CAUSAL ANALYSIS OF EMAIL PROMOTION PERFORMANCE USING FUZZY LOGIC

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ABSTRACT

The present range of tools for examining causality in marketing performance is insufficient. On a general level, complex interactions are steamrolled to statistical generalizations; in specific business contexts, apposite quantitative models are difficult to come by while case studies curb comparison across data. We argue that greater marketing performance accountability requires fresh insight to the nature of causal mechanisms linking marketing actions and reactions. Some of the problems with many analytical approaches regarding complex causality, unstated assumptions, explanatory power and theoretical depth can be overcome with a multiple conjectural analysis approach for cross-case comparison, Qualitative Comparative Analysis with Fuzzy Sets (FS/QCA). We present the methodology with email promotion case data from the travel industry and discuss the merits of the methodology for further academic study and practical research, development and application.

Keywords: *Marketing Performance, Qualitative analysis, Quantitative analysis, and Research Methodology*

INTRODUCTION AND OBJECTIVES

Marketing performance is a key research priority for marketing scholars. After decades of concentrated effort, performance is still consistently listed as a predominant concern by the likes of the AMA and MSI (Clark 1999; Morgan, Clark, and Gooner 2002; MSI 2006; O'Sullivan and Abela 2007; AMA 2008). Arguably, calls for action have produced neither sufficient scientific understanding nor practical application of findings to date.

At least three interconnected drivers for these calls to action can be distinguished. The first derives directly from the habitually quoted adage of managers not knowing which half of marketing spend is wasted. The return on marketing investments made should reflect the cost-effectiveness and efficiency of marketing activities, but linking inputs and outputs within a "black box" of marketing is a significant challenge (Rust et al. 2004). This gives rise to further drivers for improvement in control and reporting. In order to assess and report the efficiency and effectiveness of marketing processes, comparisons across settings within and outside an organization, metrics should follow a shared logic and structure (Morgan, Clark, and Gooner 2002). Thirdly, marketing researchers in particular are still looking for a shared definition of the role and scope of marketing (Webster Jr 1992). A practical guide to contextual/context-bound theory-building by discovering situationally appropriate levels of analysis may be found by looking at performance effects of marketing actions.

The question of what actions and decisions by marketers will bring about what responses in the marketplace is shared by business managers and marketing researchers alike. Practitioners in the field are faced with increasing demands for accountability (Rao and Bharadwaj 2008; Stewart 2006). However, current analytical approaches and practical toolkits fall short on a number of counts. The range of accepted generalizations in marketing science is very limited. Few theories comprehensively explain any significant portion of consumer behavior, marketing management or market mechanisms up to a level as to be able to act as guidelines for decision-making within specific busienss contexts. Quantitative models are routinely produced and published as a part of an effort to discover such rules, but they are encumbered by excessive statistical generalization, making them irrelevant for practical guidence, or a range of problems relating to unstated assumptions in model building. In-depth case studies are highly useful for understanding specific phenomena, especially in a historical context. However, findings are not easily generalized

to other cases, and detailed manual cross-case comparison rapidly becomes analytically difficult and unreliable as the number of cases increases. As marketing as a function and process is required to explain itself with more transparency, new tools and frameworks must be created and adopted so that marketings can systematically be compared, assessed, and improved. The challenge is in developing context-specific, highly reliable and qualitatively justified theories of marketing, that combine analytical rigour with practical managerial relevance.

We approach the problem of determining the causes of marketing performance by applying a novel method, Qualitative Comparative Analysis using Fuzzy Sets (FS/QCA). It offers one potential answer to some of the concerns voiced over opening the black box of marketing: a new, systematic way to carry out formal logical cross-case comparison using set theoretic principles but without losing qualitative depth. The promises of FS/QCA are in deducing a description of causal mechanisms with high explanatory power within the empirical context, and its weaknesses in demonstrating scalar differences in outcome. In other words, FS/QCA allows us to discover what the mechanisms are and how common that mechanism is among the data, but not predict what specific numerical outcome, for example, would result from a hypothetical marketing action.

To demonstrate the method, we present a case comprising a series of online promotions over one year, carried out by an airline to boost revenue on specific routes. The objective is to discover what types of offers are the most successful by having the greatest impact on revenue. Explaining the causality behind the revenue outcome includes an assumption of *configurational causality*. In order to leave room for equifinality and conjectural explanations, the conventional frame of analysis is broadened in several respects by relaxing some common assumptions, which are in direct contrast against key assumptions of mainstream/conventional statistical techniques (Berg-Schlosser et al., p. 8-9).

Additivity, or that a change in the level of a condition (value of an independent variable) will have the same incremental effect on the outcome across all cases regardless of the values of other conditions is not assumed in QCA (Berg-Schlosser et al., p. 9). Every condition is a factor to the outcome only as a part of a combination, or conjecture, with an effect that may be unique to that combination. These conditions are not analytically separable attributes, and may well operate in radically different ways in different contexts and in different cases (Ragin 2000, p. 40, 71).

The conjectural view on causality is a methodological assumption that is difficult to include in many analytical approaches. The joint effects of the presence and absence of conditions (p. 175) are difficult if not practically impossible to tackle with conventional techniques such as logistic regression. A saturated interaction model with five independent variables, for example, would require the estimation of 32 coefficients in a single equation -infeasible due to extreme collinearity and virtually impossible to interpret if achieved (Ragin and Fiss in Ragin 2008a, p. 207). Logistic regression analysis also disregards whether it is possible for cases to exist in all 32 corners of the same vector space, allowing outcome probabilities to be calculated for cases that do or cannot exist beyond the mathematics. The problem of limited diversity is ignored by making a net-effects assumption of linearity and additivity *"in an indirect and covert manner by assuming that the effect of a given variable is the same regardless of the values if the other variables and that a linear relationship can be extrapolated beyond an observed range of variables"* (p. 207). Configurational analysis, in contrast, makes no such assumptions.

To meet our objectives of demonstrating applying FS/QCA on marketing problem settings and identifying causal configurations in the airline revenue management and promotion case context, we put forth the following research question:

How do differences in comparable promotion actions explain revenue outcomes?

- What properties of email promotions are relevant as causal conditions?
- What causal configurations can be distinguished among the promotions and their outcomes?
- What relevance and potential does FS/QCA have for improving understanding of causality marketing for researchers and managers?

This paper begins with a literature review that positions the study in the wider marketing performance discourse and methodological context. Qualitative comparative analysis using fuzzy sets is presented on a general level, followed by a description of its application on the airline revenue management case study. Causal configurations resulting from the analysis are presented, followed by discussion of their relevance as an analytical tool and management decision-making aid.

LITERATURE REVIEW

Marketing performance has been on the research frontier for quite some time, as evidenced by "calls to action" by various academic and professional organizations. Progress has been made in disentangling the dynamics of relationship management, value formation and innovation management, for example, but often research stalls at endless statistical analysis of marketing orientation variables (cf. e.g. Tapp and Hughes, 2008 for discussion). Larger strides must be made, and the linkages between marketing activities and their performance effects examined on a collective, compound, qualitative level, yet without giving up practical quantitative relevance.

The organizational and relational phenomenon that is marketing is often described as a "black box." We have some understanding of the inputs and some of the outputs; both typically include both quantitative and qualitative measures. What happens inside the black box is largely unknown. One reason for this is the lack of standardization and shared understanding of what is counted, or seen as an input, and what the outputs of the process are. In other words, there is a lack of measures and and a lack of methods. Another immediate obstacle is the quantifiability of many marketing actions and marketing subprocesses. Many events cannot easily be assessed for their "marketing contribution", and there are great struggles in attributing actions (and incurred costs) to and benefits of long run and time-lagging processes such as brand building and reputation (Rust et al. 2004). The black box of marketing, however, is not impenetrable. Common metrics and standard assessment processes will allow reliable assessment to be carried out and valid performance linkages to be made – exactly as has been seen in the past with fields such as quality management (Stewart 2006).

For strategic marketing practice and research to advance, marketing inputs, outputs, and the causal mechanisms connecting them must be understood more closely. With furthered understanding of the critical issues behind outcomes, control systems can be developed to assist managers in more effective, efficient and adaptive handling of contingencies. Efforts to construct general theories of marketing have largely been unsuccessful in providing practically relevant and applicable solutions on the same level as in disciplines such as finance and accounting (Tadajewski 2004). The assessment of marketing performance, in both practice and theory, suffers from both lack of contextual depth and of general insight into patterns – often simultaneously. Some in-depth studies, often applying qualitative case research methods, offer considerable insight into market and customer processes at the

individual level. However, the relevance of these findings for other contexts is often poor. Large-scale econometric studies and marketing models allow statistical generalizations to be made, but usually fail to address causal complexity and heterogeneity – that is, distinct but co-occuring paths to outcomes, with inputs consisting of different combinations of properties of marketing actions. In practical applications, the majority of organizations do not have the resources, know-how, or developmental motivation to both model their marketing systems and study their customers in detail. Middle-road strategies that provide context-specific, valid real-world answers and analytical generalizations are lacking.

Marketing outcomes arise from a wide range of actions and situations. Both outcomes and their causes manifest in a highly complex and intertwined manner not only at the customer interface, but also in the various external and internal business processes and network interfaces of the enterprise. Marketing actions occur on a number of levels on both organizational and strategic scales, depending on the level of analysis; the properties and components comprising them are always fuzzy and varied. The key question for marketing performance is determining the manner in which *manageable inputs bring about measurable outcomes*. Together, they define the challenge that interests me: a methodology that aims at drawing these linkages out in a managerially relevant and actionable way. The fuzzy thinking based (Zadeh 1965; Zadeh 1987; Kosko 1993) approaches to epistemology, configurational causation, and case research, allow inputs and outputs to be considered as theory-building elements for unraveling causal complexity in marketing as it is manifests empirically in specific business contexts.

The analytical problems involved are common to many branches of social science (Ragin 2000, pp. 3-4). Underlying many of the conventional and dominant techniques and methodological approaches are strong homogenizing assumptions about the nature of cases and variables. In qualitative research with a small number of cases this is rarely a problem, but with quantitative techniques involving large samples, diversity of evidence has to be limited. Dealing with causal complexity and generalizability of results calls for new approaches in order to gain required depth and breadth.

FS/QCA is, for most purposes, essentially theory-building deductive research. It aims at producing context-specific understandings of interactions. No specific theory exists to predict or explain ex ante what we might find to be the causal mechanisms at work in a specific case context such as this. Numerous individual theories, or often extremely simple practical economic understandings, are used in hypothesizing about the role of given

conditions on outcomes, for example, that price will have an effect on demand. Theory is encouraged to emerge from empirical material, with the researchers' key input into the process being in brainstorming possible, measurable, and actionable conditions for inclusion in data collection, and subsequently seeking qualitatively significant characteristics in the attribute data to highlight differences among the cases.

METHOD

To address the complexity behind marketing performance, and methodological-empirical challenges in it, four key borrowings from case-oriented research are include in the proposed, partly computational FS/QCA methodology. Firstly, cases are to be understood as configurations of attribute to avoid some of the problems of variable-oriented research. Thus, parts of cases (i.e. facets of marketing actions) are understood in relation to each other, as *configurations*, not as independent conditions or triggers for some outcome. Secondly, populations are viewed as flexible, manipulable constructs instead of strictly delineating them ex ante. The relevant population (*"Cases of what?"*) is itself a product of the analysis process. Thirdly, the emphasis will be on explaining outcomes to address specific changes in specific situations. Finally, causation is viewed as conjectural and homogenous: no presumption is made that the same causal factors (attributes of marketing actions) operate the same way in all combinations, contexts, or cases.

Ragin argues, that "diversity-oriented" techniques like FS/QCA can bypass problems presented by demonstrating causality and dealing with causal heterogeneity. He further argues, that a "configurational approach" to social phenomena will attend to heterogeneity. Differences among data would be considered as differences in kinds and types of cases, *"as configurations of aspects and features […], replacing the conventional view of difference as variation (i.e. as deviation from the mean)."* (Ragin 2000, p. 5) By taking advantage of the partial *degrees* of membership that attributes may have in belonging to a type or kind of case, fuzzy sets further augment the configurational approach.

In FS/QCA, data on marketing actions and their properties are collected and analyzed in an iterative process to formulate set-theoretic structures approachable with formal multi-valued logic (fuzzy logic). This allows true inferences to be made on the necessity and sufficiency of marketing actions in bringing about different degrees of customer and market outcomes. Greater insight into how, and in what combinations, marketing actions produce results will ultimately improve decision-making and business performance. By

analyzing the range, nature and working mechanisms of marketing actions carried out within its scope, we can arrive at a more comprehensive understanding of performance. This results in better justifications and, ultimately, better results.

QCA has its origins in the late 1980s and early 1990s, developed as a "macro-comparative" approach for studying questions in political science and historical sociology (Ibid., p. 3; Berg-Schlosser & Quenter 1996). Empirical research taking entire societies, economies, states, and other complex social and cultural formations is naturally associated with a limited number of relevant cases – for example, the countries of Europe. For this reason, QCA has often been viewed as a "small-N" approach, specifically tackling many of the analytical challenges inherent to small populations. Cooper (2004) notes that the advantages of the case-based approach are beginning to be applied to larger datasets (for example, Abbott 1992, Williams and Dyer, 2004).

Ragin's 1987 original introduction to qualitative comparative methods (restricted to what is now referred to as csQCA) deliberately sought to present a *"synthetic strategy [to] provide a way to test alternative arguments and at the same time encourage the use of theory as a basis for interpretation",* ideally integrating *"the best features of the case-oriented approach with the best features of the variable-oriented approach"* (p. 84). To this specific end, QCA techniques combine features from both approaches to "allow the systematic comparison of cases, with the help of formal tools and with a specific conception of cases" (Ibid., p. 6).

QCA techniques are specifically designed to deal with cases, not variables. That is, each case is treated as an integral whole as opposed to an anonymous source of values for potentially independent variables. Each case is a configuration, a complex combination of properties (Ibid., p. 6). A distinguishing feature of this holistic approach is that cases should be known well on a specific level, allowing researchers to continuously refer back to sources and experts for additional information as requirements for the range and qualitative depth of relevant conditions are revised and clarified during the analytical process.

There is both a deductive and an inductive dimension to QCA. The analytical approach is one of theory-building, founded on constructing and evaluating theorized relationships among cases and factors, in other words deducing patterns of interaction between conditions and outcomes. For this to happen, the choice of conditions and outcomes must

be theoretically informed (Ibid., p. 6). The inductive aspect/potential is apparent in how QCA can be use to approximate the relevance of conditions on a more general level, and in the case of this study, how QCA can be used as a vehicle for methodology-building: inducing generalizable approaches for dealing with causality in a specific subdiscipline of inquiry and inducing operating mechanisms for specific marketings.

The use of formal set theory gives a distinct advantage to QCA. The language of set memberships translates well into theoretical discourse to allow findings to be presented concisely and accurately. Theoretical discourse translates as easily to the language of sets and memberships, enabling a rich dialogue with data with effective control over information loss (Ibid., p. 3; Befani, Ledermann & Sager 2006).

The dialogue of data with theory is a fundamental feature of QCA, contributing to analysis in three distinct stages.

1. In building a model, theoretical knowledge guides the selection of conditions to be included in the model and operationalizing them in how they are measured, encoded and calibrated. Outliers and exceptional cases are not dismissed in QCA, but instead treated as sources of new understanding concerning the process being studied. The heterogeneity of causation within a researcher-defined area of homogeneity is the theory-driven platform for studying the focal phenomenon, requiring at least some implicit hypotheses about the causal mechanism (Berg-Schlosser and De Meur in Rihoux 2009, p.20). The selection of cases requires a clear definition of the outcome, and researchers should strive for "a maximum of heterogeneity over a minimum number of cases" for maximum diversity for theoretical consideration (Berg-Schlosser and De Meur 2009, p. 21).
2. Many practical operations that are a part of the QCA process benefit from or require extensive theoretical knowledge. Resolving questions in the operationalization of conditions in calibrating the model, the treatment of contradictory configurations (outcomes differing in outcome, not [known/included] conditions) (Rihoux and De Meur 2009, p. 44), and the inclusion of *logical remainders,* or configurations that are not represented by empirical observations but which can help during analysis in producing a more parsimonious logical expression when supported by theoretical understanding of the theoretical linkages between conditions.

3. After analysis, interpretation of solutions to the research problem is guided by theory to understand, explain and justify preferences from among equivalent logical expressions of causal conjecture (Berg-Schlosser, De Meur, Rihoux, and Ragin 2009, p. 9).

In QCA, explanations are sought on a level that welcomes heterogeneity: individual outliers are as important as more frequent observations. Each causal configuration is a valid explanation for a route that regularities may take. However, it is only possible to offer more succinct explanations by generalizing within the homogeneity space of the initial empirical set. According to (Ibid., p. 12), *"a well-executed QCA should go beyond plain description and consider 'modest generalizations': […] from a systematic comparison of comparable cases, it is possible to formulate propositions that we can apply, with appropriate caution, to other similar cases – that is, cases that share a reasonable number of characteristics with those that were the subject of the QCA."* In contrast to statistical sampling and generalization, this approach is more reserved.

Our analytical framework for applying FS/QCA is illustrated in Figure 1. It consists of two interlinked, iterative paths. One is concerned with building a context specific theory of causality to explain the focal outcome; the other is the empirical field research process where new data is collected and analyzed to be fed into further theoretical development. As theoretical understanding develops, the empirical effort can be focused increasingly sharply to draw out qualitatively justified distinctions from among the cases to form a basis for conclusions on causality within the focal context. In the following section, we illustrate the application of this process on actual empirical data.

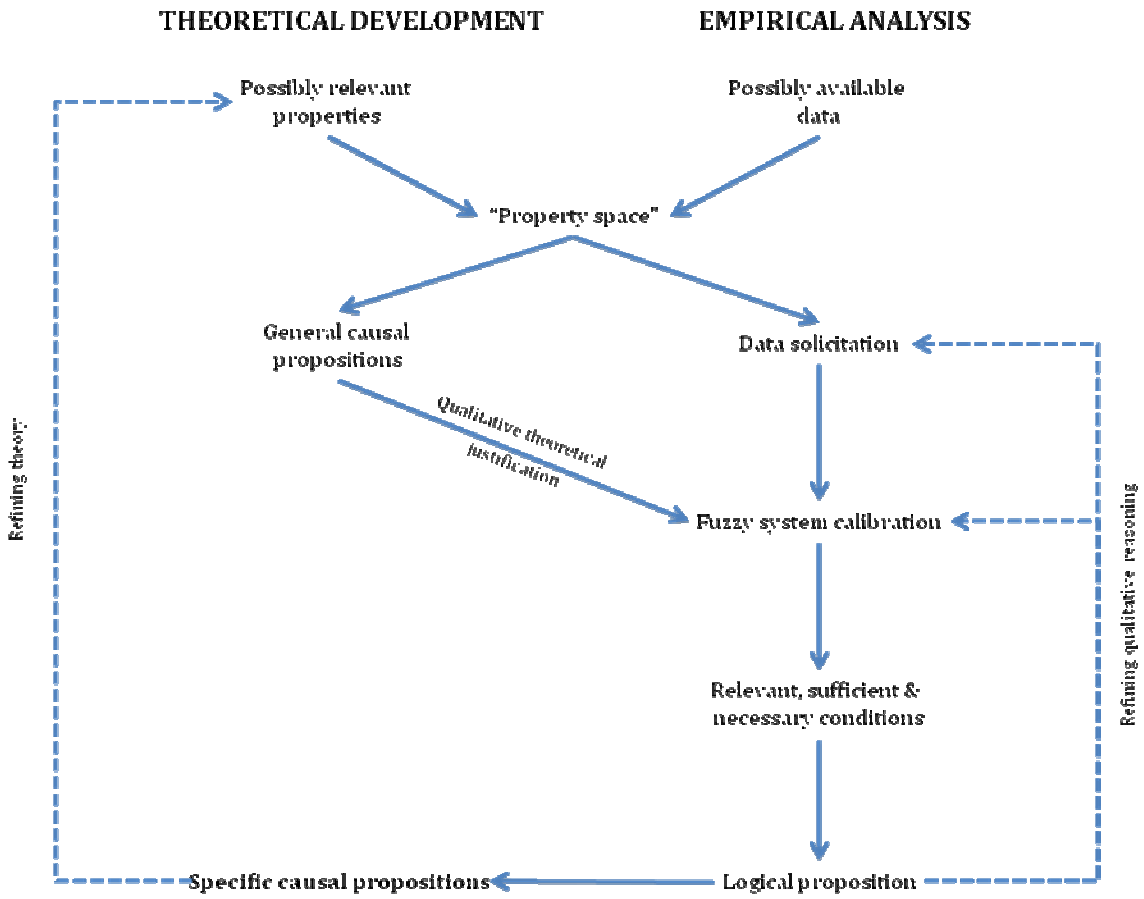

Figure 1. Analytical framework.

Analysis process

The analytical framework presented in Figure 1 forms the structure for presenting our research experience and findings with the airline revenue management case. To begin with, the case company and setting were selected based on practically guided characteristics that made it suitable for analysis. In addition to research access and commitment, a specific problem context was readily identifiable, with a large enough pool of directly comparable cases (promotion actions), for which data was immediately available and accessible. This was the basis for beginning our analysis in determining the initial potentially interesting conditions of the promotion actions (the "Theoretical Development" column in Figure 1) and intersecting them with the range of data on the conditions available from the case company ("Empirical Development"). This intersection formed the initial *property space* we were to consider in our analysis – a k-dimensional vector space where k represents the number of conditions against which each promotion action can be evaluated.

The initial property space gives rise to the next steps both in theoretical development and empirical work. The property space forms the blueprint for data collection. For advancing the empirical process, each case must be assessed for each condition of the property space. Depending on the condition, the data may be quantitative, qualitative, or some combination of these, gathered from management information systems, reports, interviews, external or secondary sources, or any combination of these. In theory building, the next step involves developing an initial understanding of what roles the conditions might play in bringing about the focal outcome. This should direct the empirical effort and property space refinement to focus on conducive conditions and point the direction, through considering the theoretical role and potential of the individual conditions, to qualitative justifications on what behavior of the conditions is significant, and thus, how the fuzzy system should be calibrated to draw out the significant differences from among the cases.

Each case (promotion action) has a distinct position in the property space determined by fuzzy set membership. The degree of membership signifies the extent to which the case is a part of a given group. For example, a promotion action might be a full member of the group of actions characterized with “expensive price” and more a non-member than a member of the group of actions characterized with “travel date coming up soon”. A case with a fuzzy membership score of 1.0 with respect to a causal condition is a full member of a corresponding fuzzy set, and situated in a corner of the property space. A case with a membership score of 0.0 is a complete nonmember of the set, and rests in the origin of the property space. A membership score of 0.5 would be ascribed to a case that is exactly on the border, as much a member of the fuzzy set as a nonmember. In the vector space, such cases would occupy a position exactly as far from the origin as from the corner with respect to the given condition. A case with a membership score of 0.5 in all causal conditions would rest exactly in the middle of the property space.

The degree of membership that a case has with respect to a condition is set by the researcher in the course of fuzzy system calibration. This is the fundamental stage in FSQCA: data on conditions must be translated to membership scores in a careful, well-documented and qualitatively justified manner. The calibration cannot entail, for example, a mechanistic linear transformation of Likert scores to a [0.0, 1.0] range by default. When quantitative values are re-encoded as fuzzy membership scores, the researcher must be acutely aware of what the numbers represent and what variation is or may be significant for explaining variation in outcome. For example, at one end of the observed range of

variation a small difference might be critical for and outcome to come about. For some condition, any variation beyond a given point may be completely extraneous. Quantitative data are usually encoded using a qualitatively justified continuous or set on continuous transfer functions so that continuous quantitative values are represented by a continuous range of fuzzy membership scores.

Qualitative anchoring is used to link fuzzy membership degrees to qualitative data on conditions where quantitative information is not available or relevant. Qualitative anchors are verbal expressions that describe set degrees of set membership. For each condition that does not take on continuous values (typical of qualitative data), the researcher must decide on the number of bins, with two being equal to using crisp sets (binary logic). Examples of qualitative anchoring are shown in Table 1.

Table 2 presents the property space used in this case study. Eight conditions were included in the final property space. Four (*seasondestn* indicating whether the travel destination was seasonal destination; *buynow* indicating whether the flight was avaialbe for purchase immediately on email sending, or if the offer began later; *nordic* indicating a Nordic destination; and *citydestn* indicating city destinations as opposed to or combined with seasonal sun or snow destinations) were discrete choises, analoguous to dummy variables, and calibrated as a crisp (boolean) set {0,1}. The condition *daysuntilend*, indicating how much time there was from the offer until the final possible departure date set for the email offer, was calibrated as a seven-value fuzzy set. The distribution of the values for the various amounts of days until ends of travel periods was clustering into seven groups, with some noise due to differences in weekdays per month and small managerial adjustments. The observed clusters were selected as the bins for assigning evenly spaced fuzzy membership scores. These correspond resonably well to the level of specificity available for managers constructing the offers. The same calibration procedure was carried out for the two conditions, calibrated as eight-value fuzzy sets, *travelsoon* indicating the number of days until the first possible departure date on the offer's terms (inverse), and *expensive* indicating the price of the flight in euros. The final condition, *emailreactivity* was calibrated using a linear transfer function with intercepts for 0 and 1 set at the minimum and maximum as there was no practical reason to use bins for values that were more clearly continuous.

Table 1. Fuzzy set calibration and qualitative anchors (Ragin 2008).

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

Table 2. Property space and calibration.

Condition	Explanation	Calibration	Note
daysuntilend	Days until latest date to depart	Seven-value fuzzy set	
travelsoon	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

Once all data have been transformed to fuzzy membership scores, the analysis proceeds to collation of the data into *truth tables* for analysis with the FS/QCA software package by Ragin, Drass and Davey (2006). Next, a *frequency threshold* must be set in order to retain those causal combinations for which there are an adequate number of empirical observations, and discard others as *logical remainders*. Since we are dealing with an extremely limited number of cases (27 route offers on 12 promotional mailings), this is set to 1. Setting a *consistency threshold* follows: because we are dealing with fuzzy truth values, set-theoretic combinations of causal conditions vary in the degree to which they are consistent as combinations for producing the outcome. Ragin (2008) recommends that the consistency threshold be set to at least 0.8, and to a position in the ranking of configurations by consistency where a natural gap can be identified. The threshold best fulfilling both criteria occurs at 0.78, cutting the number of cases included in configurations to 13. These are passed on to the Quine-McCluskey algorithm included in the fsQCA package to carry out logical minimization of the truth table. The software

implementation is capable of delivering three different solutions of varying degrees of parsimony and complexity.

From the perspective of demonstrating causality, the question of interest is to discover which conditions or combinations of conditions are *necessary* for a given outcome, and which on their own are *sufficient* to bring it about. The multiple conjectural view of causation (Ragin and Rihoux 2009, p. 10) adopted in this study implies that 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. For example, considering an outcome O and conditions A, B and C, if

$$\begin{cases} A * B \rightarrow O \\ A * C \rightarrow O, \end{cases}$$

then the first path, the combination of conditions A and B, is the first sufficient combination of conditions leading to outcome O, and the combination of A and C the second sufficient combination of conditions leading to outcome O. Neither combination, if considered separately, is both necessary and sufficient. If these two paths represent the entire universe of paths to outcome O, we can further deduce that condition A is necessary for outcome O to occur. Condition A, however, is not sufficient on its own but needs to be combined with either B or C to bring about outcome O.

In the analysis process using truth tables, conditions present after applying the frequency threshold are necessary conditions as a part of some configuration. Sufficient configurations are configurations that in themselves are sufficient to bring about an outcome – single sufficient conditions are empirically rare.

FINDINGS

Table 3 presents the complex solution for the property space given earlier, using the lack of revenue as the outcome variable. The *raw coverage* column refers to the proportion of the cases explained by each causal configuration and *unique coverage* (equal to raw coverage in this instance) to the proportion explained exclusively by the configuration. The

consistency scores for each configuration of causes reveals to what extent the cases included in the configuration are consistent in bringing about the focal outcome.

Table 3. Resultant causal configurations (complex solution) for outcome ~*revenue*.

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frequency cutoff: 1.000000
consistency cutoff: 0.782569
                                                    raw        unique
                                                 coverage    coverage   consistency
                                                ----------  ----------  -----------

~daysuntilend*travelsoon2*buynow*~nordic
                                                 0.200884    0.200884    1.000000

daysuntilend*travelsoon2*~seasondestn*~buynow*~nordic
                                                 0.159776    0.159776    0.937393

daysuntilend*~travelsoon2*seasondestn*~buynow*nordic
                                                 0.101492    0.101492    0.926251

daysuntilend*~travelsoon2*~seasondestn*buynow*nordic
                                                 0.152442    0.152442    0.782569

solution coverage: 0.614595
solution consistency: 0.909565
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Four distinct causal conjectures are seen to lead to a low revenue outcome in the business case, representing different explanations for performance. The first configuration resulting in low revenue covers a range of city destinations in the south of Europe offered in late autumn or early winter for immediate purchase, with short windows for travel. A managerial conclusion might be that quick planning is not popular for this type of time-restricted winter getaway. The second configuration covers offers on flights to Paris, which generate low revenue despite wider windows for travel time. The destinations for cases in the third and fourth causal configurations are Nordic capital cities. Here, low revenue is associated with availability for immediate purchase for one, but a readily approached conclusion would be to attribute the effect to the Nordic destination type itself.

DISCUSSION

The coverage of the solution in the general case pool (0.61) is reasonably high, and the consistency of the entire solution excellent. The FS/QCA method works on empirical data within the selected case context to produce sensible results. However, it is rapidly seen that new questions emerge with regard to the findings and their interpretation. Supplementary solutions, adding new observations, and developing the property space further with new conditions and information sources are immediate conclusions.

The solution presented above is only one of many. Depending on the choice of thresholds, and in some instances in choices made for handling logical reminders, many parallel sets

of configurations can be discovered, with different degrees of coverage and consistency. In general, there is a nondirect tradeoff between the two. A more consistent solution is more readily found when criteria for coverage are relaxed, in other words, when fewer configurations are considered. Better coverage is often found quite obviously when configurations are less consistent of bringing about outcomes. Different solutions and solution types – typically, as well as here – include a different selection of cases in

As indicated in Figure 1, the analysis process is highly iterative. The criteria for termination are met at the stage where the actors feel additional data collection will not result in greater understanding of the causal patterns essential for understanding the phenomenon. The description of the analysis process incorporated to this paper has been simplified into a more linear process, disregarding the incremental changes in subsequent iterations, as well as false leads and slowly refined theoretical justifications and changing qualitative anchorings that are an essential part of the process.

Applying FS/QCA on micro-level case data from the promotion effort process of an airline yields results that are consistent as reflected on criteria established in methodological literature as well as logical expressions, arrived at through an objective, systematic, documented and replicable process, that are a sensible and intuitively coherent basis for discussion of the causal mechanisms involved. Compared to conventional quantitative techniques, FS/QCA can yield valid and reliable results with small case populations. The results are strongly context-bound theoretical explanations of causal mechanisms, and offer a new, rigorous approach to managerial problem solving. Compared to exclusively qualitative techniques, FS/QCA allows crafting empirical generalizations, expanding the scope of managerial use considerably.

LIMITATIONS

As most of the extant research using (FS/)QCA is on a macro-level, a big question is how well will a macro-levels(-originating) methodology accommodate lower-level social business data and phenomena. Is causality distinct enough or substantive enough to warrant any generalizing conclusions on the level of a part of a business's marketing activities, the entire field it works with, a specific industry or market setting, or some even wider context? Perhaps the specificity of cases within one business will serve to offset stability, if property value assessment offered by political phenomena is rooted in human

populations. Then again, consumers are the driving force generating the causal reactions, just as is the case with socio-political ones.

FS/QCA is critical of existing epistemology and methodology in that it attempts to reconcile strict positivist and strict interpretive/relativist perspectives into something that is more valuable in practice than either of those two alone. With FS/QCA, one does not take a stance towards the existence of an objective reality. Rather, it offers tools to work within a given ontological reality and systematically assess the mechanics of causality in that context and situation. The wider applicability of results is left open to further interpretation. This fits in well with the reality of business management; FS/QCA will never be a crystal ball for accessing extraneous information. It does, however, offer the potential for new perspectives by working within the same perspective, with the same data.

FURTHER RESEARCH

Further research into investigating causality in marketing with the FS/QCA methodology is needed both within the context of the individual business case considered here, as well as in developing the approach on a general level through application in diverse case contexts and levels of analysis.

With respect to the airline case presented in this paper, the natural expansion would be adding more cases to the analysis as they become available. A more active collaboration approach could involve experimentation within the promotional offers by varying the used arguments and marketing mix variables on a greater range that has been used, and dividing the pool of consumers to subgroups presented with different versions of the promotion. While the price itself is difficult to vary under the present scheme, subgroups of consumers could easily be promoted different destinations, different travel periods, conditions, sales arguments, and promotions, given that these experiments do not undermine consumer trust and perception of equal treatment of customers. Thirdly, to deepen the understanding of the consumer decision-making process involved in reacting to the promotions, qualitative interviews should be carried out on samples of buyers to deepen our understanding of the drivers and motivations behind purchase in the different causal groups of consumer response. This additional qualitative information on buying behavior would allow us to include additional relevant conditions in the causal analysis that we do not access to presently, and develop a model with substantially greater descriptive power.

For marketing performance research in general, further development and applications of FS/QCA and its variants could offer a considerable degree of new perspective. Arguably, there is much in performance and causality that cannot be rigorously analyzed with the present tools and their inherent assumptions. Adopting a multiple conjectural view into causation and taking advantage of fuzzy sets as a logical and robust interface to reality has distinct benefits and considerable analytical potential for a wide range of applications. The most beneficial applications can only be discovered as qualitative comparative analysis is applied to new contexts and diverse new business cases. This process of practical experimentation to develop the method further for use in marketing performance contexts would not only allow us to discover the best uses for it, but perhaps even discover some regularities in marketing performance that we are presently unaware of.

MANAGERIAL IMPLICATIONS

On a managerial level, this application of FS/QCA into marketing performance of an airline's biweekly promotional offers has direct implications for revenue management by imparting a relatively objective description of the managerially controllable conditions influencing buying behavior. This knowledge can then be used as a basis for creating an accurate and relevant marketing metrics system, and used to develop the "marketing mix" of conditions in the weekly offers to a maximal revenue generating form.

Further research as discussed above will likely see the managerial relevance of result from this form of analysis develop into a key source of information of the operation of a context-specific marketing system. Potentially, developed frameworks will allow managers to focus marketing efforts on specific, empirically verified path of influence, substantially reducing resource waste in promotion and other marketing activities, and dramatically improving the efficiency and effectiveness of their marketing system.

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