Applying Conjoint Analysis to Message Testing in an Environmental Context

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"A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it."

- Max Planck
Overview

Aquatic Invasive Species (AIS)
  • Definition/Background

Message testing
  • Persuasion theories

Methodological approach
  • Study design - Conjoint vs. Traditional

Preliminary findings
  • Demonstrative...but preliminary

Conclusions
AIS Background

What are Aquatic Invasive Species?

- Non-native species that can "take over"
  - zebra mussels
  - Eurasian Water Milfoil
  - spiny water flea

- Successful because
  - Not natural predators
  - Native species can’t compete
  - Often aggressive, prolific or fight back

- Problem because
  - Reduce native populations
  - Disrupt ecosystems
  - Costly to control spread - $$
AIS Background
Efforts to encourage AIS prevention

- Wisconsin Department of Natural Resources
  - Strategic communication campaign
  - Grant to determine most effective prevention messages
  - Deliverable: Posters

- Target Audience
  - Recreational boaters
  - Anglers
Message Testing
Informed by persuasion theories

- **Expectancy-value**
  - TPB, Social Cognitive

- **Information processing**
  - ELM/HSM
  - Prospect theory

- **Common message elements**
  - Framing
  - Social norms
  - Efficacy
  - Involvement/relevance
### Study design

#### Stimuli creation

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Level</th>
<th>Operationalization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame</strong></td>
<td>Gain:</td>
<td>“Prevent the spread of AIS to keep Wisconsin lakes beautiful.”</td>
</tr>
<tr>
<td></td>
<td>Loss:</td>
<td>“Don't let the spread of AIS destroy Wisconsin lakes.”</td>
</tr>
<tr>
<td><strong>Norms</strong></td>
<td>Negative:</td>
<td>“Spreading AIS can hurt Wisconsin lakes for everyone. Don't let your fellow boaters and anglers down.”</td>
</tr>
<tr>
<td></td>
<td>Positive:</td>
<td>“Together we can prevent the spread of AIS. Join your fellow boaters and anglers in protecting Wisconsin lakes.”</td>
</tr>
<tr>
<td><strong>Efficacy</strong></td>
<td>Outcome:</td>
<td>“AIS prevention can make a big difference. A few simple steps will help protect Wisconsin lakes.”</td>
</tr>
<tr>
<td></td>
<td>Self:</td>
<td>“AIS prevention begins with you. You can prevent their spread.”</td>
</tr>
</tbody>
</table>
### Study design

Stimuli Creation – attribute combinations

#### Full Factorial design (2x2x2)

<table>
<thead>
<tr>
<th>Poster</th>
<th>Frame</th>
<th>Norms</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gain</td>
<td>Negative</td>
<td>Outcome</td>
</tr>
<tr>
<td>2</td>
<td>Gain</td>
<td>Negative</td>
<td>Self</td>
</tr>
<tr>
<td>3</td>
<td>Gain</td>
<td>Positive</td>
<td>Outcome</td>
</tr>
<tr>
<td>4</td>
<td>Gain</td>
<td>Positive</td>
<td>Self</td>
</tr>
<tr>
<td>5</td>
<td>Loss</td>
<td>Negative</td>
<td>Outcome</td>
</tr>
<tr>
<td>6</td>
<td>Loss</td>
<td>Negative</td>
<td>Self</td>
</tr>
<tr>
<td>7</td>
<td>Loss</td>
<td>Positive</td>
<td>Outcome</td>
</tr>
<tr>
<td>8</td>
<td>Loss</td>
<td>Positive</td>
<td>Self</td>
</tr>
</tbody>
</table>
Methodological Approach
Testing attribute combinations

• **Traditional vs. Conjoint**
  • Means testing vs. Modeling
  • Descriptive vs. Predictive
  • Compositional vs. Decompositional

• **Advantages of Conjoint/Choice**
  • Trade-offs among many attributes
  • Mundane realism
  • Less cognitive burden
  • Avoids satisficing, halo effects, etc.
  • Richer data
Study design

Survey and method

- **Split-half design**
  - Compare Choice vs. Likert approaches to poster evaluation

- **Survey content (34 items)**
  - Screeners
  - Awareness/attitudes/behavior
  - Socio-demographics
  - Poster evaluation
Study design

Fielding and sampling

- **Sawtooth Technologies (hosted)**
  - Web survey
  - Pretest

- **SSI panel (sample)**
  - Wisconsin boaters 18+

- **Target N=1,000**
  - Randomly assigned:
    - Choice
    - Likert
Choice

Poster A

Spreading AIS can hurt Wisconsin lakes for everyone. Don't let your fellow boaters and anglers down.

Don't let the spread of AIS destroy Wisconsin lakes.

AIS prevention can make a big difference. A few simple steps will help protect Wisconsin lakes.

Poster B

Together we can prevent the spread of AIS. Join your fellow boaters and anglers in protecting Wisconsin lakes.

Prevent the spread of AIS to keep Wisconsin lakes beautiful.

AIS prevention begins with you. You can prevent their spread.

Which poster is...

<table>
<thead>
<tr>
<th></th>
<th>Poster A</th>
<th>Poster B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which Poster is most persuasive?</td>
<td>⬜</td>
<td>⬜</td>
</tr>
<tr>
<td>Which Poster is most informative?</td>
<td>⬜</td>
<td>⬜</td>
</tr>
<tr>
<td>Which Poster is most motivating?</td>
<td>⬜</td>
<td>⬜</td>
</tr>
</tbody>
</table>
Prevent the spread of AIS to keep Wisconsin lakes beautiful.

AIS prevention can make a big difference. A few simple steps will help protect Wisconsin lakes.

Spreading AIS can hurt Wisconsin lakes for everyone. Don't let your fellow boaters and anglers down.

<table>
<thead>
<tr>
<th>How persuasive is this poster?</th>
<th>Not at all</th>
<th>A little</th>
<th>Somewhat</th>
<th>Very</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>How informative is this poster?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How motivating is this poster?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preliminary Results

Sample descriptives

- **N=935 (50% Choice/50% Likert)**
  - Female (67%)
  - White (97%)
  - Some college (43%)
  - $80k + (26%)
  - Age (mean=51)

- **QC check - no sample differences**
Preliminary Results

Rank order preference – most persuasive

<table>
<thead>
<tr>
<th>Poster</th>
<th><strong>Choice</strong></th>
<th></th>
<th><strong>Likert</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (sd)</td>
<td>Rank</td>
<td>Mean (sd)</td>
<td>Rank</td>
</tr>
<tr>
<td>1</td>
<td>-22.5</td>
<td>8</td>
<td>2.80</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>-20.6</td>
<td>7</td>
<td>2.91</td>
<td>6</td>
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<tr>
<td>3</td>
<td>14.5</td>
<td>4</td>
<td>2.88</td>
<td>7</td>
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<td>4</td>
<td>16.4</td>
<td>3</td>
<td>2.95</td>
<td>5</td>
</tr>
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<td>5</td>
<td>-16.4</td>
<td>6</td>
<td>2.99</td>
<td>3.5</td>
</tr>
<tr>
<td>6</td>
<td>-14.5</td>
<td>5</td>
<td>2.99</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>20.6</td>
<td>2</td>
<td>3.03</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>22.5</td>
<td>1</td>
<td>3.02</td>
<td>2</td>
</tr>
</tbody>
</table>

Spearman’s $r = .71$
## Preliminary Results

Likert rating results

<table>
<thead>
<tr>
<th>Poster</th>
<th>Frame</th>
<th>Norms</th>
<th>Efficacy</th>
<th>Rank (Persuasive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gain</td>
<td>Negative</td>
<td>Outcome</td>
<td>#8</td>
</tr>
<tr>
<td>2</td>
<td>Gain</td>
<td>Negative</td>
<td>Self</td>
<td>#6</td>
</tr>
<tr>
<td>3</td>
<td>Gain</td>
<td>Positive</td>
<td>Outcome</td>
<td>#7</td>
</tr>
<tr>
<td>4</td>
<td>Gain</td>
<td>Positive</td>
<td>Self</td>
<td>#5</td>
</tr>
<tr>
<td>5</td>
<td>Loss</td>
<td>Negative</td>
<td>Outcome</td>
<td>#3.5</td>
</tr>
<tr>
<td>6</td>
<td>Loss</td>
<td>Negative</td>
<td>Self</td>
<td>#3.5</td>
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<tr>
<td>7</td>
<td>Loss</td>
<td>Positive</td>
<td>Outcome</td>
<td>#1</td>
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<tr>
<td>8</td>
<td>Loss</td>
<td>Positive</td>
<td>Self</td>
<td>#2</td>
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</tbody>
</table>
## Preliminary Results

Conjoint results

### Relative Attribute Importance

<table>
<thead>
<tr>
<th></th>
<th>Persuasive</th>
<th>Informative</th>
<th>Motivating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>26.6</td>
<td>24.1</td>
<td>27.6</td>
</tr>
<tr>
<td>Norms</td>
<td>31.2</td>
<td>28.6</td>
<td>30.7</td>
</tr>
<tr>
<td>Efficacy</td>
<td>42.2</td>
<td>47.3</td>
<td>41.7</td>
</tr>
</tbody>
</table>
## Attribute Level Preference
Zero-centered Utility Scores (part-worths)

<table>
<thead>
<tr>
<th></th>
<th>Persuasive</th>
<th>Informative</th>
<th>Motivating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td>-3.02</td>
<td>-5.77</td>
<td>-1.33</td>
</tr>
<tr>
<td>Loss</td>
<td>3.02</td>
<td>5.77</td>
<td>1.33</td>
</tr>
<tr>
<td><strong>Norms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>-18.55</td>
<td>-16.31</td>
<td>-18.04</td>
</tr>
<tr>
<td>Positive</td>
<td>18.55</td>
<td>16.31</td>
<td>18.04</td>
</tr>
<tr>
<td><strong>Efficacy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td>-0.96</td>
<td>33.24</td>
<td>-1.54</td>
</tr>
<tr>
<td>Self</td>
<td>0.96</td>
<td>-33.24</td>
<td>1.54</td>
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</tbody>
</table>
## Quantifying Preference

<table>
<thead>
<tr>
<th></th>
<th>Frame</th>
<th>Norms</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poster 1</td>
<td>Gain</td>
<td>Negative</td>
<td>Outcome</td>
</tr>
<tr>
<td>(Likert rank: 8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poster 7</td>
<td>Loss</td>
<td>Positive</td>
<td>Outcome</td>
</tr>
<tr>
<td>(Likert rank: 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shares of Preference - Persuasive</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poster 1</td>
<td>39.9%</td>
</tr>
<tr>
<td>Poster 7</td>
<td>60.1%</td>
</tr>
</tbody>
</table>
Preliminary Results
Rank order preference - Persuasive

<table>
<thead>
<tr>
<th>Poster</th>
<th>Choice</th>
<th>% Share (s.e.)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>9.5 (.77)</td>
<td>#6</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>7.2 (.60)</td>
<td>#8</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>19.7 (1.20)</td>
<td>#1</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>12.2 (.87)</td>
<td>#5</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>7.9 (.71)</td>
<td>#7</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>13.5 (.99)</td>
<td>#3.5</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>13.5 (.87)</td>
<td>#3.5</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>16.6 (1.03)</td>
<td>#2</td>
</tr>
</tbody>
</table>
Preliminary Results
Latent Class Analysis & Simulation

2-group Segmentation - Persuasive

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n=234)</th>
<th>Group 2 (n=179)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame (Gain)</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Frame (Loss)</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Social Norms (Negative)</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Social Norms (Positive)</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Efficacy (Outcome)</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Efficacy (Self)</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attribute Importance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>27.1</td>
</tr>
<tr>
<td>Social Norms</td>
<td>35.1</td>
</tr>
<tr>
<td>Efficacy</td>
<td>37.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poster 3 (most persuasive)</td>
</tr>
<tr>
<td>Poster 2 (least persuasive)</td>
</tr>
</tbody>
</table>
Conclusions/Future directions

- **Pragmatic**
  - Efficacy *usually* key in AIS
  - Develop posters with ad agency
  - Mine data
    - Segment knowledge, compliance, involvement

- **Methodological**
  - Richer data, More realistic (choice)
  - Parsimony principle
  - Use in *testing theory*
Acknowledgements

Joe Curry!
Mark Little

Jeff Snyder
Frank Markowitz