# Opening Access to Environmental Software Systems

Daryl H. Hepting and Timothy Maciag
{dhh,maciagt}@cs.uregina.ca
University of Regina, Regina, SK, Canada

Motivation

- Three different user types of ESS (Rizzoli and Young, 1997):
  - scientists
  - managers
  - stakeholders
- Focus on stakeholders
  - increase level of discourse
  - their insights inform activities of other types

Motivation

- Idling calculator (from NRCan website)
  - impact of single cars?
- MSDS (Material Safety Data Sheets)
  - easy to find?
- VOCs
  - smog contributor?
  - carcinogen?
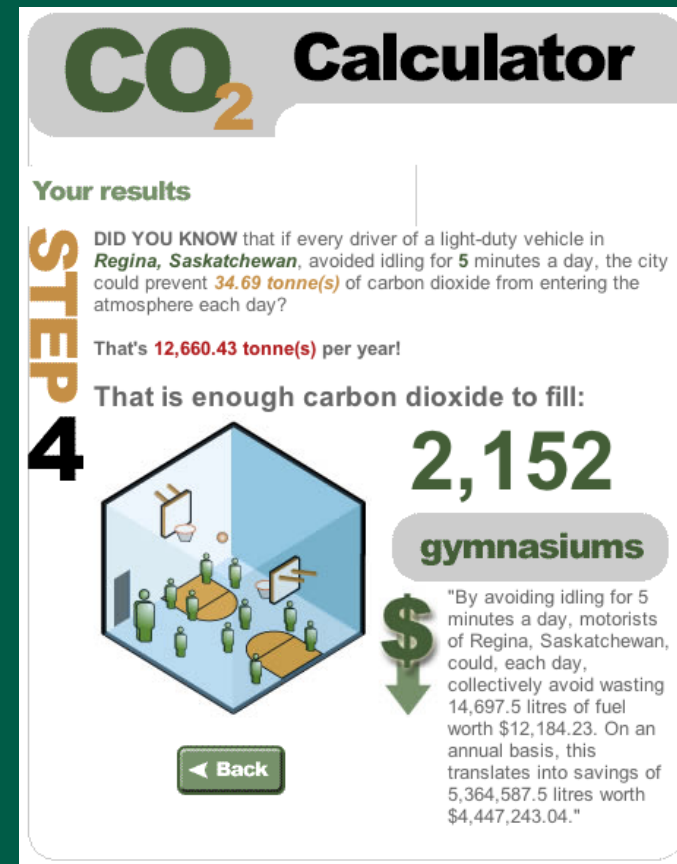
Issues

- Raskin (2000):
  - never make the user do more work than absolutely necessary
  - novice / expert: dichotomy or continuum?
- How to integrate information?
- How to smooth transitions between novice and expert (and back again)?

Example: Cleaning Products

- US EPA Environmentally Preferable Purchasing program established purchasing decision wizards: SART, MART, WART

- Related 29 products on 8 attributes:
  - *skin irritation*, *food chain exposure*, *air pollution potential*, *contains fragrance*, *contains dyes*, *product is a concentrate (reduced packaging)*, *packaging contains recycled paper*, *product minimizes exposure to concentrate*

- Not all the attributes were well-understood

Step 1: Select the minimum acceptable level for one of the **environmental attributes**.

Step 2: For the same attribute, specify a value between 0 and 1,000 that reflects its relative importance to you. The more important, the higher a value you should select. The value you enter is counted towards a product's total score, provided the product meets the attribute's acceptable level (set in Step 1). Products that do not meet this level will not receive a score for the particular attribute.

Step 3: Repeat Steps 1 and 2 for each environmental attribute.

Environmental Attribute	Acceptable Level (Default = most stringent)	Relative Importance (0 to 1,000)
Skin Irritation:	Negligible	0
Food Chain Exposure - BCF:	Minimal	0
Air Pollution Potential - % VOC:	0 %	0
Contains Fragrance:	No	0
Contains Dyes:	No	0
Product Is A Concentrate (Reduced Packaging):	Yes	0
Packaging Contains Recycled Paper:	Yes	0
Product Minimizes Exposure to Concentrate:	Yes	0

For help with determining acceptable values click on the attribute's name.
Use your browser's "Back" button to return to this page.

Step 4: Submit your request.

(Submit)   (Reset)

Choosing a Product

- Ranked list
- Faceted classification (Yee et al., 2003)
- Example-based (Pu and Chen, 2005)
- Participants tested with ranked list and example-based approaches, on questions involving 1, 2, and 3 attributes

At the Interface

- EPA Wizards present these choices for VOC: < 1%, < 5%, < 10%, < 20%, < 35%, and >= 35%

- Better choices based on data: <= 2%, <= 6%, <= 11%, <= 15% <= 35%

- Expressiveness: single value or range (threshold)

Performance Results

- Participants did better on faceted query specification (example-based features not used in this study)

- Difference was observed for 1, 2, and 3 attributes

Confidence Results

- Task performance is one indicator of satisfying interaction

- How can one know if people found what they were looking for?

  – Participants rated importance of attributes (Not Important - Very Important)

  – Ordered products based on this and assumption that lower attribute values are better

Confidence Results

- For those participants who indicated a preferred product
  - found its rank in ordered list
  - considered that selection as new preference and found how many products were equal or better
- "error" too harsh? -> decision accuracy
  - Compensatory and non-compensatory strategies

Conclusions and Future Work

- Although still many issues with sample database, performance improvements are possible over ranked list

- More care in choosing attributes, naming them, and making them accessible will also likely yield improvements

- Focus on distinguishing preferred products may simplify interface