

An Experiment to Evaluate

# How to Better Present User Models to the Users



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DIPARTIMENTO DI INFORMATICA

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- Adaptive systems have started to visualize user models to users:

Why?

Knowledge about the inner working of an application helps users in interpreting the answers it provides, especially when personal data is manipulated

# Transparency

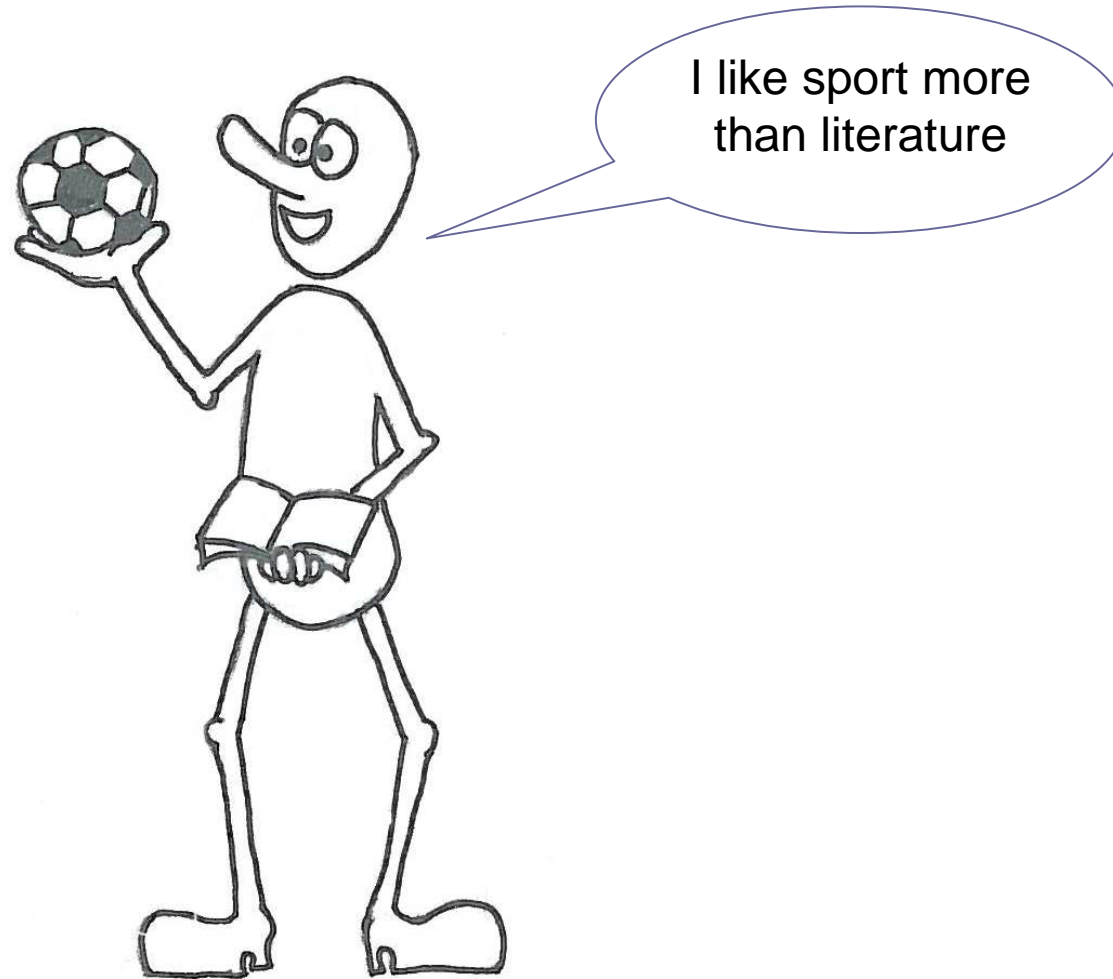
- For transparency and greater accuracy, user models should be available to users in a form similar or identical to their underlying representation...
- ...unless this representation is too complex: what is important is that users can understand their model!

- Evaluating and comparing different ways to externalize user models, in order to identify the best ones
- We consider:
  - conceptual representations  
(abstract modalities to represent values)
  - visualizations  
(concrete representation modalities)

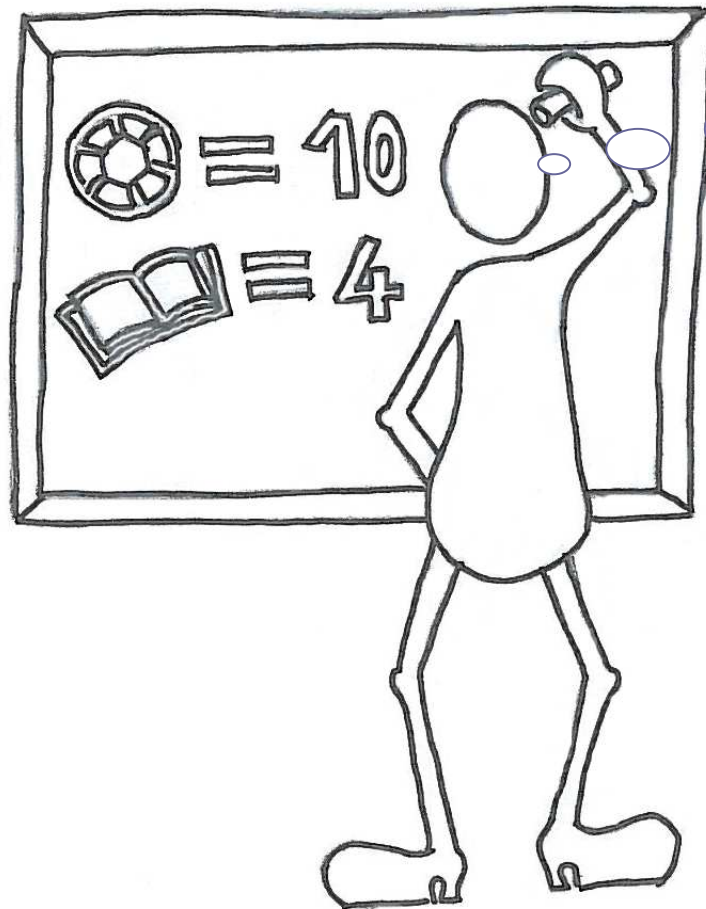
# Conceptual representation

- We have identified three ways of representing values regarding preferences/knowledge:
  - Ordered
  - Absolute
  - Relative

# Ordered representation



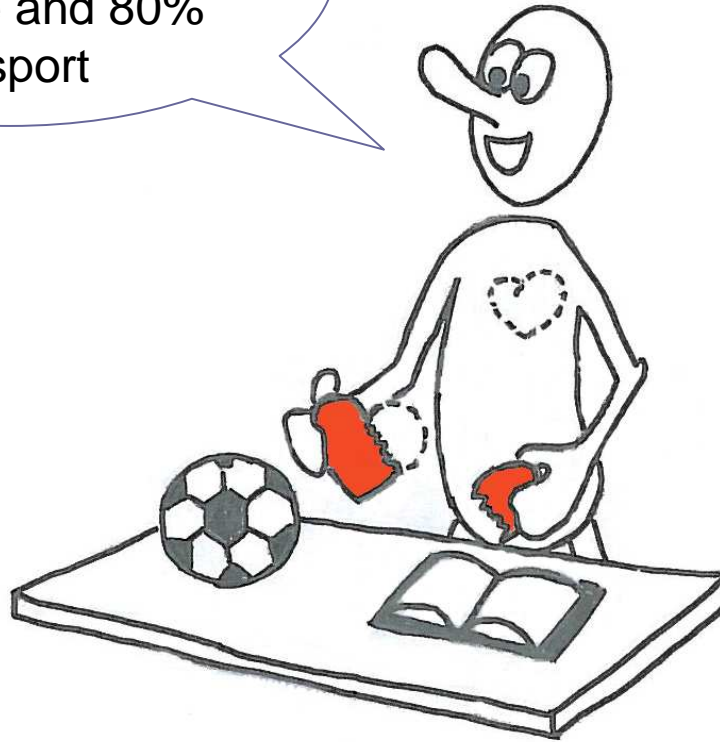
# Absolute representation



I rate sport 10  
out of 10 and I  
rate literature 4  
out of 10

# Relative representation

I would assign 20%  
of my interest to  
literature and 80%  
to sport



# Visualization

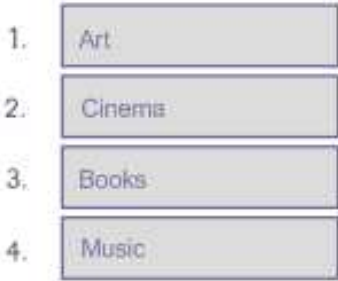


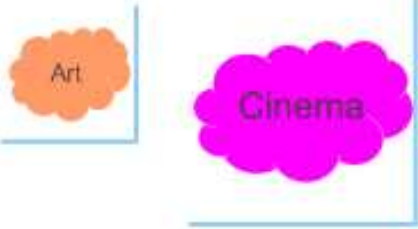
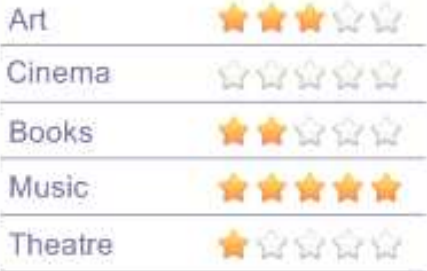
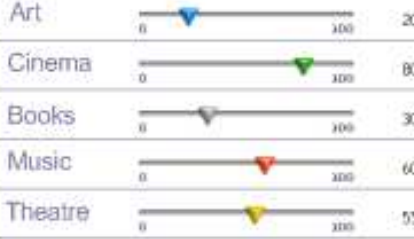


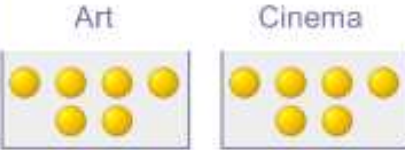
- Each conceptual representation can be visualized in different ways.
- For example:
  - Ordered representation: list;
  - Absolute representation: stars;
  - Relative representation: pie chart.

# Research questions

- Which **conceptual representation** is the most informative? Which is the easiest to understand?
- Which **visualizations** best convey the ideas underlying the three conceptual representations?

# The prototypes

Ordered

 <p>The List</p>	 <p>The Medals</p>	 <p>The Podium</p>
 <p>The Tag Cloud</p>	 <p>The Stars</p>	 <p>The Sliders</p>
 <p>The Pie Chart</p>	 <p>The Bricks</p>	 <p>The Coins</p>

Absolute

Relative

# Methodology

- We performed:
  - i) a **within-subjects** experiment, where we compared the three representation modalities and their corresponding visualizations.
  - ii) a large **between-subjects** on-line evaluation, where we compared different visualizations, given a certain representation modality;

## i) Within-subjects experiment

- **Experimental design:** multiple factors within-subjects design; thinking aloud technique.
- **Subjects:** 28 subjects (frequent Internet users), 16-45 years old, 12 females and 16 males.
- **Experimental task:** reading and modifying preferences with the proposed interfaces + filling in an online questionnaire (prototype description, prototype usability, favourite/least favourite prototypes, favourite representation modality)

- Findings about the preferred user model representation are not statistically significant; oral comments indicate that:
  - Users are accustomed to the absolute representation and find it easy to understand
  - The ordered representation is considered the easiest one;
  - The relative representation is somehow “more expressive”, because it allows to explicitly indicate relations among different categories.

## ii) Between-subjects on-line evaluation

- **Experimental design:** Multiple factors between-subjects design.
- **Subjects:** 299 subjects (Facebook users), 16-65 years old, 133 females and 166 males, randomly assigned to three groups: ordered representation (100), absolute representation (96) and relative representation (103).
- **Experimental task:** reading and modifying preferences with the proposed interfaces + filling in an online questionnaire (prototype description, prototype usability, favourite/least favourite prototypes)

# Results

- “Standard” visualizations are very appreciated;



- The pie chart (demanding, but complete) is preferred over direct manipulation-based visualizations, but also much criticized;



## Conclusions

- The relative representation is very informative as for relations among items, but also very demanding.
- If the inner user model representation is relative, it may be better to use ordered or absolute visualizations in the open user model, unless a comprehensible, easy-to-use relative visualization can be found.

Thank you for your attention!

**For any questions please contact:  
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