



# Middlegame Competitive Interaction Analysis (CIA)<sup>®</sup>

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# Introduction

**For decades, marketers have struggled to predict consumer behaviour. A key element of tactical marketing has been the analysis of how changing the marketing direction of one product affects that product's sales as well as the sales of competitors. In reality, the idea of competitive interaction has been at the heart of marketing analytics since the development of metrics like market share.**

For example, business managers at Procter & Gamble are very interested in knowing if Crest MultiCare slashes the price of its toothpaste SKUs by 10% as a promotional incentive, will Colgate Complete market share sink or will this simply cannibalize other products in the Crest product line? The generally accepted answer is that probably both will happen. However, historical insight would suggest that the market share of Aim, which happens to be more favoured by children, may not be nearly as sensitive to the Crest MultiCare price reduction.

It sounds simple, but precisely assessing these kinds of effects has been tricky. Marketers both at the manufacturer and retailers want to know the magnitude of these marketing effects and whether there is any pattern to them. So far, the preferred method of measuring these cross-elasticities has been econometric analysis. This involves tracking the market share of a given brand, observing the prices and promotional support of that brand as well as its various competitors, and relating the two. Unfortunately, this method turns up incorrect answers a significant portion of the time. Srinivasan (1998) explains “the numbers are difficult to estimate since there are typically multiple competitive products that are applying numerous changes to their marketing mix all at once”. In essence, a more formal approach is required that leverages the capabilities offered by a Category Management view.



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# Bringing Back Category Management Through Improved Analytics

Traditional marketing analysis was focused on a single brand or product group, its marketing support, and its marketing performance. Analysts established a weekly price, distribution, and promotional plan. They then implement this plan given the constraints of the marketplace and read their retail tracking database reports to assess whether or not the plan was effective. This was standard brand management in action. The introduction of marketing analytics has greatly educated the decisions of these analysts by supplying market-response capabilities. The full integration of these tools into the planning process has set marketing mix modelling far apart from many other research techniques in terms of delivering value. Although this model-based approach has revolutionized marketing efficiencies, it unfortunately ignores the portfolio approach to business management required to lead the marketing function.

Marketing managers define the potential of a marketing program to increase sales and revenue as one of the three consumer responses defined by Erhenberg (1988): increased penetration of the product category, induced switching from competitors, or increased usage of the product. The next generation of marketing analytics addresses potential opportunities by explaining marketing efficiencies in the context of all three of these impacts for each competitor in the category. Developing recommendations based on changes to consumer penetration, switching, and usage behaviour in the context of marketing analytics is inherently more complex than the traditional approach. However, the marketplace has become far too dynamic to continue to give significant credibility to marketing plans that focus on a single brand. Therefore, analytics is shifting to how the products grouped together on the store-shelf to form the competitive environment as a whole. Retailers proposed these concepts as the basis for marketing decision support using the umbrella-term “category management” in the early nineties.



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The marketplace is becoming far too dynamic to continue to give significant credibility to simple point elasticities. Developing a full comprehension of consumer penetration, switching, and usage behaviour, is inherently more complex than the scope of traditional marketing analytics. The category management approach consists of four key concepts:

## Category Management Approach - Key Concepts

1. The effect of marketing actions in support of one product must be analyzed in conjunction with the market positions and actions of all competitors
2. Different intrinsic and extrinsic product attributes create a relative “point of reference” for additional marketing activity to generate an impact
3. Marketing impacts both market shares and the demand for the whole product class
4. Expansion or contraction of the category is equally influenced by environmental factors

Understanding the marketing contribution to the total category or portfolio as opposed to the individual brand or product is essential. A significantly different series of conclusions about the current situation and subsequent marketing plans become evident by applying the category management perspective. A client recently noted that coupons were the most profitable driver of incremental volume for a key brand in their portfolio when reviewing the ROI of the various marketing elements.

However, expanding beyond the brand to review the impact on their entire portfolio demonstrated a very different story. A large portion of the brand’s incremental profit was at the expense of other players in the portfolio. Coupons actually cannibalized the sister brand and negate a sizable portion of the profits. Other marketing tools like television and special events demonstrated a much better investment for the brand as a contributor to the portfolio.



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An understanding of both the competitive and holistic environments is indispensable for establishing a viable strategy to maximize ROI. Marketing plans depend on both the structure of competition within the market and the influence of certain marketing actions on brand performance. At the same time, there is distinction between specific factors that affect a brand and general factors that affect the entire category. Middlegame intends to bring this new standard of marketing analytics to life through the Competitive Interaction Analysis (CIA)<sup>®</sup> platform.

This new approach is really based on the unique combination of several foundation ideas with years of analytical support from the academic community. The Competitive Interaction Analysis (CIA)<sup>®</sup> platform actually integrates three modelling concepts to form a system that defines the competitive and holistic environment which influences the difference between marketing success and failure. This approach is more valid than the traditional brand management analytics for two reasons. First, the analysis captures the significant competitive interactions that Guadagni & Little (1983) described in their landmark paper:

**Although first priority goes to how variables of a product affect its own sales, marketing managers will increasingly need to understand how the product interacts with the category.**

This foresight originally manifested itself during the late eighties when computing power for marketing researchers was merely a dream, but has been embedded as one of the key pillars in the development of the Competitive Interaction Analysis<sup>®</sup> platform.

Second, the category approach captures the descriptive as well as predictive elements of marketing analytics. A common tendency among business managers is to expect nothing more than good forecasts. The ability to make accurate predictions of future sales and revenue is significant to a successful analytical marketing tool, but that it is not enough. Sophisticated marketing managers engaged in portfolio management will begin to use marketing mix modelling to project the consequences of any managerial intervention, whether by a fellow marketing manager, the retail partner, or the competition.



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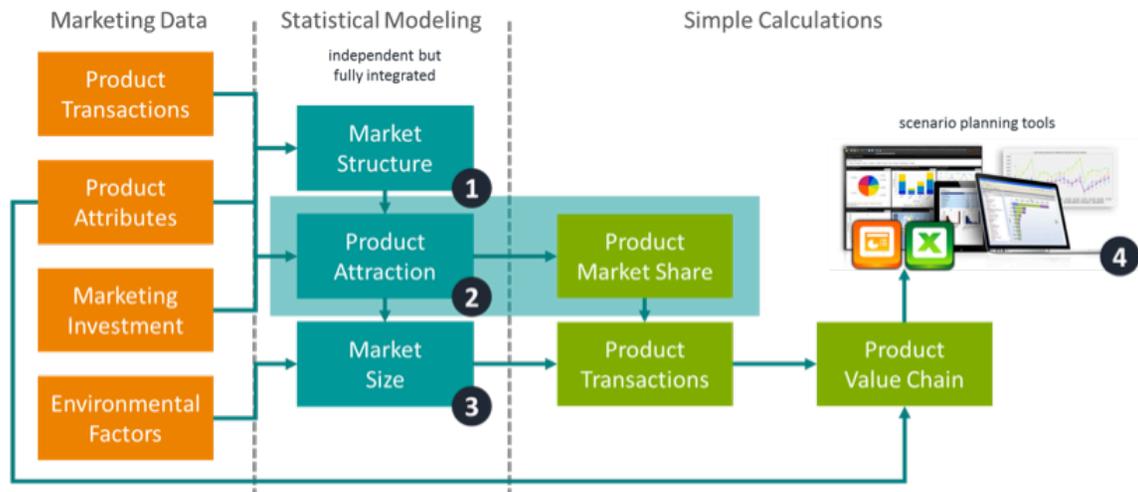
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Kirk (2002) defines marketing analytics as a system that merges several strategic marketing databases into a single datamart, develops a series of integrated models, and processes the results in a way that marketing managers can communicate profitable volume growth opportunities across their enterprise.

The core statistical modelling components take on a methodology similar to the “Mind of the Consumer” (MOC) approach explained by Lodish (2001). The MOC Model is a multinomial logit formulation explaining weekly shares for each store for each SKU in a category. It simultaneously handles marketing manager decisions regarding product attributes, price, promotion, and distribution in one modelling and estimation framework from a category or portfolio perspective and most notably helps evaluate product development or assortment projects where these initiatives can compete for resources to enable promotions and other marketing tactics.

An adaptation of these ideas as a system is discussed in detail below as Middlegame’s Competitive Interaction Analysis (CIA)<sup>®</sup> platform. An understanding of the competitive landscape and the ability for marketing actions to shift that landscape allows for the investigation of category management issues such as distribution levels, product assortment, item pricing, and promotional support in the context of scenario planning and simulation. The diagram below displays the modules of the system, while details of the various modelling components follow.



## Addressing the Structure of Demand

Some products interact heavily, others interact somewhat, while others interact very little and this can be explained by econometric analysis of shopper cross-price effects.

Initially, the Competitive Interaction Analysis (CIA)<sup>®</sup> platform provides the much-needed information on the structure of competition within the market. This idea is manifest as the Market Structure component based on Theil (1965):

$$w_{mst} \Delta \ln(q_{mst}) = \Theta_m \Delta \ln(Q_{st}) + \sum_{m=1}^J \pi_{mj} \Delta \ln(p_{jst})$$

*J* attributes levels

↑ Transformation Weight      ↑ Estimated Parameters

1. The relationship between value (currency) share, market size, and absolute price differentials establishes a hierarchy of competition or demand structure

2. It uses classical restrictions so that the estimates of the demand parameters conform to economic theory such as zero sum elasticities

3. The change in quantity demanded  $q_{jst}$  is a function of the change in total consumer spending  $Q_{st}$  and the change in pricing of all goods or services  $p_{jst}$  in the competitive set

This methodology is commonly known as the “Rotterdam Model” based on the location where Henri Theil and other econometricians developed the theory for the model. The Competitive Interaction Analysis (CIA)<sup>®</sup> platform uses the results of the Rotterdam Model to weight the interaction between products based the level of substitutability between the attribute options offered by the competitive products in the subsequent Attraction Model. For clarity, if an attribute is Flavor, then the potential attribute options might be cherry, orange, grape, lemon, etc.

Although these weights are only based on price interaction, the logic is consistent with the research presented by Bucklin, Russell, & Srinivasan (1998) that demonstrates the connection between the economic analysis of cross-price effects and the marketing analysis of brand-switching probabilities. In essence, their research explains that under certain realistic assumptions, the cross-price elasticities are exactly proportional to row-conditional brand-switching probabilities.



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## Measuring Transferred Demand and Change in Market Share

Market share is a function of the attraction shoppers feel toward alternative products as determined by the relative marketing efforts in support of these alternatives.

To understand switching behaviour, marketing analytics should be fully competitive in nature. This implies that the effects of the actions in support of one product should be analysed in conjunction with the market positions and actions of all competitors. In economic jargon, the marginal effect of a marketing variable is a function of competitor actions and their market shares. We more generally define this as transferred demand.

Next, the Competitive Interaction Analysis (CIA)<sup>®</sup> platform provides the much-needed information on the influence of certain marketing actions on brand performance. However, this evaluation of marketing effectiveness relies on the position of the competitive environment. These ideas are manifest as the Product Attraction & Product Market Share components based on Nakanishi & Cooper (1982):

1. Shopper attraction to a product is a multiplicative function of the varying competitive degrees of the  $K$  marketing mix elements logically consistent with the Multinomial Logit (MNL), solvable using least squares, and defined as the Multiplicative Competitive Interaction (MCI) model

$$A_{ist} = \prod_{k=1}^K f_k(X_{kist})^{\beta_k}$$

← Estimated Parameters  
↑ Transformation Processes including Integration of the Market Structure

$i$  = Unique Product Competitor  
 $S$  = Unique Geography  
 $t$  = Unique Time-Period



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2. Market Share  $S_{ist}$  is the weighted attraction relative to the weighted attraction of all  $M$  relevant alternatives

$$S_{ist} = A_{ist} \div \sum_{m=1}^M A_{mst}$$

An additional thought on competitive interactions suggests that some products are capable of exerting inordinately strong influence over the shaping of demand and competition, while other products are not. This observation illustrates the differential effectiveness of brands and asymmetrical competitive structures. Differential effectiveness among products reflects that the products have different degrees of effectiveness in carrying out their marketing activities. Recent advances in Hierarchical Bayesian Models, as outlined by Rossi, DeLurgio, and Kantor (2000), have made statistical assessment of differential effectiveness far more accessible.

Such differences are obvious, but differential effectiveness alone does not provide asymmetries. Asymmetries reflect differential cross effects among products. Therefore, the nature of competition suggests that products must be differentially effective. This is not only with respect to their own shares and sales, but also with respect to their ability to influence the shares and sales of other brands or products.

This argument revolves around discussions involving the Independence of Irrelevant Alternatives or IIA constraints of attraction models. Naert & Weverbergh (1985) present a detailed discussion of this criticism. To assure asymmetric response, several techniques, such as Hardie, et al. (1998) based on the attribute identification concepts of Fader & Hardie (1996) and the “zeta score” transformations of Cooper & Nakanishi (1983), provide a process to explicitly account for these differential cross effects in a parsimonious fashion.



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## Evaluating Incrementality and Change in Market Size

Expansion or contraction of the category is a function of the net attractiveness of all alternatives and any environmental (non-marketing) factors present to the shoppers.

Finally, the Competitive Interaction Analysis (CIA)<sup>®</sup> platform provides much-needed information on the influence of various marketplace dynamics based on the relevance of given markets and time-periods. This explicitly illustrates how the marketing activities forming one consumer experience relate to similar measures in other marketing exposure situations. Predicting sales and revenue requires more than the knowledge of market shares. To understand potential penetration and usage behaviour, marketing analytics must be holistic. In economic jargon, changes to the marketing mix impact both market shares and the product class as a whole. In more general terms, we call this category incrementality.

At the same time, variables exogenous to the marketing of products within the category also influence expansion or contraction of the category. This implies a distinction between specific factors that affect a product group and general factors that affect the entire category. This idea is manifest as the Market Size component based on Mason (1990):

1. Changes to the marketing mix impact both market shares within a shopper category and demand for the product class as a whole

$$Q_{st} = f_a \left[ \sum_{m=1}^M A_{mst} \right]^{\beta_M} + \sum_{e=1}^E f_e (Z_{est})^{\beta_e}$$

Results of Attraction Model

Estimated Parameters

Transformation Processes

$S$  = Unique Geography  
 $t$  = Unique Time-Period



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## Applying the Holistic and Competitive Approach

2. The expansion or contraction of the category  $Q_{st}$  is a function of the total attractiveness of the category  $A_{mst}$  [or  $M$  competing brands depicted below based on Bright & Kirk (1999)] and variables  $Z_{st}$  exogenous to the category, i.e. weather, holidays, local events, other categories, competing outlets, etc.

The role of marketing managers is changing from traditional brand management to category or portfolio management. This new perspective is not easy to accept at first glance, but the Competitive Interaction Analysis (CIA)<sup>®</sup> platform intends to meet these growing needs. To marketing planners that are used to analysing the performance of one product or brand at a time, the complexity involved in competitive interaction analysis might indeed look formidable. However, the objective of future marketing analytics is to simultaneously evaluate the effectiveness of marketing actions in both a competitive and holistic environment.

Therefore, the true difficulties lie in the perceptions of the marketing research community and not the availability of analytical approaches or computing resources for this decision support system framework. The academic community offered the theory and methodology to activate several decades ago. Technology to increase computational speed has surpassed the requirements of these approaches.

Regardless, traditional marketing analytics may sometimes represent a distorted view of the marketing environment for today's category or portfolio manager. In essence, the analyst implicitly assumes that the same brand or product group monopolizes the marketplace and therefore exaggerates the relationship between base and incremental sales. Category Management strategies based on this implicit assumption are bound to eventually present more questions than answers when the true structure of the market tends toward oligopolistic or monopolistic competition.



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The essential benefit of a category management approach and the Competitive Interaction Analysis (CIA)<sup>®</sup> platform is that it does capture the competitive interactions and holistic dynamics of the market. These relationships are what define the marketplace and all marketing elements within that arena. Initial capabilities consist of the following:

1. Isolate the marketing volume contributions of media, trade, and consumer promotions by product group or brand
2. Explain changes in volume between periods “due to” changes in marketing
3. Estimate marketing effectiveness by geography and channel
4. Identify competitive sources of volume for these marketing initiatives
5. Evaluate cost-efficiency for a product, brand, portfolio, category, etc. or any level where decisions are made
6. Provide “what if?” computer simulation results based on issue driven marketing scenarios



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Within this context, scenario planning and simulation that quantifies opportunities to grow a marketer's business or offset potential threats looming on the horizon have included:

1. Explain the portfolio impact of the sale or discontinuation of a brand or product group
2. Test a shift in promotional support from the established products in a brand to the innovative products new line extensions
3. Understand the ability of potential line extensions to grow a weakened brand without cannibalizing itself or sister brands
4. Investigate the longer-term impact of advertising as a function of the cumulative share of voice
5. Estimate a volumetric for brand equity by isolating the brand name from all other product attributes and marketing
6. Examine various spending allocation scenarios across a portfolio of brands to develop the next year's marketing plan
7. Evaluate the impact of a competitor's expected strategy to increase marketing spending following a hiatus period

Cooper & Nakanishi (1988) point out that relying solely on the brand or product management model is like taking a picture of marketing through a telephoto lens. While one brand may be in excellent focus, the foreground or background is either excluded or out of focus. As artistic as the picture may seem, far too much is ignored by this view. Therefore, category management and the Competitive Interaction Analysis (CIA)<sup>®</sup> platform offers a "wide-angle" picture to assure clear resolution of where a marketing organization is and where there is the greatest opportunity to grow their business profitably in a challenging environment.



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# References

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