

Towards causal explanation of marketing outcomes (CEMO)

Fuzzy-set configurational analysis of marketing actions

The “Holy Grail” of measuring marketing performance

- Marketing performance remains elusive and a key research priority, but current methods fail in consistent delivery of contextually relevant knowledge
 - Case studies provide useful in-depth knowledge, but are / can rarely be developed into decision support system components
 - Quantitative response modeling is heavy on mathematics and stiff on versatility
 - Marketing models rely structurally on inaccurate assumptions instead of empirically observed reality
- Managers making efforts to systematically manage MP face:
 - The inherently highly nonlinear, complex nature of business
 - Statistical models often a burden to develop, and not easily modified
 - Marketing metric systems do not reflect actual key determinants of performance

Why is our study relevant?

- Explaining marketing outcomes with input configurations deduced in fuzzy set qualitative comparative analysis (fsQCA)
 - Marketing metrics & marketing intelligence
 - The world works in configurations!
 - Causal mechanisms explaining marketing performance
 - Fuzzy set analysis
 - Response modeling
 - Multimeasure assessment

Explaining marketing performance with causal configurations

- Business-case specific answers to complex configurational questions such as
 - Marketing mix vs. Media mix vs. Sales response
- Building contextual models relying on logically true (as opposed to statistically inferred) deductive causal reasoning
- Systematic comparison of qualitative and quantitative case data
 - Result: configurations of similarities and differences behind performance outcomes
 - Comparison process tells us which configurations of conditions are *necessary* and/or *sufficient* for bringing about focal outcome (e.g. sales)
 - Continuous, iterative dialogue between data and analysis through qualitative calibration
- Practicable even on very small ($n < 10$) and readily adjustable populations
- No homogenizing or linear-additive assumptions about causation
 - Let the empirical observations speak!

Multiple configurational causality

- Systematic comparison across small-N to medium-N adjustable case populations
- No homogenizing or linear-additive assumptions
 - Let the empirical observations speak!
- A set-theoretic perspective => logically true (as opposed to statistically inferred) causal inferences possible
- Continuous dialogue between data and analysis through qualitative calibration
- Balancing between generalizability and business case specific accuracy

Conditions for marketing performance

1. Contextual conditions

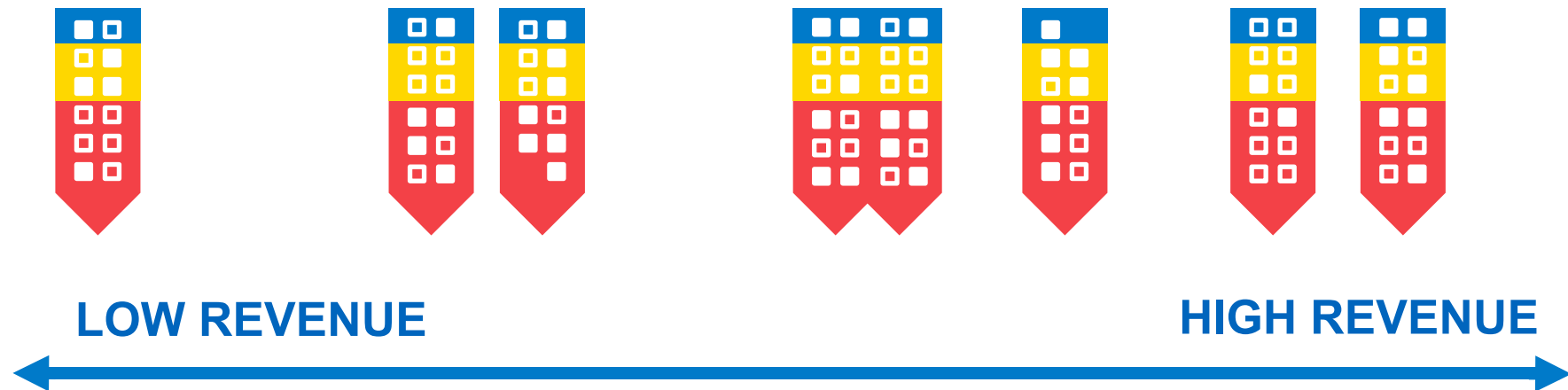
- General economic and market conditions of the operating environment
- Competitors' actions, marketing assets and business outcomes
- Customer behavior and outcomes
- Organization's marketing assets and business outcomes
- Change over time
- Not easily altered (e.g. on a per-action basis)

2. Action conditions

- Marketing mix attributes
- Available for direct decision making
- Cause marketing outcomes and changes in assets across the context

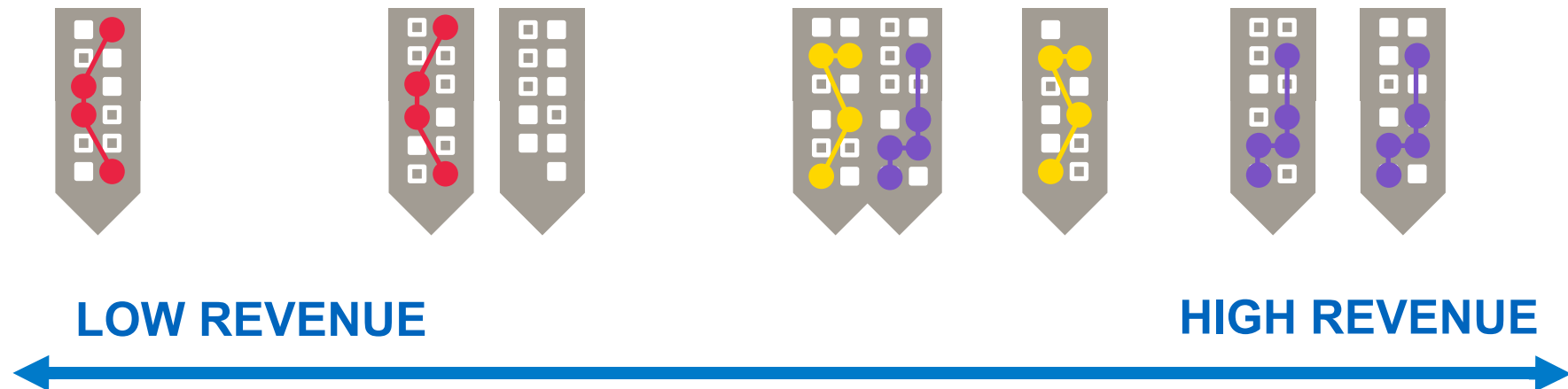
Configurations of conditions

- Configurations of contextual conditions and action properties result in different degrees of outcome
- Considering some on/off combinations of conditions of e.g.
 - Company ■
 - Business environment ■
 - Marketing action ■
 - Customer...?

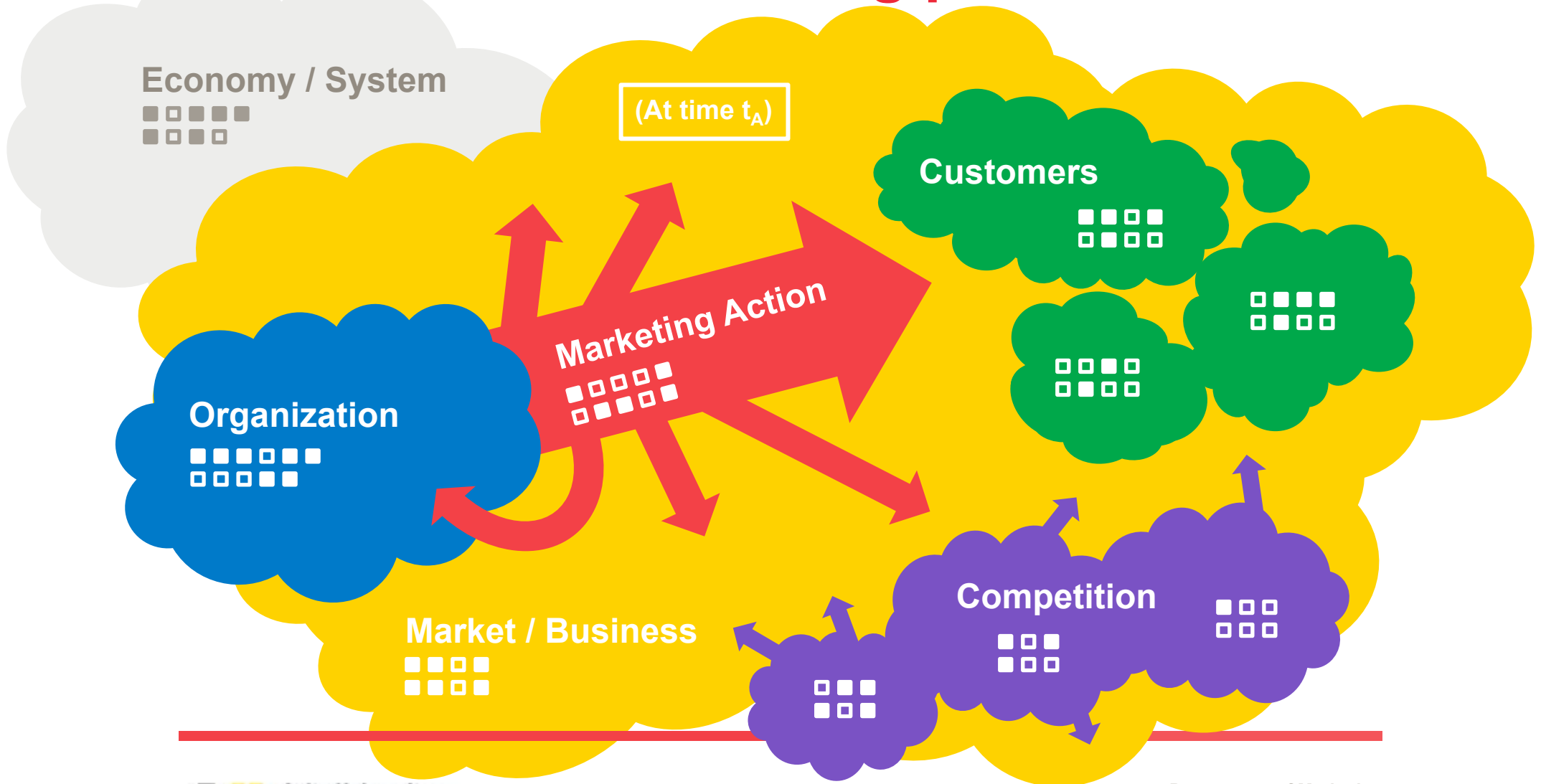


Configurations of conditions

- Configurations can be logically analyzed to deduce common features (concurrent causal mechanisms)
- The analysis algorithm finds configurations which are *shared properties of cases with a similar outcome*
- Emplanations for an outcome are not necessarily the same as for its reverse (e.g. low revenue) » *Either may or may not produce good explanations*



Conditions for marketing performance



Conditions for marketing performance

- Marketing performance is shaped by **marketing actions** that affect other actors in the market, including the organization itself, by using assets to attempt to bring about change in conformity with managerial intent
- Marketing actions bring about **marketing outcomes** (changes in composition, measured with *marketing metrics*) that may build into **marketing assets** – the physical, financial, and intangible/intellectual resource bases for further actions
- Actions require a **managerial decision** to be made on the use (or disuse etc.) of assets » *The marketing mix*
- Actions are tied to a **marketing context** that is specific in time with respect to the state, nature, outcomes and developmental phases of the actors involved
- **Conditions** used to characterize actions and the assets and outcomes forming the marketing context are **approximations of reality**

Necessary and sufficient conditions

- Any path to a given outcome comprises one or more sufficient conditions
- If a condition is always present in any path to a given outcome, it is deemed necessary
- Both sufficient and necessary conditions can (and in the real world usually do) manifest as combinations, or set-theoretic intersections of conditions

Outcomes from configurations of conditions

- Multiple configurations can lead to the same outcome, e.g.:

$$\left\{ \begin{array}{l} \left\{ c_a^C, c_b^C, c_c^C \right\} \wedge \left\{ c_a^A, c_b^A \right\} \rightarrow O \\ \left\{ c_a^C, c_d^C \right\} \wedge \left\{ c_b^A \right\} \rightarrow O \\ \left\{ c_c^C, c_d^C \right\} \wedge \left\{ c_a^A, c_c^A \right\} \rightarrow O \end{array} \right.$$

- ...and be manipulated using predicate logic to produce minimal solutions.

Qualitative comparative analysis (QCA)

- Building theory from observing logical combinations of artefacts among case data
- Models combine qualitative and quantitative input with theoretically-grounded parsimony
- Key methodologists: Ragin (1987..2009), Rihoux, Berg-Schlosser, De Meur
- Background in macro-level sociology and political science
- Some research in organizational theory (cf. Fiss 2007), but none in marketing until now

Fuzzy logic



- About *degrees* of truth,



instead of black and white extremes

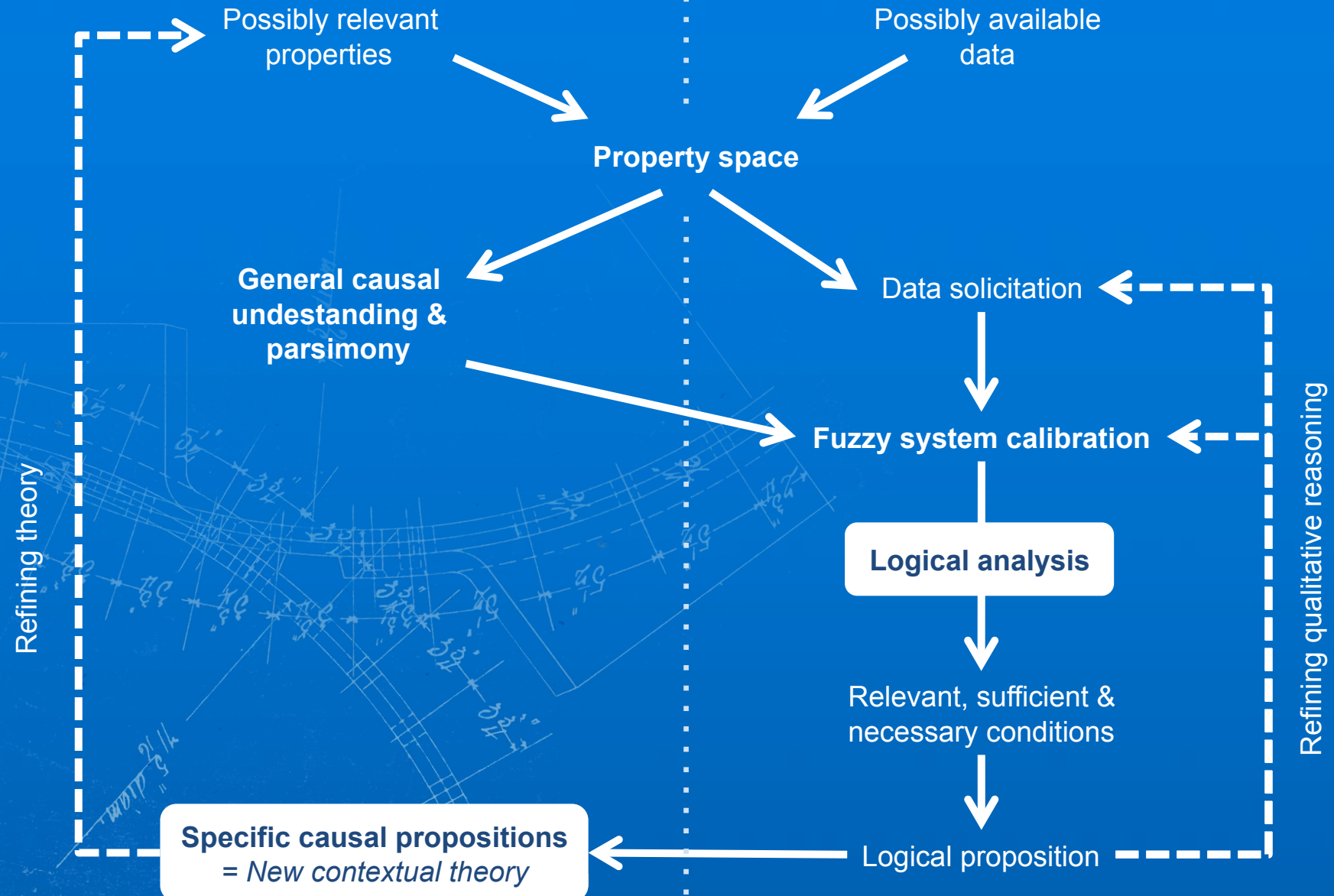


Fuzzy logic

- Fuzzy logic is a precise logic of imprecision and approximate reasoning (Zadeh 2008)
- Fuzzy logic allows rapid, dynamic modeling of diverse, vague, and contradictory rules and expectations (Winter&Kron)
- Advantages of fuzzy systems (Kosko):
 - Direct parallels for linguistic/qualitative descriptions
 - Ease of building a complex system from simple rules
 - Computational efficiency of fuzzy systems compared to traditional machine intelligence
 - A formal multivariate logic distinguishing degrees of truth between the boolean extremes: $\mu_A : X \rightarrow [0,1]$

THEORETICAL DEVELOPMENT

EMPIRICAL ANALYSIS



Study 1: Short-haul airline

- A series of short opt-in email promotions over one year
 - Carried out to boost revenue on specific routes
 - 27 route offers on 12 promotional mailings
- Business problem: Which offers do customers find most attractive and why?
 - » **What combinations of attributes in the offers result in greatest revenue impact?**
- Data
 - Interviews of 4 people from organization (Mkting & RM)
 - Destination planning, pricing and promotion details
 - Email tracking and sales data

Research questions

How do differences in between promotions explain revenue outcomes?

1. What properties of email promotions are relevant as causal conditions?
2. What causal configurations can be distinguished among the promotions and their outcomes?

Calibration

Condition	Explanation	Calibration	Note
daysuntilend	Days until latest date to depart	Seven-value fuzzy set	
travelsoon2	Days until first possible departure	Eight-value fuzzy set	
seasondestn	Seasonal destination (snow, sun)	Crisp set	
buynow	Available for purchase immediately	Crisp set	
nordic	Nordic destination	Crisp set	
citydestn	City destination	Crisp set	Logical remainder
expensive	Offered price of flight	Eight-value fuzzy set	Logical remainder
emailreactivity	Degree of reaction provoked by email	Continuous fuzzy set	Logical remainder

- Eight conditions included in final property space
- Five conditions causal in the chosen solution of configurations

CAUSAL CONFIGURATION
FOR LOW REVENUE

#

LONG UNTIL TRAVEL
WINDOW ENDS

MANY DAYS UNTIL
TRAVEL POSSIBLE

IMMEDIATELY AVAIL.
FOR PURCHASE

SEASONAL
DESTINATION

NORDIC
DESTINATION



Logical analysis:
Conditions shared
by cases which have
similar outcomes

TRAVEL WINDOW
ENDS SOON

FEW DAYS UNTIL
TRAVEL POSSIBLE

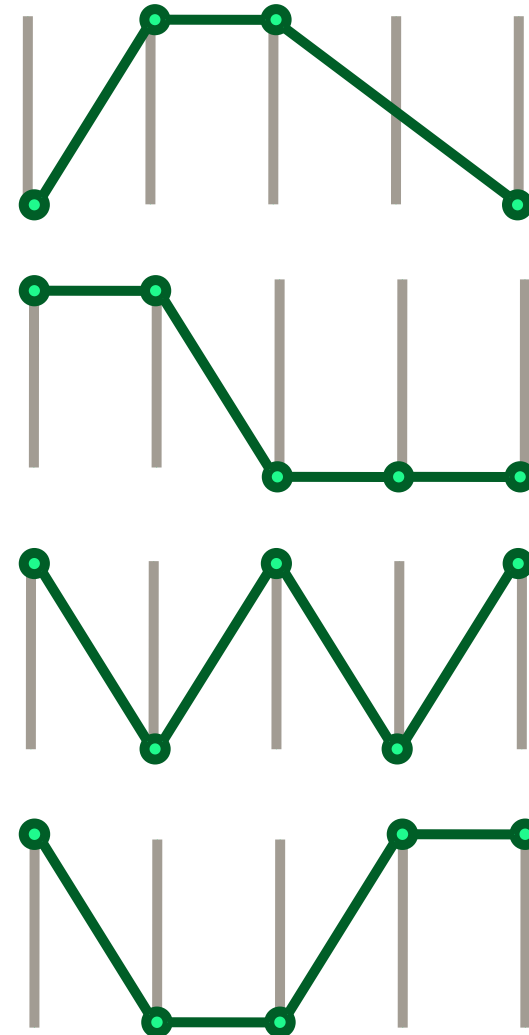
AVAILABLE TO BUY
THE FOLLOWING DAY

CITY
DESTINATION

NOT A NORDIC
DESTINATION

Causal explanations

- Four very different configurations of company-controllable inputs
 - » *Four explanations for focal outcome (low revenue)*
- Data on many interesting conditions currently unavailable, e.g.
 - Consumer buying process
 - External variables' effects
 - Competition
 - General temporal travel behavior



Next steps

- Analysis process development
- Potential applications
- Experimental empirical testing
- Visualization
- Actor-based simulations
- Role of marketing/analysis/case specific experts
- Analysis interface development
- Analysis templates for “archetypal” problems and situations
- BI system integration
- Commercial application

Calibration

Crisp set	Three-value fuzzy set	Four-value fuzzy set	Six-value fuzzy set	"Continuous" fuzzy set
1 = fully in	1 = fully in	1 = fully in	1 = fully in	1 = fully in
0 = fully out	0.5 = neither fully in nor fully out	0.67 = more in than out	0.9 = mostly but not fully in	Degree of membership is more "in" than "out": $0.5 < X_i < 1$
	0 = fully out	0.33 = more out than in	0.6 = more or less in	0.5 = cross-over: neither in nor out
		0 = fully out	0.4 = more or less out	Degree of membership is more "out" than "in": $0 < X_i < 0.5$
			0.1 = mostly but not fully out	
			0 = fully out	0 = fully out

- All qualitative and quantitative data is calibrated into fuzzy set membership scores – *degrees of membership in a group*
- Choice of set type and qualitative anchoring depends on data resolution and theoretical significance of differences between cases

Marketing problem settings

- Optimal levels of marketing expenditure: marketing mix, sales/marketing balance, media mix
- Retail location, store type fitting
- Fitting messages to mediums and audiences
- Split testing
- Empirical segmentation based on qualitative consumer attributes
- Understanding heterogeneous complex causation