The Toyota recall crisis: Predicting corporate reputation from the media

David Geddes, Ph.D.
David Fan, Ph.D.
Institute for Public Relations 9th Summit on Measurement
Philadelphia, PA
September 19, 2011
• Prediction and forecasting
  • Modeling case study
• Priorities
Prediction and forecasting
Overview

- Examine role of media and persuasive information in shaping opinions
- Apply InfoTrend model to corporate brand reputation
- Not an assessment of Toyota’s crisis management
## The Toyota recall crisis

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 – 2008</td>
<td>Early problem indications</td>
</tr>
<tr>
<td>Sept. 10, 2009</td>
<td>Release of 911 crash call audio</td>
</tr>
<tr>
<td>Sept. 29, 2009</td>
<td>3.9 M vehicles recalled in U.S.</td>
</tr>
<tr>
<td>Late Jan.- Feb.</td>
<td>2.3 M vehicles recalled in U.S.</td>
</tr>
<tr>
<td></td>
<td>Sales suspended for eight models</td>
</tr>
<tr>
<td></td>
<td>Plants closed</td>
</tr>
<tr>
<td></td>
<td>Recall expanded to Europe and China</td>
</tr>
<tr>
<td></td>
<td>CEO apologizes, testifies</td>
</tr>
<tr>
<td>March 2010</td>
<td>Congressional hearings</td>
</tr>
<tr>
<td></td>
<td>DoT and NHTSA scrutiny</td>
</tr>
</tbody>
</table>
Communications theory

• Agenda-setting theory
  ▫ First level
  ▫ Second level

• Information accessibility

• Validated

• Agenda setting and prediction
InfoTrend® model structure

Positive today = Positive yesterday + Converts - Defections
InfoTrend® model basic structure

Positive message pressure

K2

Positive % <--- Neutral %

K1

Neutral % --- Negative %

K3

K4

Negative message pressure
Minimal model structure before adaptation for Toyota

\[ F_G(t) = k \sum_i C_{i,G} \exp(-p(t-t_i)) + \epsilon_G(t) \]

\[ \frac{dI_G}{dt} = F_G(t)(1 - I_a) - F_B(t)I_G. \]

\[ I_G(t) = \frac{\int F_G(t) e^{\int(F_G(t)+F_B(t))dt} dt}{e^{\int(F_G(t)+F_B(t))dt}} + \frac{c}{e^{\int(F_G(t)+F_B(t))dt}} \]
Dependent variable

- YouGov BrandIndex
  - Daily online survey
  - Aggregated weekly ... 674 average/week
  - Weighted to U.S. Census Bureau’s American Community Survey
  - “Positive impression” and “negative impression” questions
- January 1, 2009 – March 31, 2011
Predictor variables

- Media categories
  - 24 major newspapers
  - 24 matched online newspaper sites
  - 25 top blogs
  - 25 top forums
  - AP news wire
  - Note: no broadcast, no Twitter

- Censored data

- Automated sentiment scoring
  - OpenText Content Analytics (Nsentiment) untrained
  - Toyota, sentence-level aggregated to document level
Analysis

• 113 weeks of data
• Separate models by media type
• Separate models by sentiment within media type
  ▫ 31,945 positive documents
  ▫ 49,611 negative documents
• Model results generates daily
## Results

### Model R-squared

<table>
<thead>
<tr>
<th>Media</th>
<th>R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>All media</td>
<td>0.84</td>
</tr>
<tr>
<td>Forum</td>
<td>0.82</td>
</tr>
<tr>
<td>Newspaper</td>
<td>0.79</td>
</tr>
<tr>
<td>Online news</td>
<td>0.77</td>
</tr>
<tr>
<td>Blog</td>
<td>0.75</td>
</tr>
<tr>
<td>AP newswire</td>
<td>0.66</td>
</tr>
</tbody>
</table>
All media
$R^2 = 0.84$

- Survey
- Model
Blogs
$R^2 = 0.75$

- Survey
- Model
Forums
$R^2 = 0.82$

- Survey
- Model
AP
$R^2 = 0.66$

- **Survey**
- **Model**

- Prediction is high
- Prediction is low
- Prediction is flat

![Graph showing positive and negative stories, positive and negative opinions, with predictions for each.](Image)
Results

• Broad media sample is sufficient
• Sentiment matters in shaping corporate reputation
• Automated sentiment analysis good enough
• Information half-life ≈ zero
Results

Positive/negative persuasibility ratio

<table>
<thead>
<tr>
<th>Category</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP newswire</td>
<td>3.7</td>
</tr>
<tr>
<td>Newspaper</td>
<td>2.3</td>
</tr>
<tr>
<td>All except AP</td>
<td>2.2</td>
</tr>
<tr>
<td>Online newspaper</td>
<td>2.2</td>
</tr>
<tr>
<td>Forum</td>
<td>2.0</td>
</tr>
<tr>
<td>Blog</td>
<td>1.8</td>
</tr>
</tbody>
</table>
Further directions

- Message-level drivers
- Media channel influence
- Positive/negative impact
- General reputation and brand model
- Other marketing mix elements
Priorities / industry agenda

1. Common measurement framework
2. Standard metrics
3. Better models
4. Open the box
5. Empiricism
6. Education and training
7. Research ethics
8. Break down barriers with social media measurement
9. ROI
For further information

David Geddes, Ph.D.
Chief Consultant and Client Relationship Director
InfoTrend, Inc.
dgeddes@infotrend.com
314-960-4780
www.infotrend.com

David Fan, Ph.D.
Chief Technology Office and Founder
InfoTrend, Inc.
dfan@infotrend.com
651-329-4264
www.infotrend.com

A full academic research paper will be available in late 2011: