«The Holy Grail in decision-making?»
How Big Data changes decision processes of marketing managers.

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Christoph Wortmann/Peter M. Fischer/Sven Reinecke
Agenda of today’s presentation.

1. Problem definition
2. Theoretical background
3. Conceptual framework & hypotheses
4. Empirical findings
5. Contribution & Further research
Big Data: A crucial issue in practice.

- Availability of new data sources (social media data or sensory data) → improving decision making and firm performance (360° customer view) → individual customer targeting (Barton & Court 2012).

- Recent research has found great potential for generating insights and better decision making (LaValle et al. 2011; McAfee & Brynjolfsson 2012) especially in stable environments with relatively little uncertainty (Gigerenzer 2014).

- Besides, it seems that the implementation of Big Data solutions positively affects firm performance (Mueller, Fay & vom Brocke 2018).

![Application of Big Data](chart)

**Application of Big Data**

- 35% of respondents use Big Data
- 24% plan to implement Big Data
- 18% discuss Big Data
- 23% have no experience with Big Data

![Important decisions are increasingly based on data insights](chart)

**Important decisions are increasingly based on data insights**

- In 2015, 37% fully agree and 38% rather agree on the importance of data insights.
- In 2016, 40% fully agree and 40% rather agree.

*Source: Bitkom 2016*
No substantial contribution in the four top-tier marketing outlets (JM, JMR, JCR and MS); exception: Marketing Science → but no focus on managerial decision-making
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Decision-making in marketing: Three different options.

**The Subjective Marketing Decision Modeling Approach**
- Management (Marketing) problem
  - Managerial Judgment
  - Decision
  
  *e.g. Wübben & v. Wangenheim 2008*

**The (Traditional) Marketing Decision Modeling Approach**
- Management (Marketing) problem
  - Model
  - Managerial Judgment
  - Decision

  *e.g. McAfee & Brynjolfsson 2012; Müller, Fay, & vom Brocke 2018*

**The Automated Marketing Decision Modeling Approach**
- Management (Marketing) problem
  - Model
  - Decision

  *BIG DATA?*

  Algorithm aversion
  *(Dietvorst, Simmons, & Massey 2014)*

  vs. algorithm appreciation
  *(Logg, Minson, & Moore 2018)*

Source: Lilien 2011
Decision-making properties depend on hierarchy level.

- Top-Management
  - Due to the postulated **high superiority of Big Data**, top managers might be inclined to use it → **defensive motifs**/playing safe/justification (Ashforth & Lee 1990)
  - Top managers have **less time and resources** to critically investigate Big Data (Barton & Court 2012; Stone 2014)

- Lower-level Management
  - Lower level managers might perceive facts and figures generated by Big Data Analytics as an **identity threat** (Dalton & Huang 2014)
  - Lower level managers have more time and resources to critically investigate Big Data (Barton & Court 2012; Stone 2014) → questioning of the “buzz word” Big Data
Why do top-managers rely on Big Data?

Two different and competing approaches ... but the same outcome

Big Data (existence in company)

Prevention focus (Higgins 1997)
e.g. need for security; fulfilment of duties

Defensive decision-making

- Defensive-decision making is characterized by risk aversion and joint decision-making (Ashforth & Lee 1990)

⇒ Big Data: “playing safe/scapegoat”

Promotion focus (Higgins 1997)
e.g. maximizing success; risk acceptance

Non-defensive decision-making

- In contrast to this, non-defensive decision-making is characterized by egocentric behavior and risk affinity

⇒ Big Data: Feeling invincible

Reliance on Big Data
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Study 1: Conceptual framework & hypotheses.

**Hypotheses:**

**H$_{1a/1b}$**  Marketing managers have a greater (lower) tendency to accept recommendations for action derived from Big Data compared to recommendations derived from market research or practical experience.

**H$_{2}$**  Top-executives in marketing have a greater tendency to accept recommendations for action derived from Big Data than lower-level managers.
Study 2: Conceptual framework & hypotheses.

**Hypotheses:**

- **H₃a**  
  Top-managers resort to Big Data, as it activates their prevention focus, thus making them more defensive and cautious in decision-making.

- **H₃b**  
  Top-managers resort to Big Data, as it activates their promotion focus, thus making them less defensive and cautious in decision-making.

Only for top-level executives (CMO, CEO, Head of Sales)
Study 3: Conceptual framework & hypotheses.

Hypotheses:

$H_{3a}$ Top-managers resort to Big Data, as it activates their prevention focus, thus making them more defensive and cautious in decision-making.

$H_{3b}$ Top-managers resort to Big Data, as it activates their promotion focus, thus making them less defensive and cautious in decision-making.
Study 4: Conceptual framework & hypotheses.

Hypothesis:

\[ H_4 \quad \text{Top-managers resort to Big Data, as it activates their prevention focus, thus making them more defensive and cautious in decision-making.} \]
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Study 1: Methodology and results.

- A controlled paper-and-pencil experiment («between subject design»; n= 94 marketing executives)
- Main manipulation: Recommendations for action for a new product proposal based on different information sources
- Dependent variable: Agreement with product proposal
- Independent variable: Information source
- Moderator: Hierarchy level (Low-level management 55.3 %; top-level management 44.7 %)

<table>
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<tr>
<th>Information Source</th>
<th>I fully agree</th>
<th>I agree but I have change requests</th>
<th>I disagree</th>
<th>Total</th>
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<td>22</td>
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<td>Big Data</td>
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Linear-by-Linear Association: p=0.057; γ=-.324, p=0.036

Contingency table: Experimental condition and agreement with product proposal (n=94)

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<td>Big Data</td>
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<tr>
<td>Total</td>
<td>10</td>
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<td>7</td>
<td>42</td>
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</table>

Linear-by-Linear Association: p=0.016; γ=-.519, p=0.003

Contingency table: Experimental condition and agreement with product proposal (top level, n=42)

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<th>Total</th>
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<tr>
<td>Practical Experience</td>
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<td>15</td>
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<td>Market Research</td>
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<tr>
<td>Total</td>
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<td>42</td>
<td>7</td>
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</table>

Linear-by-Linear Association: p=0.926; γ=-.027, p=0.920

Contingency table: Experimental condition and agreement with product proposal (low level, n=52)
Study 2: Methodology and results.

(Correlational) field study (n= 159 marketing top-executives)

**Dependent variable:** Defensive and cautious decision-making (e.g. Ashfort & Lee 1990; M = 3.70 ; SD = .904 ; α = .539).

**Independent variable:** Perceived maturity of Big Data in own organization (adapted version of the 3-item customer analytics scale by Germann et al. 2014, M = 2.67, SD = 1.57; α = .910)

**Mediator:** Situational regulatory focus (M = 2.15, SD = .919; α = .568)

**Bootstrapped mediation analysis (Hayes 2009)**

- β = .052 (df = 1; p = .013)
- β = -.065 (df = 1; p = .169)
- β = -.408 (df = 1; p = .028)

Indirect effect (β = -.021, SE = .0135; 95% CI [-.0523, -.0003])
Study 3: Methodology and results.

- **Online experiment** («between subject design»; \( n = 121 \) marketing top-executives)
- **Manipulation (1):** Information source and customer targeting; **Manipulation (2):** Prevention-focus prime
- **Dependent variable:** Estimation of future visitor numbers of a new amusement park
- **Independent variable:** Information source (Big Data vs. market research)
- **Moderator:** Prevention focus-prime vs. control

**Manipulation** of regulatory focus \( \rightarrow (M_{\text{NoPreventionPrime}} = 2.44; M_{\text{PreventionPrime}} = 2.05; F(1, 119) = 4.33, p = .040) \)

A contrast analysis revealed the following results:

- \( M_{\text{Big Data – Control}} = 39.7 \) million vs. \( M_{\text{Big Data – Prevention}} = 39.7 \) million (\( F(1, 119) = 6.72, p = .011 \))
- \( M_{\text{Market Research – Control}} = 1.19 \) million vs. \( M_{\text{Market Research – Prevention}} = 9.9 \) million (\( F(1, 119) = .344, p = .559 \))
Study 4: Methodology and results.

- **Online experiment** («between subject design»; n= 126 marketing top-executives)
- **Manipulation (1):** Lay-Belief Manipulation (unrelated study); **Manipulation (2):** Information source and customer targeting
- **Dependent variable:** Advice taking (joint decision-making)
- **Independent variable:** Information source (Big Data vs. market research)
- **Mediator:** Situational regulatory focus (M = 2.49, SD = 1.01; α = .687); **Moderator:** Lay-Belief Manipulation

**A contrast analysis revealed the following results:**

- $M_{\text{Big Data – Control}} = 0.95$ vs. $M_{\text{Big Data – Deactivation}} = 0.70$ (F(1, 123) = 5.86, p = .017)
- $M_{\text{MR – Control}} = 0.66$ vs. $M_{\text{MR – Deactivation}} = 0.77$ (F(1, 123) = .950, p = .332)

**Results of a moderated mediation analysis:**

*Index of moderated mediation analysis:*

$\beta = .3157, \ SE = .2039; 95\%\ CI [.0123, .7938]$
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Implications for research & practice

Research
1. Tackling the research gap concerning Big Data and Marketing
2. Investigating how the perception of Big Data influences managerial decision making
3. Scale development: defensive decision making
4. Big Data – Regulatory Focus – Decision Making
5. Debiasing mechanism: lay belief (the more, the better)

Practice
1. Big Data might change decision making approaches (especially problematic in innovation management)
2. Consequences for working behavior (risky and egocentric behavior of top-executives)

Future Research
1. More context-specific research concerning the usefulness of Big Data
2. Investigating other potential mechanisms that might explain the superiority of Big Data: commitment level with an organization etc.
3. What about the respective creativity of the managers?
4. Investigating the use of Big Data in lower-level management (usage vs. identity threat)
Thank you for your attention.

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