basket**

 Here you can store entries for comparison. When you choose one of them, you can proceed to checkout

No element in that set

Look-ahead principle: stimulate the user to express more preferences (outcome tradeoff) with the predictive recommendations

# Representative Works

- Natural language dialog
- Graphical user interfaces
  - System-suggested critiques
  - User-initiated critiquing
  - Hybrid critiquing

# 4<sup>th</sup> type: Hybrid Critiquing

Hybrid of system-suggested critiques and user-initiated critiquing  
(Chen and Pu, IUI'07)

To find similar products with better values than this one



**Canon PowerShot S2 IS Digital Camera** \$424.15  
Canon, 5.3 M pixels, 12x optical zoom, 16 MB memory, 1.8 in screen size, 2.97 in thickness, 404.7 g weight. [detail](#)

Add to saved list

We have the following

- 1. Less Optical Zoom and Thinner and Lighter Weight Explain Show Products
- 2. Different Manufacturer and Lower Resolution and Cheaper Explain Show Products
- 3. Larger Screen Size and More Memory and Heavier Explain Show Products

OR would you like to improve some value(s) by yourself?

	Keep	Improve	Take any suggestion
Manufacturer	<input checked="" type="radio"/> Canon	<input type="radio"/> Sony <input type="button" value="▼"/>	<input type="radio"/>
Price	<input checked="" type="radio"/> \$424.15	<input type="radio"/> less expensive <input type="button" value="▼"/>	<input type="radio"/>
Resolution	<input checked="" type="radio"/> 5.3 M pixels	<input type="radio"/> higher <input type="button" value="▼"/>	<input type="radio"/>
Optical Zoom	<input checked="" type="radio"/> 12x	<input type="radio"/> more zoom <input type="button" value="▼"/>	<input type="radio"/>
Removable Flash Memory	<input checked="" type="radio"/> 16 MB	<input type="radio"/> more memory <input type="button" value="▼"/>	<input type="radio"/>
LCD Screen Size	<input checked="" type="radio"/> 1.8 in	<input type="radio"/> larger <input type="button" value="▼"/>	<input type="radio"/>
Thickness	<input checked="" type="radio"/> 2.97 in	<input type="radio"/> thinner <input type="button" value="▼"/>	<input type="radio"/>
Weight	<input checked="" type="radio"/> 404.7 g	<input type="radio"/> lighter <input type="button" value="▼"/>	<input type="radio"/>

Show Results Reset

System-suggested critiques

User-initiated critiquing

# Extension: Chen and Pu, RecSys'07

## Preference-based organization

The product best matching your preferences

	Toshiba Portege M200 Tablet PC <a href="#">Add to saved list</a> \$ 2649 (USD) Toshiba, Microsoft Windows XP Tablet PC, 4.34 hours battery, 12.1 in display size, 80 GB HD, 1500 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.07 kg weight. <a href="#">detail</a>
--	---

Specify your own criteria for "Better Features"

We also recommend the following products with some Better Features

	Panasonic Toughbook 18 Tablet PC - Touchscreen PC Version <a href="#">Add to saved list</a> \$ 2599.99 (USD) Panasonic, Microsoft Windows XP Pro, 8.5 hours battery, 10.4 in display size, 40 GB HD, 256 MB memory, Intel Pentium M Processor (Centrino), 1.1 GHz processor speed, 2.03 kg weight. <a href="#">detail</a>
--	---

	Acer TravelMate C302XCI-SP2 Tablet PC <a href="#">Add to saved list</a> \$ 1299 (USD) Acer, Microsoft Windows XP Tablet PC, 5.5 hours battery, 14.1 in display size, 60 GB HD, 512 MB memory, Intel Pentium M Processor (Centrino), 1.6 GHz processor speed, 2.79 kg weight. <a href="#">detail</a>
--	---

These products have Cheaper Price and Longer Battery Life, although they have slightly Lower Processor Speed

	Acer TravelMate C314XMI Tablet PC <a href="#">Add to saved list</a> \$ 1776.49 (USD) Acer, Microsoft Windows XP Tablet PC, 4 hours battery, 14.1 in display size, 100 GB HD, 1024 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.88 kg weight. <a href="#">detail</a>
--	--

	Toshiba Satellite R10 Tablet PC <a href="#">Add to saved list</a> \$ 1439 (USD) Toshiba, Microsoft Windows XP Tablet PC, 4 hours battery, 14 in display size, 40 GB HD, 512 MB memory, Intel Pentium M Processor, 1.6 GHz processor speed, 2.93 kg weight. <a href="#">detail</a>
--	---

6 products [Show All](#)

These products have Larger Display Size, although they have slightly Shorter Battery Life and Heavier Weight

	ElectroVaya Scribbler SC-500 Tablet PC <a href="#">Add to saved list</a> \$ 2499 (USD) ElectroVaya, Microsoft Windows XP Tablet PC, 8 hours battery, 10.4 in display size, 30 GB HD, 512 MB memory, Intel Pentium III Processor with SpeedStep, 0.866 GHz processor speed, 1.76 kg weight. <a href="#">detail</a>
--	---

	Acer TMIC104TI Tablet PC <a href="#">Add to saved list</a> \$ 1059 (USD) Acer, Microsoft Windows XP Tablet PC, 3.5 hours battery, 10.4 in display size, 30 GB HD, 256 MB memory, Intel Pentium M Processor, 0.99 GHz processor speed, 1.4 kg weight. <a href="#">detail</a>
--	---

6 products [Show All](#)

These products have Lighter Weight and Different Processor Class, although they have slightly Smaller Display Size

	Acer TravelMate C314XMI Tablet PC <a href="#">Add to saved list</a> \$ 1776.49 (USD) Acer, Microsoft Windows XP Tablet PC, 4 hours battery, 14.1 in display size, 100 GB HD, 1024 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.88 kg weight. <a href="#">detail</a>
--	--

	Acer TravelMate C302XCI-SP2 Tablet PC <a href="#">Add to saved list</a> \$ 1299 (USD) Acer, Microsoft Windows XP Tablet PC, 5.5 hours battery, 14.1 in display size, 60 GB HD, 512 MB memory, Intel Pentium M Processor (Centrino), 1.6 GHz processor speed, 2.79 kg weight. <a href="#">detail</a>
--	---

6 products [Show All](#)

These products have Cheaper Price and Larger Display Size, although they have slightly Heavier Weight

	Acer TravelMate C314XMI Tablet PC <a href="#">Add to saved list</a> \$ 1776.49 (USD) Acer, Microsoft Windows XP Tablet PC, 4 hours battery, 14.1 in display size, 100 GB HD, 1024 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.88 kg weight. <a href="#">detail</a>
--	--

	Acer TravelMate C302XCI-SP2 Tablet PC <a href="#">Add to saved list</a> \$ 1299 (USD) Acer, Microsoft Windows XP Tablet PC, 5.5 hours battery, 14.1 in display size, 60 GB HD, 512 MB memory, Intel Pentium M Processor (Centrino), 1.6 GHz processor speed, 2.79 kg weight. <a href="#">detail</a>
--	---

6 products [Show All](#)

## User-initiated critiquing support

To find products with better features than this one

	Toshiba Portege M200 Tablet PC \$ 2649 (USD) Toshiba, Microsoft Windows XP Tablet PC, 4.34 hours battery, 12.1 in display size, 80 GB HD, 1500 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.07 kg weight.
--	--

would you like to improve some values by yourself?

What you have chosen	Improve	Take any suggestion
Manufacturer	<input checked="" type="radio"/> Toshiba	<input type="radio"/> Acer
Price	<input type="radio"/> \$ 2649 (USD)	<input checked="" type="radio"/> < \$ 2649 (USD)
Operating System	<input checked="" type="radio"/> Microsoft Windows XP Tablet PC	<input type="radio"/> <= \$ 2500 (USD)
Battery Life	<input checked="" type="radio"/> 4.34 hours	<input type="radio"/> <= \$ 2000 (USD)
Display Size	<input checked="" type="radio"/> 12.1 in	<input type="radio"/> > 12.1 in
Hard Drive Capacity	<input checked="" type="radio"/> 80 GB	<input type="radio"/> >= 80 GB
Installed Memory	<input checked="" type="radio"/> 1500 MB	Not Available
Processor Class	<input checked="" type="radio"/> Intel Pentium M Processor (Centrino)	<input type="radio"/> Intel Mobile Celeron Processor
Processor Speed	<input checked="" type="radio"/> 2 GHz	<input type="radio"/> > 2 GHz
Weight	<input checked="" type="radio"/> 2.07 kg	<input type="radio"/> < 2.07 kg

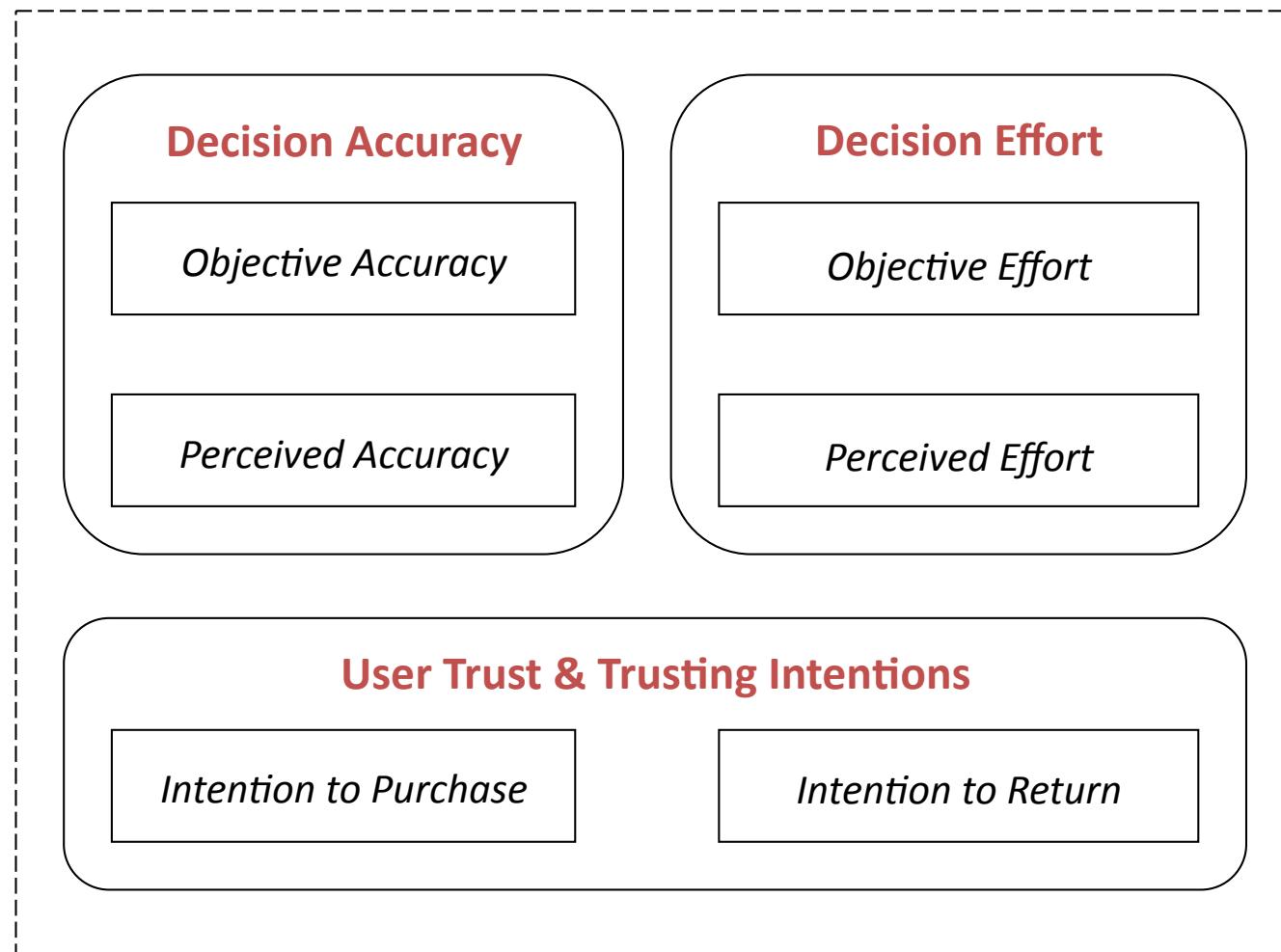
[Show Results](#) [Reset](#)

If suggested critiques and products do not interest the user in the organization interface, she could switch to make the self-initiated critiquing

# Outline

- What is critiquing-based recommender system and Why?
- Development history
- User experiences
- Conclusion

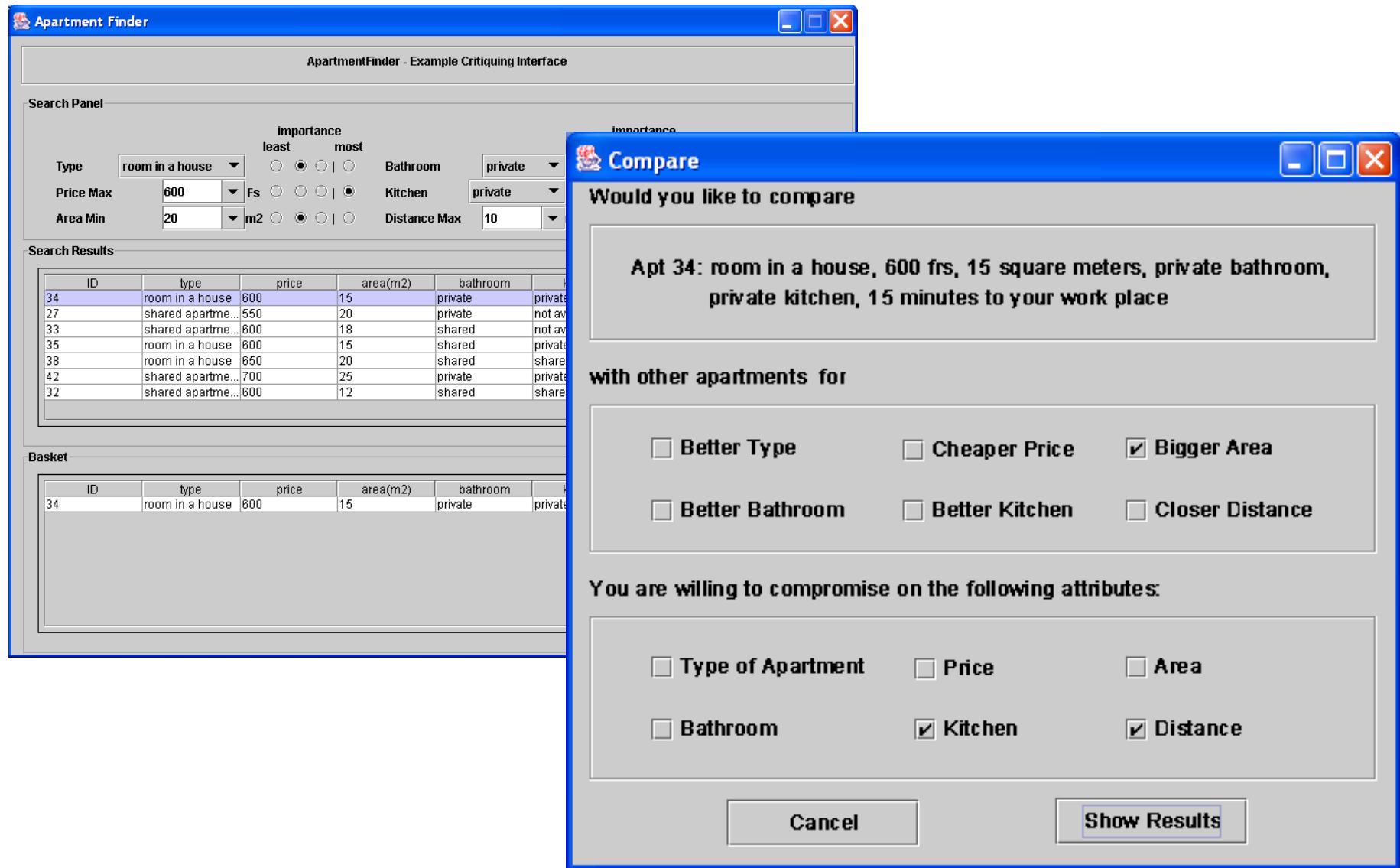
# User Evaluation Framework



# Experiments

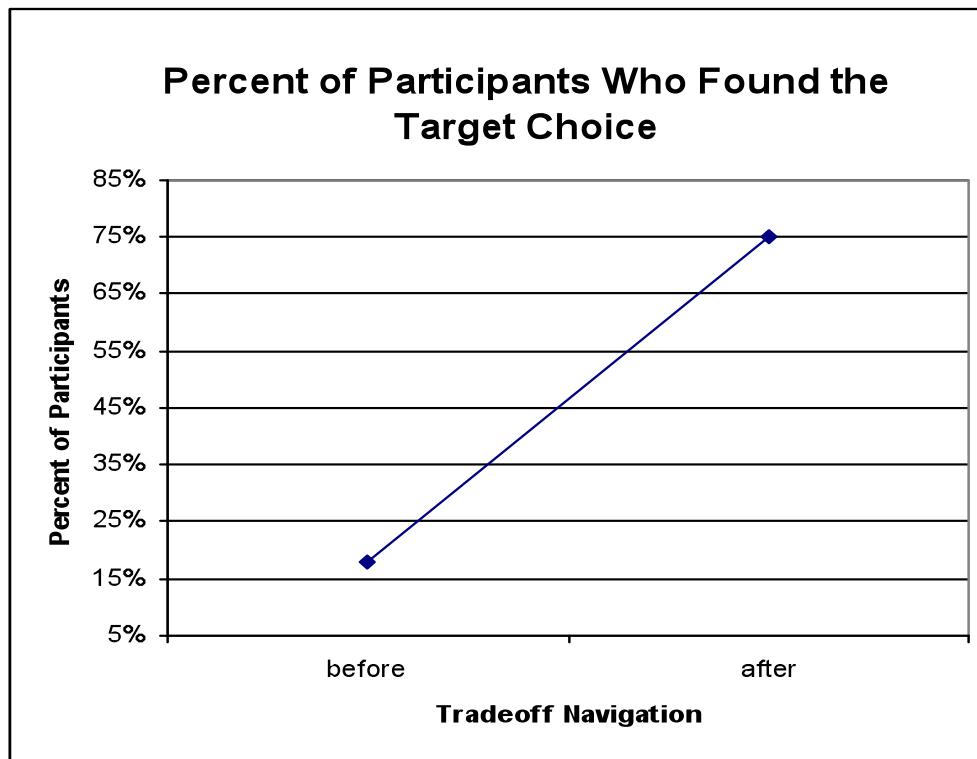
1. Example critiquing vs. non-critiquing based system (EC'05)
2. Example critiquing vs. dynamic critiquing (AAAI'06)
3. Organization interface vs. ranked list (IUI'06, UMAP'10)
4. Evaluation of hybrid critiquing (IUI'07, RecSys'08)

# Example Critiquing (Pu and Chen, EC'05)



# Experiment 1: Example critiquing vs. non-critiquing based system (EC'05)

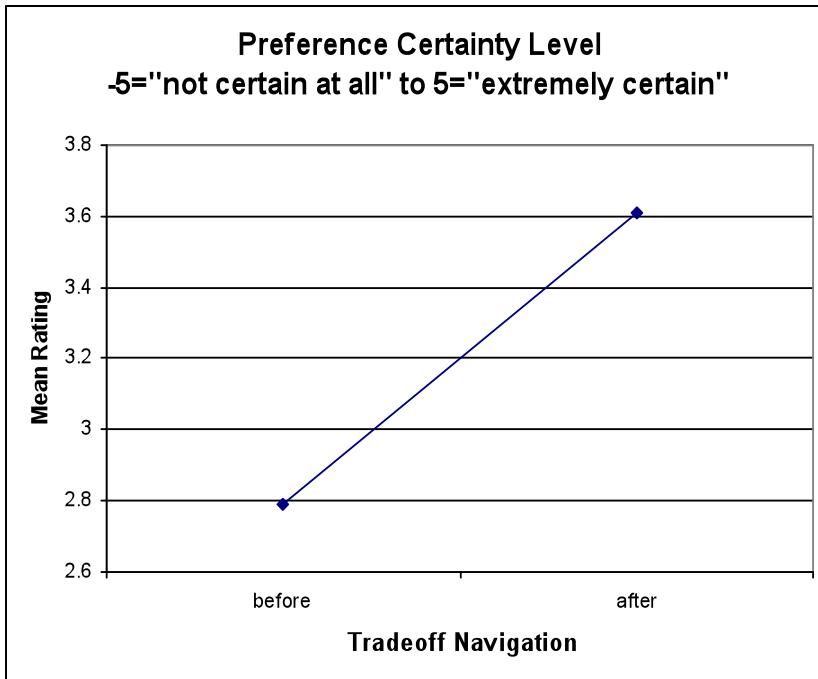
Participants: 28; Material: Apartment Finder



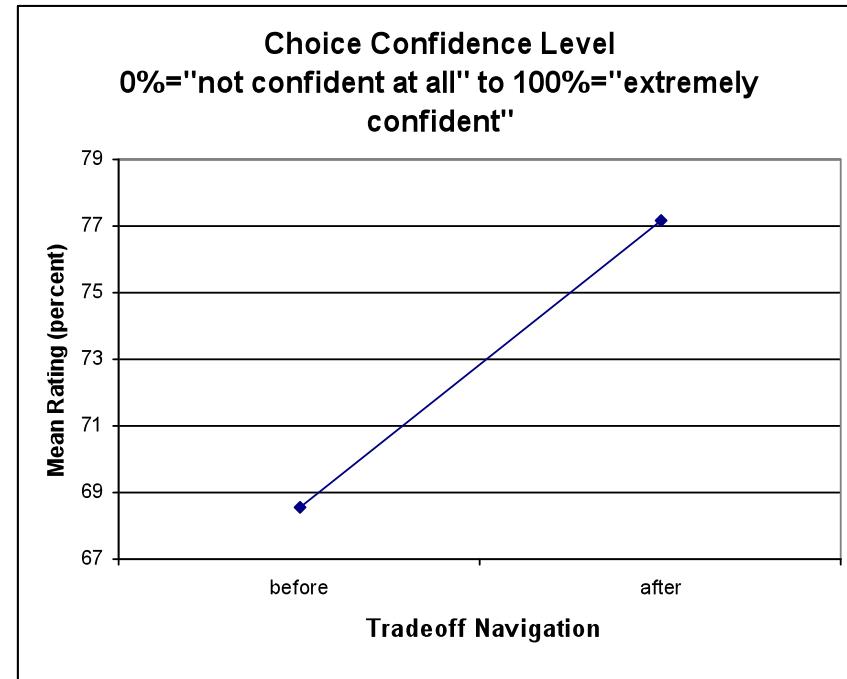
Effect of example critiquing on improving decision accuracy

→ Tradeoff navigation process with the support of example-critiquing can significantly improve users' decision accuracy by **up to 57%**

## Preference certainty



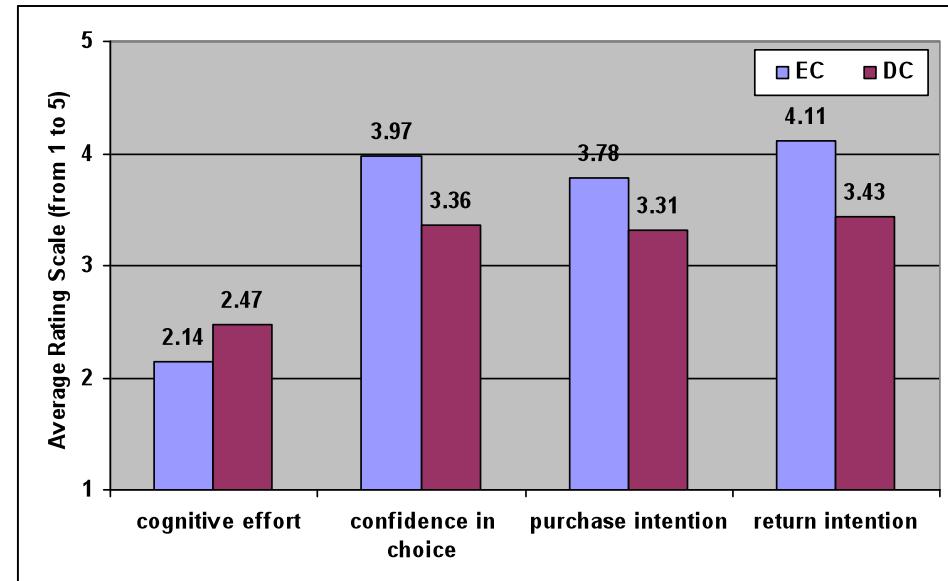
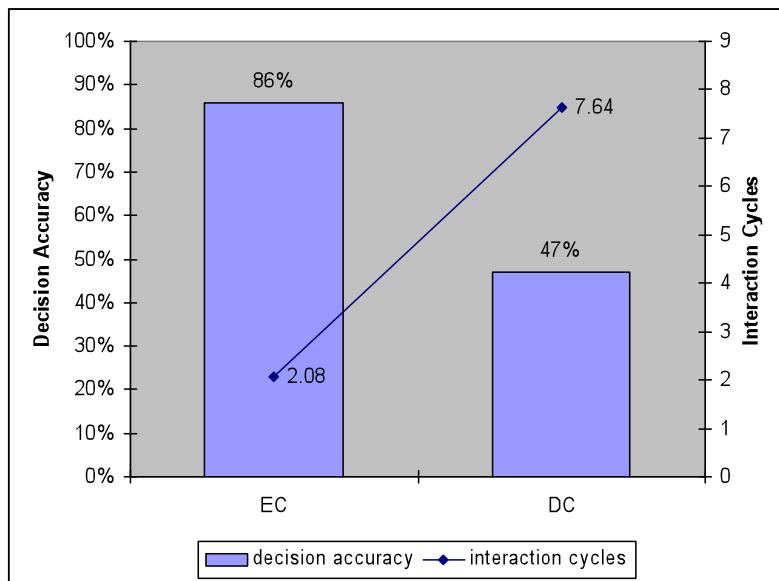
## Decision confidence



➔ Tradeoff navigation process with the support of example-critiquing can significantly improve users' preference certainty and decision confidence

# Experiment 2: Example critiquing vs. dynamic critiquing (AAAI'06)

Participants: 36; Material: Online product finder; Procedure: within-subjects



→ Example critiquing significantly outperforms dynamic critiquing regarding **objective/subjective accuracy, objective interaction effort and perceived effort, purchase and return intentions**

# Dynamic Critiquing (McCarthy *et al.*, IUI'05)

The screenshot shows a web-based application for critiquing digital cameras. At the top, there's a navigation bar with links to HOME, ABOUT THIS PROJECT, and CONTACT. Below that, a search bar says "Shop for: Digital Cameras, Holidays, PCs". The main content area has a purple header "Digital Cameras". On the left, there's a large image of a Canon EOS 300D camera and a sidebar with "Item Found: Canon EOS 300D" and its specifications: 6.3 Megapixel CMOS sensor, 7-point wide-area AF, High-performance DIGIC processor, 100-1600 ISO speed range, Compatible with all Canon EF lenses and EX Speedlites, PictBridge, Canon Direct Print and Bubble Jet Direct compatible - no PC required.

The central part of the interface is titled "Unit Critiques" and contains a form for adjusting preferences. It includes fields for Manufacturer (Canon), Model (EOS-300D), Price (\$), Format (SLR), Resolution (M Pixels), Optical Zoom (X), Digital Zoom (X), Weight (grams), Storage Type (Compact Flash), and Storage Included (MB). A yellow arrow points from the "Item Found" sidebar towards this form.

Below the critique form, a section titled "We have more matching products with the following..." lists three compound critiques:

1. Less Optical Zoom & More Digital Zoom & A Different Storage Type (139) PICK EXPLAIN
2. A Lower Resolution & A Different Format & Cheaper (169) PICK EXPLAIN
3. A Different Manufacturer & Less Optical Zoom & More Storage (167) PICK EXPLAIN

At the bottom, a copyright notice reads "COPYRIGHT 2004 ©".

## Method

- Dynamically generate a set of compound critiques (each over multiple attributes) through association rule mining
- The recommended item should satisfy the user picked critique as well as being most similar to the previous recommendation

# Experiment 3: Organization interface vs. ranked list (IUI'06)

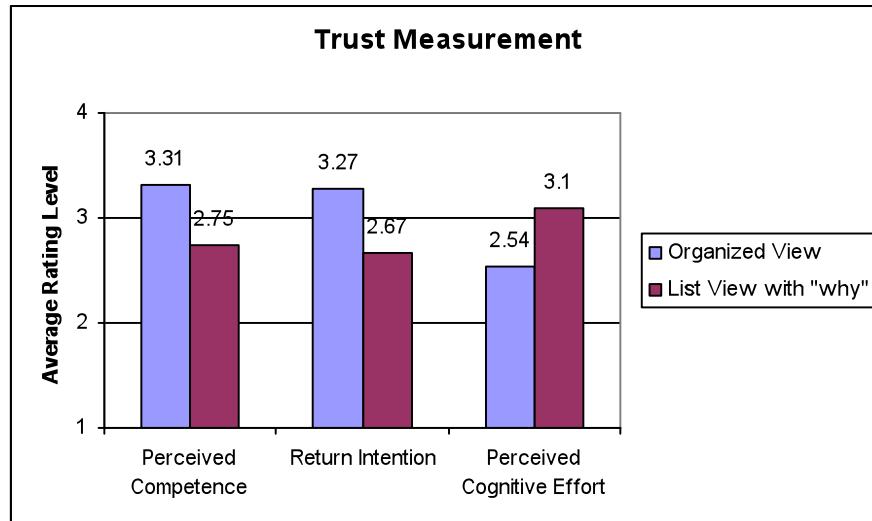
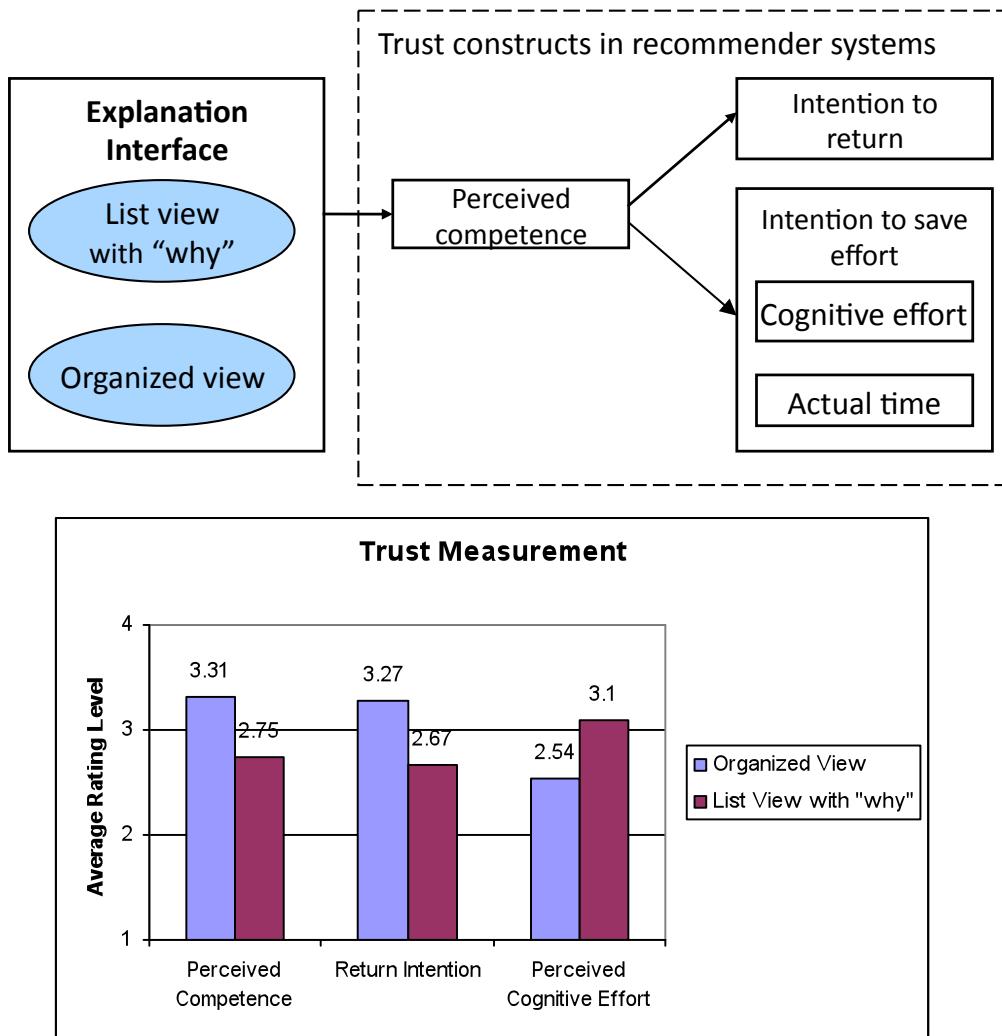
The most popular product							
Manufacturer	Price	Processor speed	Battery life	Installed memory	Hard drive capacity	Display size	Weight
C ——	\$2'095.00	1.67 GHz	4.5 hour(s)	512 MB	80 GB	38.6 cm	2.54 kg
We also recommend the following products because they are cheaper and lighter, but have lower processor speed							
they have higher processor speed and bigger hard drive capacity, but are heavier							
they have longer battery life and lighter weight, but smaller display size							
they are cheaper, but heavier							
C ——	\$1'220.49	1.8 GHz	5 hour(s)	1 GB	100 GB	38.1 cm	2.95 kg
C ——	\$2'148.99	2 GHz	4 hour(s)	1 GB	100 GB	39.1 cm	2.9 kg
C ——	\$1'379.00	3.3 GHz	2 hour(s)	512 MB	100 GB	43.2 cm	4.31 kg
C ——	\$2'235.00	1.8 GHz	2.5 hour(s)	1 GB	100 GB	43.2 cm	3.99 kg
C ——	\$2'319.00	1.7 GHz	4.5 hour(s)	512 MB	100 GB	43.2 cm	3.13 kg
C ——	\$2'075.00	1.8 GHz	1.67 hour(s)	512 MB	100 GB	43.2 cm	4.4 kg

Organization interface

The most popular product							
Manufacturer	Price	Processor speed	Battery life	Installed memory	Hard drive capacity	Display size	Weight
C ——	\$2'095.00	1.67 GHz	4.5 hours	512 MB	80 GB	38.6 cm	2.54 kg
We also recommend the following products							
they have higher processor speed and bigger hard drive capacity, but are heavier							
they have longer battery life and lighter weight, but smaller display size							
they are cheaper, but heavier							
C ——	\$1'220.49	1.8 GHz	5 hours	1 GB	100 GB	38.1 cm	2.95 kg
C ——	\$2'148.99	2.0 GHz	4 hours	1 GB	100 GB	39.1 cm	2.90 kg
C ——	\$1'379.00	3.3 GHz	2 hours	512 MB	100 GB	43.2 cm	4.31 kg
C ——	\$1'179.00	3.2 GHz	2 hours	512 MB	80 GB	39.1 cm	3.62 kg
C ——	\$1'529.00	1.7 GHz	6.5 hours	512 MB	80 GB	33.8 cm	1.77 kg
C ——	\$1'599.00	1.7 GHz	6.5 hours	512 MB	80 GB	33.8 cm	1.91 kg
C ——	\$1'425.00	1.6 GHz	5.5 hours	512 MB	80 GB	39.1 cm	2.86 kg
C ——	\$2'235.00	1.8 GHz	2.5 hours	1 GB	100 GB	43.2 cm	3.99 kg
This product has higher processor speed and bigger hard drive capacity, but is heavier.						\$1'190.00	3.2 GHz
						1 hours	512 MB
						\$1'125.00	1.5 GHz
						6 hours	512 MB
						30.7 cm	2 kg
C ——	\$2'319.00	1.67 GHz	4.5 hours	512 MB	100 GB	43.2 cm	3.13 kg
C ——	\$1'499.00	1.5 GHz	5 hours	512 MB	80 GB	33.8 cm	1.91 kg
C ——	\$1'739.99	1.5 GHz	4.5 hours	512 MB	80 GB	38.6 cm	2.49 kg
C ——	\$1'629.00	1.8 GHz	5.8 hours	512 MB	60 GB	39.1 cm	2.81 kg
C ——	\$627.10	1.6 GHz	1.5 hours	256 MB	40 GB	38.1 cm	2.81 kg
C ——	\$520.00	1.13 GHz	3.5 hours	128 MB	30 GB	35.8 cm	2.59 kg

Ranked list

# Results



Participants: 72; Material: online product finder; Procedure: within-subjects

Items in the <b>Perceived Competence</b> construct	Mean	
	Organized view	List view with "why"
I felt comfortable using the interface;	3.24	2.78
This interface enabled me to compare different products very efficiently.	3.38	2.72
<b>Cronbach's alpha = 0.84</b>		

Items in the <b>Intention to Return</b> construct	Mean	
	Organized view	List view with "why"
If I had to buy a product online in the future and an interface such as this was available, I would be very likely to use it;	3.11	2.56
I don't like this interface, so I would not use it again ( <i>reverse scale</i> ).	3.40	2.79
<b>Cronbach's alpha = 0.91</b>		

Items in the <b>Cognitive Effort</b> construct	Mean	
	Organized view	List view with "why"
I easily found the information I was looking for ( <i>reverse scale</i> );	2.47	3.07
Selecting a product using this interface required too much effort.	2.61	3.14
<b>Cronbach's alpha = 0.73</b>		

# Eye-Tracking Study (Chen and Pu, UMAP'10, IUI'11)

## Three different layouts:

The product best matching your preferences	
	<a href="#">Dell Vostro 1000 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,099.99</b>	Dell Microsoft Windows Vista Home Basic, 10.4 inch display size, 80 GB HD, 0.5 GB memory, AMD Sempron Mobile, 1.0 GHz processor speed, 1.39 kg weight. <a href="#">details</a>
Recommended other products with some Better Features	
	<a href="#">Sony VAIO VGN-SZ710HN Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 2,920.44</b>	Sony Microsoft Windows Vista Business, 6 hours battery, 13.3 inch display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 1.81 kg weight. <a href="#">details</a>
	<a href="#">Sony VAIO VGN-SZ740HN Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,988.09</b>	Sony Microsoft Windows Vista Business, 2.5 hours battery, 13.3 inch display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 1.9 kg weight. <a href="#">details</a>
	<a href="#">Apple 13.3-inch MacBook Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,149.00</b>	Apple Intel CS / v10 (2.0) (quad), 4.5 hours battery, 13.3 inch display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.4 GHz processor speed, 2.26 kg weight. <a href="#">details</a>
	<a href="#">Apple 13.3-inch MacBook Pro Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,149.00</b>	Apple Intel CS / v10 (2.0) (quad), 5 hours battery, 15 inch display size, 200 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.4 GHz processor speed, 2.42 kg weight. <a href="#">details</a>
	<a href="#">Apple 13.3-inch MacBook Pro Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,149.00</b>	Apple Intel CS / v10 (2.0) (quad), 6 hours battery, 13.3 inch display size, 160 GB HD, 1 GB memory, Intel Core 2 Duo Mobile, 2.2 GHz processor speed, 2.42 kg weight. <a href="#">details</a>
Interleaving Manufacturing, Interpreting Processor Class and More Installed Memory, but Heavier Weight	
	<a href="#">Sony VAIO VGN-AR710NC Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 2,007.80</b>	Sony Microsoft Windows Vista Home Premium, 2.5 hours battery, 17 inch display size, 320 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 2.5 kg weight. <a href="#">details</a>
	<a href="#">Gateway P-1715 FX Edition Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,599.99</b>	Gateway Microsoft Windows Vista Home Premium, 17 inch display size, 250 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 2 GHz processor speed, 4.16 kg weight. <a href="#">details</a>
	<a href="#">Apple 13-inch MacBook Pro Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,249.00</b>	Apple Intel CS / v10 (2.0) (quad), 5 hours battery, 17 inch display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 2.42 kg weight. <a href="#">details</a>
	<a href="#">Sony VAIO VGN-AR710MA Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,122.00</b>	Sony Microsoft Windows Vista Home Premium, 2.5 hours battery, 17 inch display size, 160 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.1 GHz processor speed, 3.5 kg weight. <a href="#">details</a>
	<a href="#">Acer Aspire 5700 AS7500.9115 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 795.00</b>	Acer Microsoft Windows Vista Home Premium, 6 hours battery, 17 inch display size, 160 GB HD, 2 GB memory, AMD Athlon 64 X2 Mobile, 1.6 GHz processor speed, 3.4 kg weight. <a href="#">details</a>
	<a href="#">Dell Inspiron 1720 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 780</b>	Dell Microsoft Windows Vista Home Premium, 17 inch display size, 120 GB HD, 1 GB memory, Intel Pentium Dual-Core Mobile, 1.6 GHz processor speed, 3.62 kg weight. <a href="#">details</a>
Interesting Processor Class and Increasing System, but Lower Processor Speed and Smaller Display Size	
	<a href="#">Dell XPS M1330 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 999</b>	Dell Microsoft Windows Vista Home Premium, 13.3 inch display size, 120 GB HD, 1 GB memory, Intel Core 2 Duo Mobile, 1.5 GHz processor speed, 1.8 kg weight. <a href="#">details</a>
	<a href="#">Sony VAIO VGN-TA100HN Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 975.00</b>	Sony Microsoft Windows Vista Business, 7.5 hours battery, 11.1 inch display size, 100 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.05 GHz processor speed, 1.2 kg weight. <a href="#">details</a>
	<a href="#">Sony VAIO VGN-T220HN Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 979.47</b>	Sony Microsoft Windows Vista Business, 4.5 hours battery, 11.1 inch display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.53 GHz processor speed, 1.2 kg weight. <a href="#">details</a>
	<a href="#">Lenovo ThinkPad T23 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 299</b>	Lenovo Microsoft Windows 2000 Professional, 3.5 hours battery, 14.1 inch display size, 30 GB HD, 0.125 GB memory, Intel Pentium 4 1.13 GHz processor speed, 2.5 kg weight. <a href="#">details</a>
	<a href="#">Apple G4 Cube Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 249</b>	Apple 0.6 Mac / 0.6 Mac, 6 hours battery, 14.1 inch display size, 20 GB HD, 0.25 GB memory, PowerPC G3, 0.59 GHz processor speed, 2.71 kg weight. <a href="#">details</a>
	<a href="#">Sony VAIO VGN-DK600H Laptop PC</a> <a href="#">Add to wishlist</a>
<b>\$ 1,299.00</b>	Sony Microsoft Windows Vista Business, 4.5 hours battery, 4.5 inch display size, 32 GB HD, 1 GB memory, Intel Core Solo, 1.33 GHz processor speed, 0.64 kg weight. <a href="#">details</a>
More Installed Memory and Bigger Hard Disk Capacity, but More Expensive Price and Lower Processor Speed	
	<a href="#">Asus F50 A52F A5200.9115 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,029.00</b>	Asus Microsoft Windows Vista Home Premium, 3 hours battery, 17 inch display size, 160 GB HD, 2 GB memory, AMD Athlon 64 X2 Mobile, 1.6 GHz processor speed, 3.4 kg weight. <a href="#">details</a>
	<a href="#">Dell Inspiron 1720 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 740</b>	Dell Microsoft Windows Vista Home Premium, 17 inch display size, 120 GB HD, 1 GB memory, Intel Pentium Dual-Core Mobile, 1.6 GHz processor speed, 3.62 kg weight. <a href="#">details</a>
	<a href="#">Gateway M105 M105 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 729.99</b>	Gateway Microsoft Windows Vista Home Premium, 10.4 inch display size, 250 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 1.66 GHz processor speed, 2.42 kg weight. <a href="#">details</a>
	<a href="#">Dell Inspiron 1525 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 599</b>	Dell Microsoft Windows Vista Home Premium, 13.3 inch display size, 120 GB HD, 1 GB memory, Intel Core 2 Duo Mobile, 1.5 GHz processor speed, 2.42 kg weight. <a href="#">details</a>
	<a href="#">Dell Inspiron 1525 Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 547</b>	Dell Microsoft Windows Vista Home Premium, 15.4 inch display size, 160 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 1.66 GHz processor speed, 2.42 kg weight. <a href="#">details</a>
	<a href="#">Sony VAIO TZ100HN Notebook</a> <a href="#">Add to wishlist</a>
<b>\$ 1,675.00</b>	Sony Microsoft Windows Vista Business, 7 hours battery, 11.1 inch display size, 100 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.6 GHz processor speed, 1.2 kg weight. <a href="#">details</a>

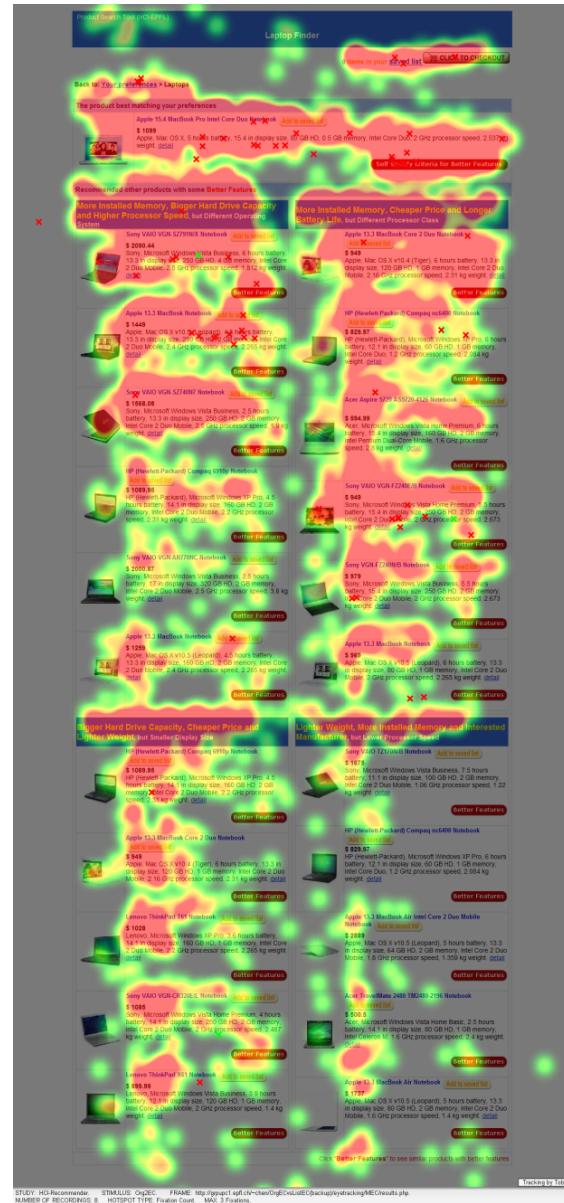
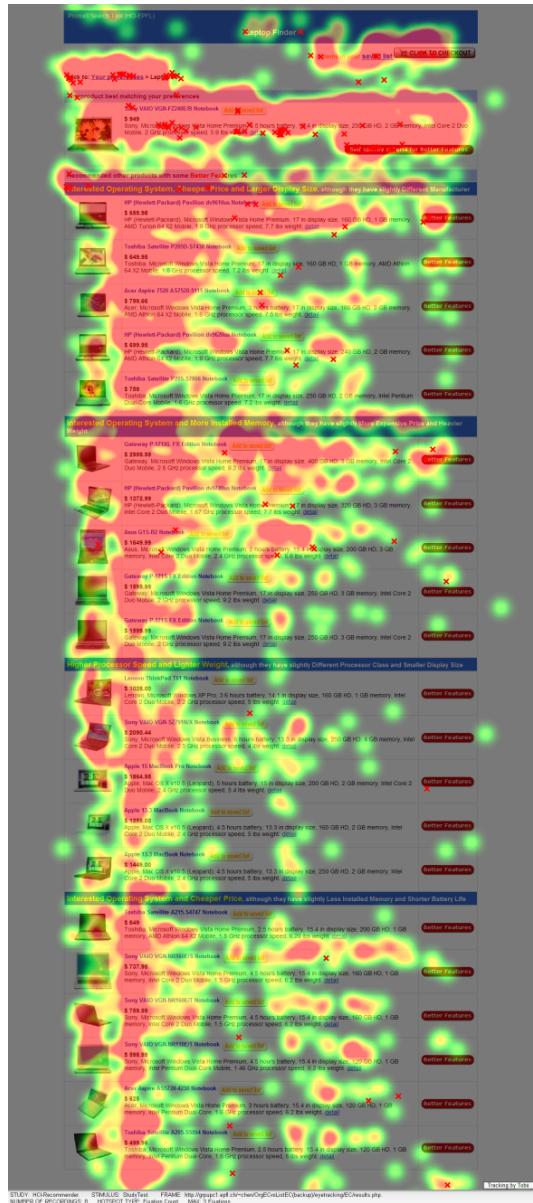
<b>The product best matching your preferences</b>	
	<b>Dell Vostro 1000 Notebook</b> <a href="#">Add to saved list.</a> \$ 399 Dell, Microsoft Windows Vista Home Basic, 15.4 in display size, 80 GB HD, 0.5 GB memory, AMD Sempron Mobile, 1.8 GHz processor speed, 2.89 kg weight. <a href="#">detail</a>
<b>Recommended other products with some Better Features</b>	
<b>Lighter Weight and Bigger Hard Drive Capacity, but More Expensive Price and Smaller Display Size</b>	<b>Sony VAIO SZ791HMX Notebook</b> <a href="#">Add to saved list.</a> \$ 2099.44 Sony, Microsoft Windows Vista Business, 6 hours battery, 13.3 in display size, 250 GB HD, 1.6 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 1.812 kg weight. <a href="#">detail</a>
<b>Sony VAIO SZ791HMX Notebook</b> <a href="#">Add to saved list.</a> \$ 1568.96 Sony, Microsoft Windows Vista Business, 2.5 hours battery, 13.3 in display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 1.9 kg weight. <a href="#">detail</a>	<b>Interesting Manufacturer, Interesting Processor Class and More Installed Memory, but Heavier Weight</b>
<b>Apple 13.3 MacBook Notebook</b> <a href="#">Add to saved list.</a> \$ 1449 Apple, Mac OS X v10.5 (Leopard), 4.5 hours battery, 13.3 in display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.4 GHz processor speed, 2.265 kg weight. <a href="#">detail</a>	<b>Sony VAIO VGN-AR770NC Notebook</b> <a href="#">Add to saved list.</a> \$ 2000.87 Sony, Microsoft Windows Vista Home Premium, 2.5 hours battery, 17 in display size, 160 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 3.8 kg weight. <a href="#">detail</a>
<b>Apple 13.3 MacBook Notebook</b> <a href="#">Add to saved list.</a> \$ 1289 Apple, Mac OS X v10.5 (Leopard), 4.5 hours battery, 13.3 in display size, 200 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.4 GHz processor speed, 2.265 kg weight. <a href="#">detail</a>	<b>Gateway P-1715 FX Edition Notebook</b> <a href="#">Add to saved list.</a> \$ 1598.99 Gateway, Microsoft Windows Vista Home Premium, 17 in display size, 250 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 4.168 kg weight. <a href="#">detail</a>
<b>Apple 13.3 MacBook Notebook</b> <a href="#">Add to saved list.</a> \$ 1289 Apple, Mac OS X v10.5 (Leopard), 4.5 hours battery, 13.3 in display size, 200 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.4 GHz processor speed, 2.265 kg weight. <a href="#">detail</a>	<b>Apple iMac 24" All-in-one</b> <a href="#">Add to saved list.</a> \$ 2499 Apple, Mac OS X v10.5 (Leopard), 5 hours battery, 17 in display size, 250 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.5 GHz processor speed, 3.038 kg weight. <a href="#">detail</a>
<b>Apple 15 MacBook Pro Notebook</b> <a href="#">Add to saved list.</a> \$ 1864.95 Apple, Mac OS X v10.5 (Leopard), 5 hours battery, 15 in display size, 300 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.4 GHz processor speed, 2.45 kg weight. <a href="#">detail</a>	<b>Sony VAIO VGN-AR770NA Notebook</b> <a href="#">Add to saved list.</a> \$ 1222 Sony, Microsoft Windows Vista Business, 2.5 hours battery, 17 in display size, 160 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 2.1 GHz processor speed, 3.9 kg weight. <a href="#">detail</a>
<b>Apple 13.3 MacBook Notebook</b> <a href="#">Add to saved list.</a> \$ 1289.99 Apple, Mac OS X v10.5 (Leopard), 6 hours battery, 13.3 in display size, 160 GB HD, 1 GB memory, Intel Core 2 Duo Mobile, 2.2 GHz processor speed, 2.265 kg weight. <a href="#">detail</a>	<b>Acer Aspire 5720 AS7520-5115 Notebook</b> <a href="#">Add to saved list.</a> \$ 799.66 Acer, Microsoft Windows Vista Home Premium, 3 hours battery, 17 in display size, 160 GB HD, 2 GB memory, AMD Athlon 64 X2 Mobile, 1.6 GHz processor speed, 3.4 kg weight. <a href="#">detail</a>
<b>Dell MPS 1310 Notebook</b> <a href="#">Add to saved list.</a> \$ 899 Dell, Microsoft Windows Vista Home Premium, 10.3 in display size, 120 GB HD, 1 GB memory, Intel Core 2 Duo Mobile, 1.5 GHz processor speed, 1.29 kg weight. <a href="#">detail</a>	<b>Dell Inspiron 1720 Notebook</b> <a href="#">Add to saved list.</a> \$ 750 Dell, Microsoft Windows Vista Home Premium, 17 in display size, 120 GB HD, 1 GB memory, Intel Pentium Dual-Core Mobile, 1.6 GHz processor speed, 3.624 kg weight. <a href="#">detail</a>
<b>Sony VAIO TZ710NB Notebook</b> <a href="#">Add to saved list.</a> \$ 1675 Sony, Microsoft Windows Vista Business, 7.5 hours battery, 11.1 in display size, 100 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.06 GHz processor speed, 1.22 kg weight. <a href="#">detail</a>	<b>Acer Aspire 5720 AS7520-5115 Notebook</b> <a href="#">Add to saved list.</a> \$ 798.66 Acer, Microsoft Windows Vista Home Premium, 3 hours battery, 17 in display size, 160 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.6 GHz processor speed, 3.4 kg weight. <a href="#">detail</a>
<b>Sony VAIO VGN-TZ280XNC Notebook</b> <a href="#">Add to saved list.</a> \$ 3252.47 Sony, Microsoft Windows Vista Business, 4.5 hours battery, 11 in display size, 200 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.33 GHz processor speed, 1.2 kg weight. <a href="#">detail</a>	<b>Dell Inspiron 1720 Notebook</b> <a href="#">Add to saved list.</a> \$ 750 Dell, Microsoft Windows Vista Home Premium, 17 in display size, 120 GB HD, 1 GB memory, Intel Pentium Dual-Core Mobile, 1.6 GHz processor speed, 3.624 kg weight. <a href="#">detail</a>
<b>Lenovo ThinkPad T23 Notebook</b> <a href="#">Add to saved list.</a> \$ 2991 Lenovo, Microsoft Windows 2000 Professional, 3.5 hours battery, 14.1 in display size, 30 GB HD, 0.125 GB memory, Intel Pentium III, 1.13 GHz processor speed, 2.5 kg weight. <a href="#">detail</a>	<b>Gateway M-6755 Notebook</b> <a href="#">Add to saved list.</a> \$ 729.99 Gateway, Microsoft Windows Vista Home Premium, 15.4 in display size, 250 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 1.65 GHz processor speed, 2.85 kg weight. <a href="#">detail</a>
<b>Apple iBook G3 Notebook</b> <a href="#">Add to saved list.</a> \$ 369 Apple, Mac OS X v10.3 GS X, 6 hours battery, 14.1 in display size, 30 GB HD, 0.25 GB memory, PowerPC G3, 0.59 GHz processor speed, 2.713 kg weight. <a href="#">detail</a>	<b>Dell MPS 1310 Notebook</b> <a href="#">Add to saved list.</a> \$ 899 Dell, Microsoft Windows Vista Home Premium, 15.4 in display size, 160 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 1.66 GHz processor speed, 1.8 kg weight. <a href="#">detail</a>
<b>Sony VAIO VGN-ZX390N Laptop PC</b> <a href="#">Add to saved list.</a> \$ 1299 Sony, Microsoft Windows Vista Business, 4.5 hours battery, 4.5 in display size, 32 GB HD, 1 GB memory, Intel Core Solo, 1.33 GHz processor speed, 0.544 kg weight. <a href="#">detail</a>	<b>Dell Inspiron 1525 Notebook</b> <a href="#">Add to saved list.</a> \$ 747 Dell, Microsoft Windows Vista Home Premium, 15.4 in display size, 160 GB HD, 3 GB memory, Intel Core 2 Duo Mobile, 1.66 GHz processor speed, 2.873 kg weight. <a href="#">detail</a>
<b>Sony VAIO VGN-ZX390N Laptop PC</b> <a href="#">Add to saved list.</a> \$ 1299 Sony, Microsoft Windows Vista Business, 4.5 hours battery, 4.5 in display size, 32 GB HD, 1 GB memory, Intel Core Solo, 1.33 GHz processor speed, 0.544 kg weight. <a href="#">detail</a>	<b>Sony VAIO TZ710NB Notebook</b> <a href="#">Add to saved list.</a> \$ 1675 Sony, Microsoft Windows Vista Business, 7.5 hours battery, 11.1 in display size, 100 GB HD, 2 GB memory, Intel Core 2 Duo Mobile, 1.6 GHz processor speed, 1.22 kg weight. <a href="#">detail</a>

ORG1

ORG2

## LIST

# Hotspot plot



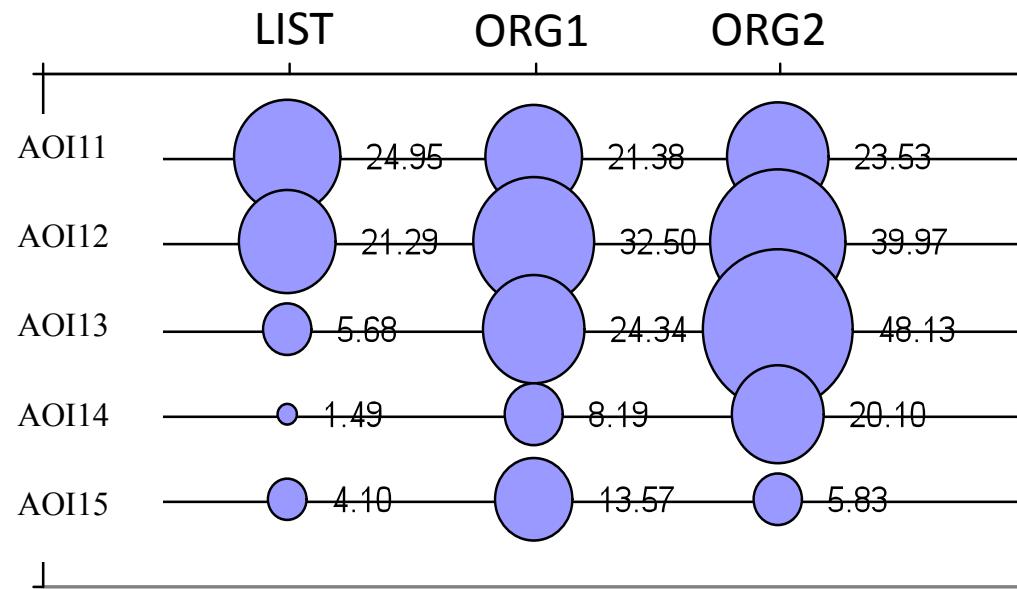
ORG1

ORG2

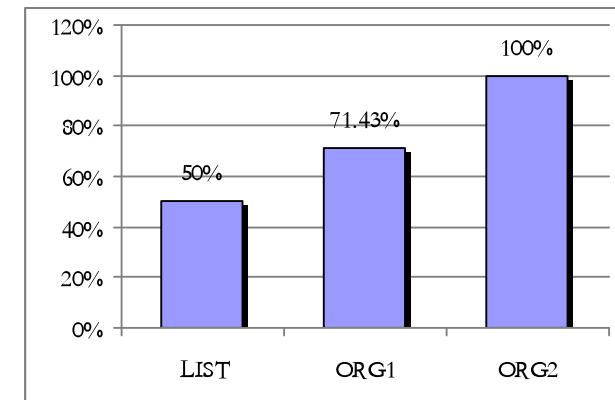
LIST

# AOI analysis & decision quality

Fixation duration on each AOI



Percent of users who have finally made product choice



Distribution of users' choices among AOIs

	Average selections	Top item (AOI1)	AOI2	AOI3	AOI4	AOI5
LIST	1.33	25%	75%			
ORG1	1.86	23%	31%	15%	8%	23%
ORG2	3.2	12.5%	37.5%	37.5%	12.5%	

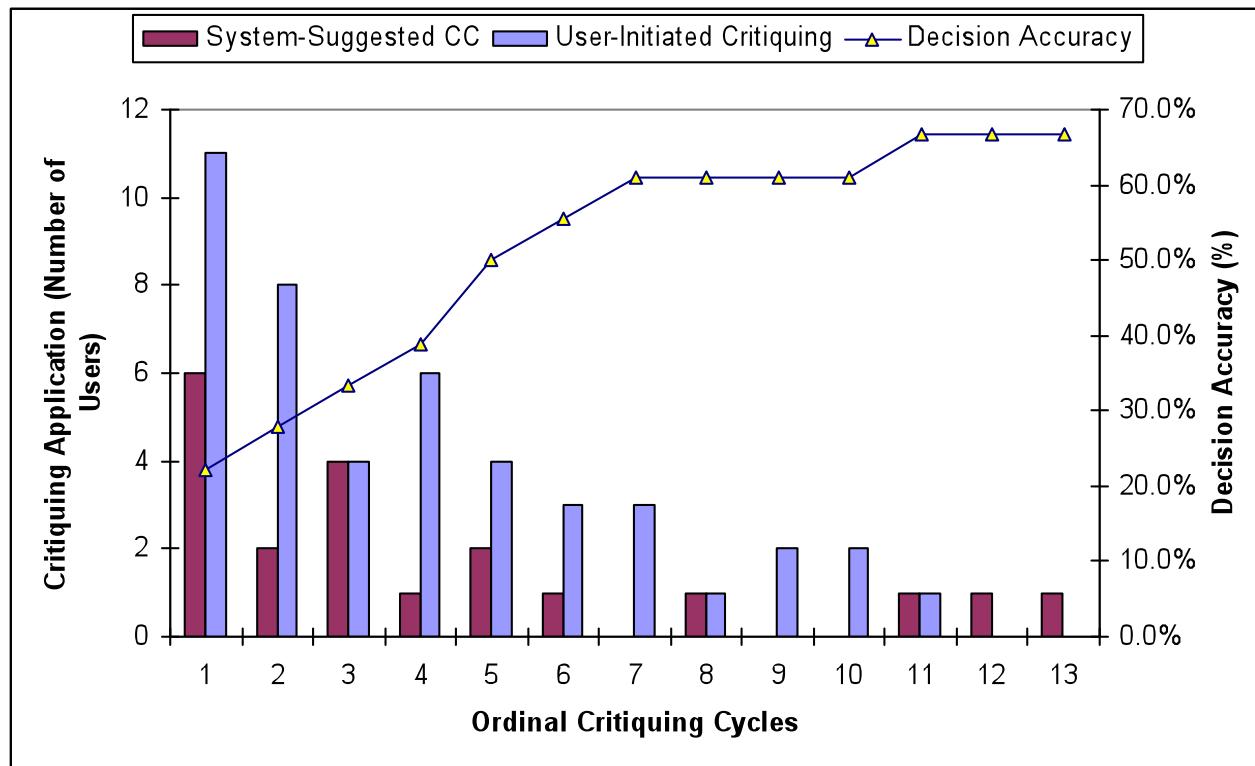
# Cross-Cultural Study (Chen and Pu, RecSys'08)

	<i>Oriental Culture (60)</i>	<i>Western Culture (60)</i>
Nation	China (60)	Switzerland (41); Other European countries (19)
Gender	Female (23); Male (37)	Female (15); Male (45)
Average age	21~30 (57); >30 (3)	<21 (14); 21~30 (44); >30 (2)
Major/ job domain	Computer, mathematics, environment, electronics, architecture, etc.	Computer, education, mechanics, electronics, architecture, etc.
Computer knowledge	4.34 (advanced)	4.08 (advanced)
Internet usage	4.83 (almost daily)	4.98 (almost daily)
e-commerce site visits	3.69 (1-3 times a month)	3.36 (a few times every 3 months)
e-shopping experiences	3.25 (a few times every 3 months)	2.92 (a few times every 3 months)

- People from different cultural backgrounds basically performed similar regarding both objective performance and subjective perceptions
- Significant favor of ORG against LIST
- Stronger among Chinese participants

# Experiment 4: Evaluation of hybrid critiquing (IUI'07)

Participants: 18



→ Users behaved more active in creating their own criteria with the self-initiated critiquing aid, relative to their application of the system-suggested critiques

# 4<sup>th</sup> type: Hybrid Critiquing

Hybrid of system-suggested critiques and user-initiated critiquing  
(Chen and Pu, IUI'07)

To find similar products with better values than this one



**Canon PowerShot S2 IS Digital Camera** \$424.15  
Canon, 5.3 M pixels, 12x optical zoom, 16 MB memory, 1.8 in screen size, 2.97 in thickness, 404.7 g weight. [detail](#)

Add to saved list

We have the following

- 1. Less Optical Zoom and Thinner and Lighter Weight Explain Show Products
- 2. Different Manufacturer and Lower Resolution and Cheaper Explain Show Products
- 3. Larger Screen Size and More Memory and Heavier Explain Show Products

OR would you like to improve some value(s) by yourself?

	Keep	Improve	Take any suggestion
Manufacturer	<input checked="" type="radio"/> Canon	<input type="radio"/> Sony <input type="button" value="▼"/>	<input type="radio"/>
Price	<input checked="" type="radio"/> \$424.15	<input type="radio"/> less expensive <input type="button" value="▼"/>	<input type="radio"/>
Resolution	<input checked="" type="radio"/> 5.3 M pixels	<input type="radio"/> higher <input type="button" value="▼"/>	<input type="radio"/>
Optical Zoom	<input checked="" type="radio"/> 12x	<input type="radio"/> more zoom <input type="button" value="▼"/>	<input type="radio"/>
Removable Flash Memory	<input checked="" type="radio"/> 16 MB	<input type="radio"/> more memory <input type="button" value="▼"/>	<input type="radio"/>
LCD Screen Size	<input checked="" type="radio"/> 1.8 in	<input type="radio"/> larger <input type="button" value="▼"/>	<input type="radio"/>
Thickness	<input checked="" type="radio"/> 2.97 in	<input type="radio"/> thinner <input type="button" value="▼"/>	<input type="radio"/>
Weight	<input checked="" type="radio"/> 404.7 g	<input type="radio"/> lighter <input type="button" value="▼"/>	<input type="radio"/>

Show Results Reset

System-suggested critiques

User-initiated critiquing

# Extension: Chen and Pu, RecSys'07

## Preference-based organization

The product best matching your preferences

	Toshiba Portege M200 Tablet PC <a href="#">Add to saved list</a> \$ 2649 (USD) Toshiba, Microsoft Windows XP Tablet PC, 4.34 hours battery, 12.1 in display size, 80 GB HD, 1500 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.07 kg weight. <a href="#">detail</a>
--	---

Specify your own criteria for "Better Features"

We also recommend the following products with some Better Features

These products have Cheaper Price and Longer Battery Life, although they have slightly Lower Processor Speed

	Panasonic Toughbook 18 Tablet PC - Touchscreen PC Version <a href="#">Add to saved list</a> \$ 2599.99 (USD) Panasonic, Microsoft Windows XP Pro, 8.5 hours battery, 10.4 in display size, 40 GB HD, 256 MB memory, Intel Pentium M Processor (Centrino), 1.1 GHz processor speed, 2.03 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>
	Acer TravelMate C302XCI-SP2 Tablet PC <a href="#">Add to saved list</a> \$ 1299 (USD) Acer, Microsoft Windows XP Tablet PC, 5.5 hours battery, 14.1 in display size, 60 GB HD, 512 MB memory, Intel Pentium M Processor (Centrino), 1.6 GHz processor speed, 2.79 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>

6 products [Show All](#)

These products have Larger Display Size, although they have slightly Shorter Battery Life and Heavier Weight

	Acer TravelMate C314XMi Tablet PC <a href="#">Add to saved list</a> \$ 1776.49 (USD) Acer, Microsoft Windows XP Tablet PC, 4 hours battery, 14.1 in display size, 100 GB HD, 1024 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.88 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>
	Toshiba Satellite R10 Tablet PC <a href="#">Add to saved list</a> \$ 1439 (USD) Toshiba, Microsoft Windows XP Tablet PC, 4 hours battery, 14 in display size, 40 GB HD, 512 MB memory, Intel Pentium M Processor, 1.6 GHz processor speed, 2.93 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>

6 products [Show All](#)

These products have Lighter Weight and Different Processor Class, although they have slightly Smaller Display Size

	ElectroVaya Scribbler SC-500 Tablet PC <a href="#">Add to saved list</a> \$ 2499 (USD) ElectroVaya, Microsoft Windows XP Tablet PC, 8 hours battery, 10.4 in display size, 30 GB HD, 512 MB memory, Intel Pentium III Processor with SpeedStep, 0.866 GHz processor speed, 1.76 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>
	Acer TMIC104TI Tablet PC <a href="#">Add to saved list</a> \$ 1059 (USD) Acer, Microsoft Windows XP Tablet PC, 3.5 hours battery, 10.4 in display size, 30 GB HD, 256 MB memory, Intel Pentium M Processor, 0.99 GHz processor speed, 1.4 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>

6 products [Show All](#)

These products have Cheaper Price and Larger Display Size, although they have slightly Heavier Weight

	Acer TravelMate C314XMi Tablet PC <a href="#">Add to saved list</a> \$ 1776.49 (USD) Acer, Microsoft Windows XP Tablet PC, 4 hours battery, 14.1 in display size, 100 GB HD, 1024 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.88 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>
	Acer TravelMate C302XCI-SP2 Tablet PC <a href="#">Add to saved list</a> \$ 1299 (USD) Acer, Microsoft Windows XP Tablet PC, 5.5 hours battery, 14.1 in display size, 60 GB HD, 512 MB memory, Intel Pentium M Processor (Centrino), 1.6 GHz processor speed, 2.79 kg weight. <a href="#">detail</a>	<a href="#">Better Features</a>

6 products [Show All](#)

## User-initiated critiquing support

To find products with better features than this one

	Toshiba Portege M200 Tablet PC \$ 2649 (USD) Toshiba, Microsoft Windows XP Tablet PC, 4.34 hours battery, 12.1 in display size, 80 GB HD, 1500 MB memory, Intel Pentium M Processor (Centrino), 2 GHz processor speed, 2.07 kg weight.
--	--

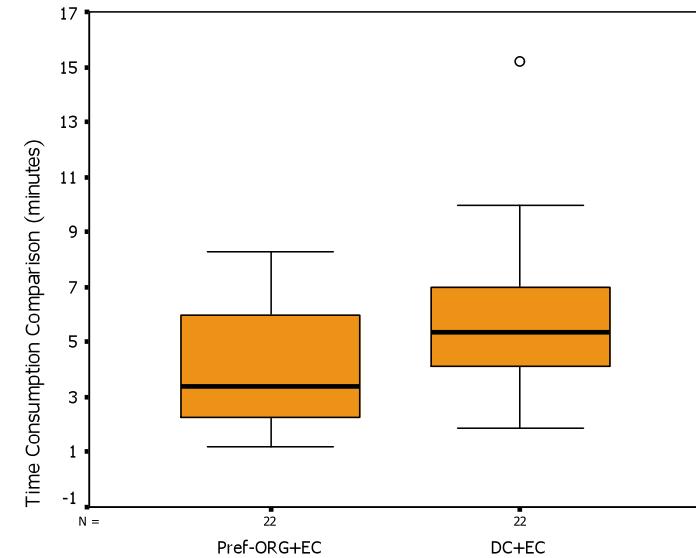
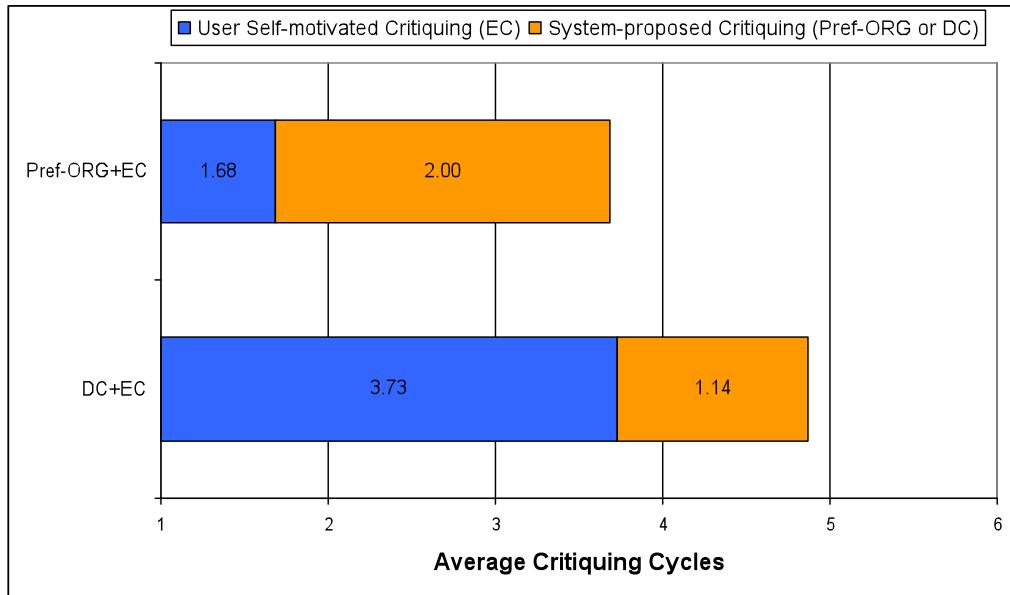
would you like to improve some values by yourself?

What you have chosen	Improve	Take any suggestion
Manufacturer	<input checked="" type="radio"/> Toshiba	<input type="radio"/> Acer
Price	<input type="radio"/> \$ 2649 (USD)	<input checked="" type="radio"/> < \$ 2649 (USD)
Operating System	<input checked="" type="radio"/> Microsoft Windows XP Tablet PC	<input type="radio"/> < \$ 2500 (USD)
Battery Life	<input checked="" type="radio"/> 4.34 hours	<input type="radio"/> <= \$ 2000 (USD)
Display Size	<input checked="" type="radio"/> 12.1 in	<input type="radio"/> > 12.1 in
Hard Drive Capacity	<input checked="" type="radio"/> 80 GB	<input type="radio"/> >= 80 GB
Installed Memory	<input checked="" type="radio"/> 1500 MB	Not Available
Processor Class	<input checked="" type="radio"/> Intel Pentium M Processor (Centrino)	<input type="radio"/> Intel Mobile Celeron Processor
Processor Speed	<input checked="" type="radio"/> 2 GHz	<input type="radio"/> > 2 GHz
Weight	<input checked="" type="radio"/> 2.07 kg	<input type="radio"/> < 2.07 kg

[Show Results](#) [Reset](#)

If suggested critiques and products do not interest the user in the organization interface, she could switch to make the self-initiated critiquing by clicking the button

## Participants: 44; between-group experiment procedure



→ The integration of the preference-based recommendation organization in hybrid critiquing can effectively help **increase the suggested critiques' application frequency** and significantly contribute **to saving users' task time and interaction effort**

# Outline

- What is critiquing-based recommender system and Why?
- Development history
- User experiences
- Conclusion

# *What can be concluded?*

- Design guidelines
  - Li Chen and Pearl Pu. Interaction Design Guidelines on Critiquing-based Recommender Systems. *User Modeling and User-Adapted Interaction Journal (UMUAI)*, vol. 19 (3), pages 167-206, 2009.
  - Li Chen and Pearl Pu. Critiquing-based Recommenders: Survey and Emerging Trends. *User Modeling and User-Adapted Interaction Journal (UMUAI)*, vol. 22(1), pages 125-150, 2012.
- User-centric evaluation framework for RS
  - Pearl Pu, Li Chen and Rong Hu. A User-Centric Evaluation Framework for Recommender Systems. In *Proceedings of the 5th ACM Conference on Recommender Systems (RecSys'11)*, pages 157-164, Chicago, IL, USA, October 23-27, 2011.

# Critiquing in MovieLens (Vig *et al.*, IUI'11)

movielens - Toy Story 3 (2010) - Windows Internet Explorer  
http://www.movielens.org/movieDetail?movieId=78499

Your Prediction: Rate This Movie: Not seen Wish List: [ ]

**Movie Information** (edit info) (flag)

**Starring:** Tom Hanks, Tim Allen, Joan Cusack, Ned Beatty, Don Rickles, Michael Keaton, Wallace Shawn, John Ratzenberger, Estelle Harris, John Morris, Jodi Benson, Emily Hahn, Laurie Metcalf, Blake Clark, Teddy Newton, Bud Luckey, Beatrice Miller, Javier Fernandez Pena, Timothy Dalton, Lori Alan, Charlie Bright, Kristen Schaal, Jeff Garlin, Bonnie Hunt, John Cygan, Jeff Pidgeon, Whoopi Goldberg, Jack Angel, R. Lee Ermey, Jan Robson, Richard Kind, Erik von Detten  
**Directed By:** Lee Unkrich  
**Genres:** Adventure, Animation, Children, Comedy, Fantasy, IMAX  
**Languages:** English Spanish  
**Average rating:** (4.22 stars)  
**Your Prediction:** (2.5 stars)  
**Rated by:** 263 users  
**Links:** [IMDb](#), [Rotten Tomatoes](#)

**Movie Tags** (more about tags)  
Add and edit tags here or update all of your tags

Community Tags ([?](#)) Tags represent how MovieLens users feel about this movie  
view

Trash

My tags for this movie ([?](#))

What I like about movie	I'm neutral about	What I dislike about movie
<a href="#">Edit</a>	<a href="#">Edit</a>	<a href="#">Edit</a>

**Toy Story 3**  
In this installment of the hit Pixar animated adventure, toy cowboy Woody (voiced by [Tom Hanks](#)), his astronaut pal, Buzz Lightyear ([Tim Allen](#)), and their friends cope with their owner's departure for college -- and their new home in a daycare center. [Lee Unkrich](#) directs this family film that features the voices of [Joan Cusack](#), [John Ratzenberger](#), [Don Rickles](#), [Wallace Shawn](#), [Ned Beatty](#), [Jodi Benson](#) and [Estelle Harris](#).

[Report Wrong Movie](#) [Delivered by Netflix \(add to queue\)](#)

**Movie Tuner** (New!) Find similar movies with less or more of particular qualities. The movie list below will update as you indicate your preferences.

What I want  
This movie less ok more

animation		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
pixar		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
adventure		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
children		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
bittersweet		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

lock

Enter selection... [reset all](#)

Similar to *Toy Story 3*, but less children:  
 *Shawshank Redemption, The* (1994)  
 *Lord of the Rings: The Return of the King, The* (2003)  
 *Curious Case of Benjamin Button, The* (2008)  
 *Raiders of the Lost Ark (Indiana Jones and the Raiders of the Lost Ark)* (1981)  
 *Cinema Paradiso (Nuovo cinema Paradiso)* (1989)  
 *Stand by Me* (1986)

(Click to flag movies that do not belong)

**MovieLens Q&A**  
There are no posts that mention *Toy Story 3* (2010)

[Ask a question about Toy Story 3 \(2010\)](#)

About MovieLens | Published Research | Privacy Policy | Acceptable Use | Contact Us  
(1 item remaining) Waiting for http://www.movielens.org/movieDetail?movieId=78499...  
Internet | Protected Mode: On  
Find us on Facebook  
100% 110% 23:49

# Editorial Picked Critiques (Pu et al., RecSys'09)

Miracle So Magic! by Lancome for Women 3.4 oz Eau de Parfum Spray



LANCOME  
Miracle So Magic! by Lancome for Women 3.4 oz Eau de Parfum Spray 100ml

Price : Around \$47.98

Features:

Quantity: 100 ml  
Category: Eau de Parfum  
Gender: Women  
Bestselling rate: 9.5  
Average user rate: 0  
Source: Amazon

Add to shopping list >

A fresh, floral and vibrant fragrance. A daring association of fresh clover leaf with flowery heart notes of wild rose and narcissus, to create a truly vibrant fragrance.

User Rating: ★ ★ ★ ★ ★ / 10  
Uninteresting  I love it  Rate

You may also like...

**More popular and cheaper (1/1)**

Kai Perfume Kai Perfume Oil \$ 45  
An intoxicating blend of tropical gardenia and white exotic flowers. Preciously packed in a roll-on vial...

**Same brand and cheaper (1/6)**

Attraction by Lancome for Women 1.7 oz Eau de Parfum Spray \$ 34.99  
It begins with light, the inexplicable flash between a man and a woman. A look. A touch. A passionate emb...

**Just as popular, but cheaper (1/6)**

Green Tea Scent by Elizabeth Arden for Women 1.7 oz Eau Parfumes Natural Spray \$ 13.99  
Evoke feelings of pure serenity. Clean and refreshing, with peaceful notes of Green Tea accord...

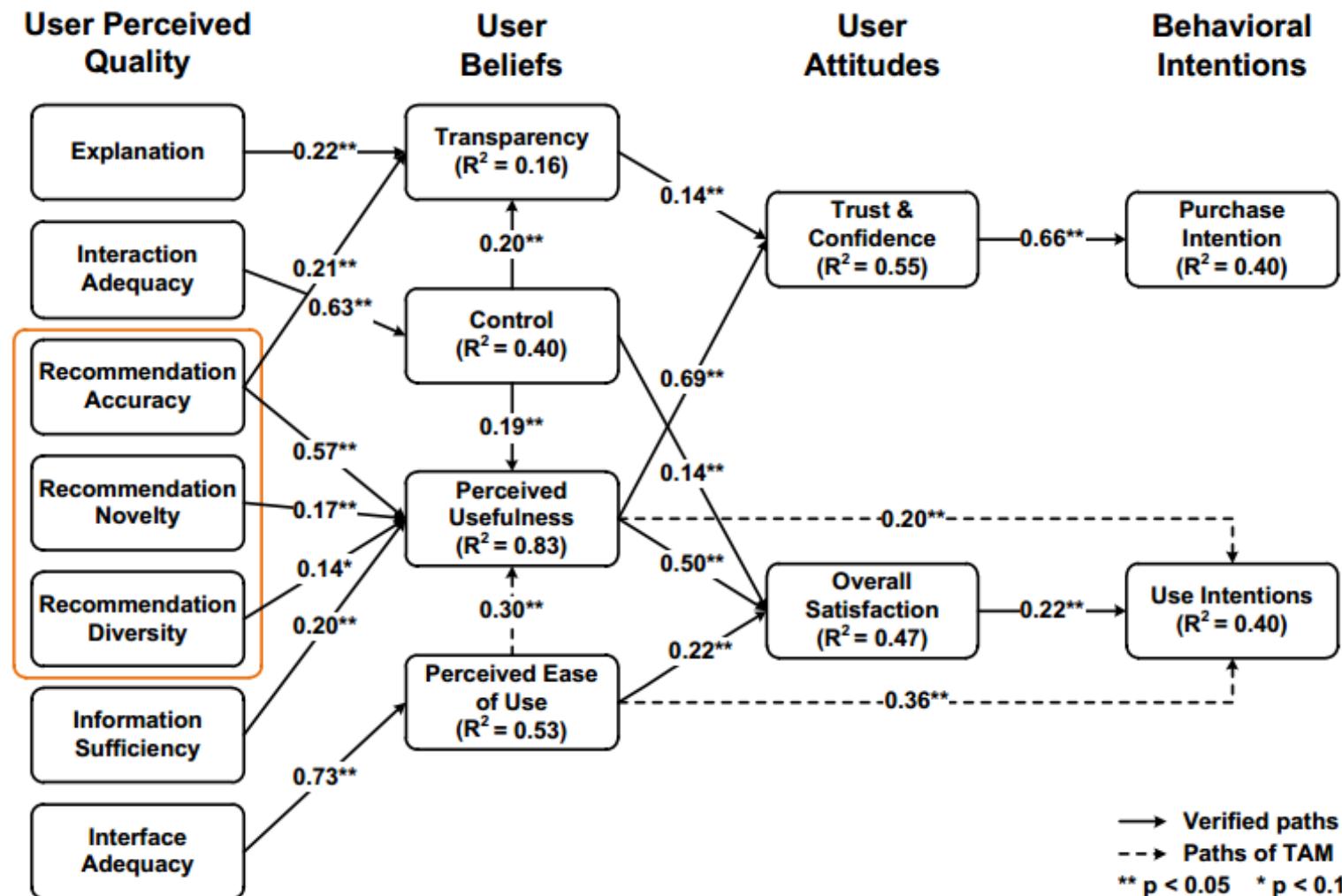
**Same price range, just as popular (1/6)**

Kai Perfume Kai Perfume Oil \$ 45  
An intoxicating blend of tropical gardenia and white exotic flowers. Preciously packed in a roll-on vial...

**People who like this may also like (1/6)**

Versace Signature by Gianni Versace for Women 3.4 oz Eau de Parfum Spray \$ 47.99  
NULL...

# ResQue: Recommender systems' Quality of user experience



# 32 questions and 15 constructs

---

## 1. Recommendation Accuracy

The items recommended to me matched my interests.

## 2. Recommendation Novelty

The items recommended to me are novel.

The recommender system helped me discover new products.

## 3. Recommendation Diversity

The items recommended to me are diverse.

## 4. Interface Adequacy

The labels of the recommender interface are clear.

The labels of the recommender interface are adequate.

The layout of the recommender interface is attractive.

The layout of the recommender interface is adequate.

## 5. Explanation

The recommender explains why the products are recommended to me.

## 6. Information Sufficiency

The information provided for the recommended items is sufficient for me to make a purchase/download decision.

## 7. Interaction Adequacy

The recommender allows me to tell what I like/dislike.

I found it easy to tell the system what I like/dislike.

I found it easy to inform the system if I dislike/like the recommended item.

## 8. Perceived Ease of Use

I became familiar with the recommender system very quickly.

I easily found the recommended items.

---

## 9. Control

I feel in control of modifying my taste profile.

The recommender allows me to modify my taste profile.

I found it easy to modify my taste profile in the recommender.

## 10. Transparency

I understood why the items were recommended to me.

## 11. Perceived Usefulness

The recommender helped me find the ideal item.

Using the recommender to find what I like is easy.

The recommender gave me good suggestions.

## 12. Overall Satisfaction

Overall, I am satisfied with the recommender.

## 13. Confidence & Trust

I am convinced of the items recommended to me.

I am confident I will like the items recommended to me.

The recommender made me more confident about my selection/decision.

The recommender can be trusted.

## 14. Use Intentions

I will use this recommender again.

I will use this recommender frequently.

I will tell my friends about this recommender.

---

## 15. Purchase Intention

I would buy the items recommended, given the opportunity.

# End of my talk

- Thanks!
- Q&A



- Call For Papers
  - 2014 5<sup>th</sup> International Workshop on Social Recommender System (in WWW'14) (  
<http://users.soe.ucsc.edu/~jwang30/srs2014/>)
  - 2014 ACM Conference on Recommender System  
(<http://recsys.acm.org/recsys14/>)