



Data Science Playbook

Data science solutions for the world's leading brands.

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Introduction

As the data available to marketers continues to grow, companies are struggling under the weight of it all.

In an effort to demonstrate value, analyses are often carried out for the sake of it, and with disparate data sources, decision-makers don't trust what they see or can't easily identify what action to take. The winners are the high-performing organizations that have the ability to go beyond measurement, move data to insights, and into action.

Data science delivers these insights, unique to your business, helping to predict behaviors and enable personalization using data and algorithms - essentially delivering on the promise of this data-driven era. Bringing together statistics, mathematics, computer sciences, machine learning, and business strategy, data science surfaces useful insights from what was once just a giant pile of confusing data. Without applied data science, your data's not talking.

Cardinal Path's digital intelligence teams work with clients to apply data science techniques and answer their toughest marketing questions. Namely, *who are my best customers*, and *how do I get more of them?*

These data science solutions have evolved from the foundational analytics work that **Cardinal Path** is known for - establishing a solid analytics platform to collect, integrate, and view data, and creating a digital roadmap and measurement framework that will serve the organization for years to come - and create significant business value from data where before there was none.

This playbook represents some of the data science solutions we deliver across many of the world's leading brands.



Forecasting

Forecasting is a technique that can provide benefits to virtually any business.

While *forecasting* is not new, *machine learning techniques* are, and using these tools you can forecast just about anything - from information about sales, marketing, customers or operations. Cardinal Path uses a variety of statistical and machine-based learning techniques that will let you tap into internal and external data trends, and increase the efficiency of your marketing approach by projecting expected inputs and results over time. Extract forecasts for any time series (daily sales, yearly revenue, website actions, etc.) to best suit your objectives.

The ability to look around corners

Begin forecasting your KPIs to see what the future holds based on your past experiences.

If you know what you might expect to see for revenue or web actions, you can use this information for more precise planning. Answer business-critical questions such as:

“If we increase spend, will it raise the number of actions? Can we beat the forecast by adding new efficiencies into the website or media spend?”

Compare forecasted values to actual values as they come in:

- How accurate is the forecast based on your historic trends and decisions?
- Did you exceed the forecast because of new website changes or media partners?
- Were you unable to meet the forecast due to economic factors?
- Where accuracy falters, we take an iterative approach to try to change the forecast to account for new strategy changes

Our forecasting solutions account for both online and offline actions, and use any available data sets including time series, user actions, or attributes in order to glean accurate forecasts.



Forecasting

Case study: Major after-market automotive parts retailer

This client wanted to predict calls, appointments and quotes at a channel level. With the code in place, we were able to test a wide range of different algorithms and iterate very quickly. We updated the model on a monthly cadence, and constantly updated the inputs to improve model accuracy, for example when the media spend changed. Cardinal Path was able to improve model accuracy by 30% through moving from a traditional statistical forecasting approach to using machine learning techniques.

Cardinal Path's forecasts were integrated into weekly Tableau dashboard reporting. This allowed the client to understand what expected outcomes would look like over the short to mid term, helping with budgeting and strategic investments, internal alignment and operations.

Resources

[Solution Sheet: Forecasting](#)

[Blog Post: Forecasting with machine learning techniques](#)



Predictive Dashboarding

A custom-made predictive dashboard using Tableau and R can transform your business.

It cuts cost and time, and provides you with deep insight into your data with no additional software costs. If you're already harnessing the transformational power of advanced data visualization platforms with Tableau, you know how essential it is to quickly and easily share data and insights across the enterprise. With predictive dashboarding, we embed predictive algorithms inside any dashboard to unlock your decision making power.

This solution uses R, one of the most powerful programming language and software environments data scientists use for statistical computing and graphics, to take your data collection, reporting and analysis to the next level. When integrated with Tableau, R turbo-charges an organization's ability to execute high-level data analyses for predictive analysis, data mining and complex algorithm execution.



Predictive Dashboarding

A seamless process for heightened decision-making

Your predictive dashboard begins with an in-depth analysis of your current data strategy, business goals, key performance indicators, marketing programs, and a validation of your data sources.

- Our kick-off meeting will serve to gather and review relevant documentation, receive appropriate access rights, meet with the Project Team to review desired objectives, validate expected outcomes, and review the project plan.
- Cardinal Path then creates a custom roadmap for setting up R in your organization's computing environment.
- The process ends with a walk-through of your technology and a knowledge transfer. We will ensure a smooth integration by giving you one of two options: taking the developed dashboard and algorithms in-house, or relying on Cardinal Path for ongoing maintenance, optimization, and execution.

Resources

[Solution Sheet: Tableau and R Custom Integration](#)

[Webinar: Marketer's guide to digital dashboards: surfacing insights for business impact](#)

[Blog Post: Dashboard best practices](#)



Lifetime Value Analysis

*If **80%** of your sales come from **20%** of your customers, you need to know who those high-value customers are, and what makes them behave the way they do.*

A Lifetime Value Analysis predicts how much value a customer provides across their entire lifetime (or, the total net profit from the entire future relationship with a customer), rather than just the value you obtain from their first purchase. This can be calculated for customers segmented by certain values (e.g. segmented by spend levels, gender/age/demographic information, first touch marketing channel, and so on) to find which demographics and/or marketing channels lead to higher lifetime value.

Cardinal Path's expertise in predictive analytics and data analysis uncovers the estimated revenues over a customer's lifetime. This lifetime value (LTV) analysis helps you to:

- Attract customers with higher LTV
- Optimize the experience of high LTV customers to ensure they stay with your brand
- Determine optimal customer acquisition costs
- Incorporate personalization to serve optimal website experience based on LTV

Using sophisticated data science, machine learning, and financial techniques, we develop an approach that is unique to your organization. You will gain a deeper understanding of your customers, get practical recommendations for next steps to act on these insights. Realize the full potential of your customer base and discover how to attract not just more customers, but the *right* customers.



Lifetime Value Analysis

Case study: U.S. education client

Cardinal Path completed a customer lifetime value project for a U.S. education client seeking to understand how to acquire students who provided the most value of the lifetime of their educational careers. Cardinal Path's analysis found that very specific marketing channels showed good initial conversion rates but were attracting students who provided limited value and dropped out after short time periods. Through an in-depth analysis of multiple data sets, a more appropriate mix of marketing channels was found to improve long term ROI.

Resources

[Solution Sheet: Lifetime Value Analysis](#)

[Blog Post: How to best use customer lifetime value analysis results](#)

[Case Study: U.S. Education provider applies customer data to optimize spending](#)



Customer Segmentation Analysis

Understanding your customers gives you a competitive advantage.

Cardinal Path's Customer Segmentation Analysis helps you to target and engage specific groups in order to maximize every dollar you spend to acquire a customer. Using deep expertise in customer clustering, segmentation, and data analysis, this solution allows you to:

- Capture and make sense of the vast customer information available to you
- Improve relationships with customers by segmenting and personalizing messaging, services, and offers
- Cut down on advertising dollars wasted on the wrong audience
- Improve marketing productivity, effectiveness, and ROI

Cardinal Path can help to determine the most effective type or combination of segmentation techniques to achieve the best results for your business. We can employ both machine learning and data science techniques in addition to statistical approaches, and work from myriad data sources including CRM, web analytics, or third party data and surface meaningful insights to inform your marketing approach.

Case study: Cluster Analysis

Cardinal Path carried out an internal cluster analysis based on this client's CRM data. This analysis included both transactional records, and demographical information which allowed for an analysis of major customer segments according to who they were and what they had previously purchased.

Resources

[Solution Sheet: Customer Segmentation Analysis](#)



Churn Analysis

When you know who your at-risk customers are, you can take steps to retain them before they stop engaging with you.

This technique assigns a score to every customer in order to determine their likelihood to churn so you can quickly address your most ‘savable’ customers and turn them into your most profitable ones.

Acquiring a new customer costs between five and 25 times more than keeping an existing one. Increasing your customer retention rates by just 5% could increase your profits by up to 95%.

Cardinal Path’s well-proven Churn Analysis solution allows you to:

- Segment customers with similar, expected behaviors
- Target “saveable” segments with personalized retention efforts/campaigns
- Identify the customers that will generate the most profit

Once we understand your specific needs, we can create a unique definition of what “churn” means for your business, identify the personalized customer data to work with, and what data we can add to lend depth and dimension to your analysis. We will create a model which identifies churners and non-churners, run the analysis, and present you with results and recommendations for how to make the most of these identified groups of customers.



Churn Analysis

Case study: High churn in subscription-based organization

Although almost all industries are impacted by churn, subscription service-based companies experience it at the highest rates. Customers can choose when they want to cancel a contract at any time, while companies struggle to hold onto them as best they can.

Cardinal Path ran an in-depth project which analyzed a telecommunication company dataset. Our data scientists prepared data for an exploratory analysis which determined which factors could be influencing churn. Once we deduced which features were predictive of a customer ending a subscription, we were able to run the model, identify at-risk customers, which enabled the client to serve up targeted messaging and special offers to proactively reduce the risk of customer churn.

Resources

[Solution Sheet: Customer Churn Analysis](#)

[Blog Post: Predictive Analytics: 3 case studies in seeing the future](#)



Diminishing Returns Analysis

It's the age old question of "which half of my marketing budget is being wasted?"

The more you spend, the more likely you will reach a point of "diminishing returns".

- Ad spend doesn't provide the same lift indefinitely. For each channel of ad spend, there is a "point of diminishing returns": that is, a point where your \$1 of ad spend results in less than \$1 in revenue.
- Identify the point at which your ad spend is not providing as much benefit. Use this to help with optimal budget allocation, so no advertising efforts are wasted.
- Compare points of diminishing return across brands, products, channels and so on. Use this to compare the effect of ad spend on different segments, and further optimize your budget between them.

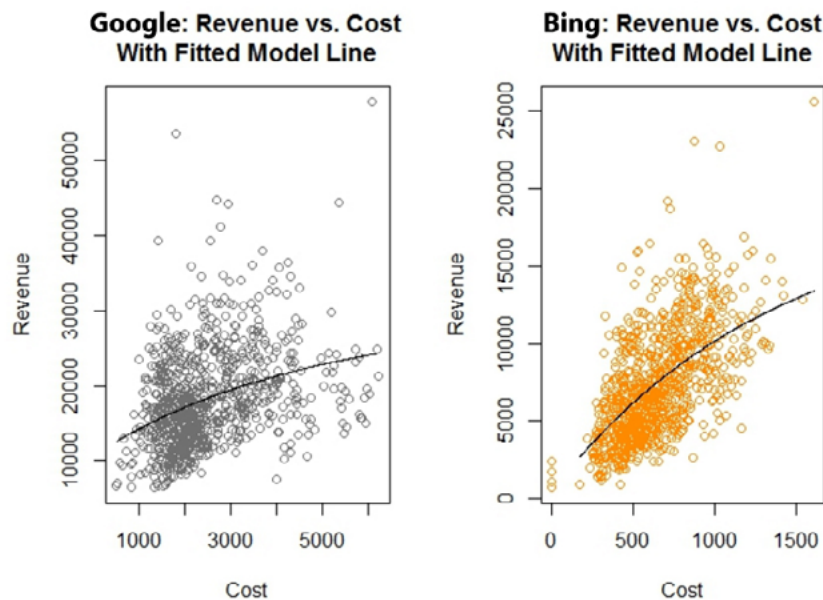
With this solution, we identify the tipping point of diminishing returns to help you optimize your ad spend across multiple brands and platforms, based on historical data. We derive your 'tipping point' (ie. when the last \$1 of ad spend results in less than \$1 of revenue) using sophisticated modeling carried out in R (statistical computing environment). A Diminishing Returns Analysis is ideal if you:

- Want to know at what point your spend stops bringing in as much as it puts in
- Have had historically high ad spend variability, and want to know where in that variability is the optimal spend
- Have someone else managing your ad spend and want an unbiased data-driven analysis of how much to spend
- Already have Cardinal Path managing your ad spend but would like assistance to determine an effective strategy for spending more
- Would like to optimize the spend across two similar ad partners (e.g. Bing Ads vs. Google Adwords)

Diminishing Returns Analysis

Case study: diminishing returns on search engine marketing

Cardinal Path collected historic Google Adwords and Bing Ads data to fit a non-linear diminishing returns model for a major retail chain. After finding the model that provided the best fit for the data, Cardinal Path was able to identify at what point ad spend stopped achieving optimal return on investment for each brand. This showed the client that there was room for growth in ad spend, and also provided suggestions on what the optimal split between the Google Adwords and Bing Ads would provide the highest ROI based on the model.



Resources

[Blog Post: Econometric studies measure the sales impact of YouTube](#)

[Whitepaper: Top 100 drivers of advertising profitability](#)

Uplift Modeling

Discover the true ROI of your campaigns, attribute sales, and determine which sales closed because of the campaign, so you can target more customers in future initiatives.

There are two reasons to conduct an uplift analysis:

- When measuring a campaign's impact and;
- For targeting prospects with a high likelihood of conversion.

Uplift modeling helps you measure the true impact of campaigns, and analyze the results to identify statistically significant impact.

We use machine learning techniques to estimate the increase in conversion rate, revenue, or any other conversion goal which the campaign drove at the user level. We also profile the results in order to come up with a description of who responds best to advertising campaigns such as this.

Segmentation of customers by likelihood to buy as a response to advertising or offers:			
Buy if do receive an offer	No	Do-not-disturb	Lost causes
	Yes	Sure things	Persuadable
		Yes	No
Buy if don't receive an offer			



Topic Modeling Analysis

Topic modeling lets you to tap into advanced social listening, so you can monitor digital conversations across all mediums and understand what people are saying about a brand and industry.

Social media, peer-to-peer sharing, and user-generated content has given way to vast data sets that contain potentially useful insights into the perception of your brand and products.

By effectively grouping phrases, sentences, emails, and other forms of text under the umbrella of a common topic, and combining these with network visualization, you get powerful insights that may otherwise be lost due to the nature of unstructured data.

Topic modeling can help you to:

- Identify major reoccurring topics
- Discover the most talked about aspect of a campaign or website
- Identify emerging trends related to your website
- Understand changing interest levels on a topic over time
- Create keyword targeting strategies

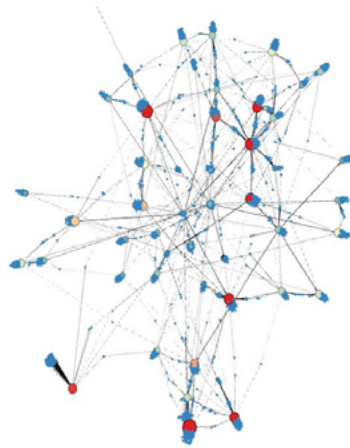
A Topic Modeling Analysis from Cardinal Path lets you surface what's important from within reviews, comments and customer emails to find major themes that can help to guide your marketing efforts.

Topic Modeling Analysis

Case study: website forum posts

Cardinal Path conducted a topic modeling analysis of a web forum by first grouping the posts into related subjects. This created a network visualization that could be explored as a graphic representation of the relationships between posts.

The modeling was able to uncover relationships between specific posts, suggesting related chains of topics that could be leveraged for ongoing social media optimization for specific audiences. As a follow up, the model was ingested into a dashboard format which allowed for ongoing reporting.



*Example of a network analysis: documents (blue nodes) grouped to topics (red nodes).
Some documents link to only one topic, while others group to multiple topics.*

Resources

[Solution Sheet: Topic Modeling Analysis](#)



Purchase Intent Analysis

Marketers need to know what are the most meaningful, revenue-driving online actions that take place during the customer's path to purchase.

A Purchase Intent Analysis is a powerful tool which combines the probability that a consumer will purchase a product, based on their website actions, with a quantified dollar value for that action.

Having a deep understanding of purchase intent will give you unprecedented insight into what behaviors on your website lead to both online and offline sales. Plus, the ability to assign a true dollar value to website actions means you can identify preset targets for your media agencies, giving clear direction for optimizing media buys.

Cardinal Path's Purchase Intent Analysis activates your data for business benefits such as:

- Optimized marketing campaigns towards high-value website actions that are highly predictive of future revenue both on- and off-line
- Insights to prioritize and guide your testing plans in order to continually optimize performance and focus on the areas that provide the best return for your effort
- Customized, targeted messaging across all of your marketing assets to promote activities that are likely to create future value



Purchase Intent Analysis

Case study: U.S. Cellular aims to understand the role of its website

When U.S. Cellular was trying to learn what role its website was playing in driving in-store sales, and how to prioritize their upcoming site optimizations, they turned to Cardinal Path for a Purchase Intent Analysis.

After a deep dive into site behaviors and sales, U.S. Cellular learned that it was not their previously assumed metric of “store locator” searches that was best correlated with new sales, but visits to the “offers” section of their website. Armed with these insights, initial testing has already driven a 23% increase in visitors to the “Offers” section of the website and a 61% boost in customer lifetime value by improving the blend of higher-value customers in the mix and increasing response rates.

Once U.S. Cellular understood the behavior that was most likely to lead to a purchase, they were able to prioritize testing and messaging optimization to drive sales – online and offline.

Resources

[Solution Sheet: Purchase Intent](#)

[Blog Post: Purchase Intent Webinar: Q&A](#)

[Webinar: Purchase Intent: Understanding customers to drive sales](#)

[Case Study: Purchase Intent Analysis pays off for U.S. Cellular](#)

[Marketing Land Article: How to drive real, measurable value with purchase intent analysis](#)



Channel Contribution Analysis

Do you know which marketing mediums have a hand in closing the most deals, and how much overall value they add to your business?

Answer your big marketing questions, such as: “*Where do my high-value customer journeys begin?*” and, “*Which channels are pushing them to conversion?*”. With Cardinal Path’s Channel Contribution Analysis, you will get a customizable, data-driven model for converting channels.

Adjust your advertising spend to achieve the best results possible by understanding the precise dollar value represented by each marketing channel, at every stage of the customer journey. Use these specific insights to target customers with highly customized, timely, and relevant content.

Cardinal Path will help you to understand how much to spend on each media channel, and where to adjust marketing messages for the biggest impact.

Case study: Education provider

Through an assessment of data from this education provider’s training website, organic search revealed itself to be a great introductory touchpoint, adding considerable value when it was the first touch in a user’s path. In contrast, display traffic didn’t help as a ‘closer’ to user paths as channel value decreased when display was in the final position. These findings helped to inform strategic investments by channel and informed the retargeting strategy of the organization, who consequently reduced investment in display media for retargeting.

Resources

[Solution Sheet: Channel Contribution Analysis](#)



Attribution Modeling

Attribution Modeling is one of the most precise ways to understand your digital audience.

Attribution modeling can leverage web analytics, ad servers or log files to map precise user interactions, leading to specific models of user interaction with marketing channels and assets.

Data driven attribution works best for the collection of data from online channels and for the ongoing collection and refreshing of models, so if frequent report updates are required, attribution modeling is the ideal solution. Depending on the attribution provider, tags may be used to collect data or, attribution may work with data collected by your existing analytics platforms.

With a never-ending supply of online advertising, attribution modeling helps you understand which of your advertising placements are providing you with value and contributing to online conversions.

An Attribution Model Analysis from Cardinal Path is ideal for organizations that want to move beyond last-touch attribution, and learn how much each channel is worth with respect to its placement in the conversion path to optimize budget spending on paid search, display, email campaigns, and more.

Resources

[Blog Post: Data driven attribution or media mix modeling?](#)

[Blog Post: Attribution and Goodhart's Law](#)

[Blog Post: Assessing a data driven attribution solution](#)



Advanced Campaign Analytics

Make better decisions about future campaigns.

This solution provides a simple and actionable report that demonstrates which campaign elements worked, and which didn't so that you can invest in a media mix that delivers the highest possible return.

With Advanced Campaign Analytics by Cardinal Path, you are optimizing your campaigns based on specific, rigorously tested and validated insights into campaign elements. Quantify your campaign performance in the context of your ongoing media and other marketing efforts to learn:

- Which aspects of the campaign had the most impact?
- How much did each element contribute to overall performance?
- What combination of activity drove the best results?
- Were campaign ROI or target goals met?

After reviewing your targeted campaign, we use decision tree and regression models to construct a custom model to determine behavior changes, test individual campaign elements, and rank them from most to least impactful. You'll get an easy-to-understand report and summary, designed to help you tweak your investments in media mix elements for the best possible return on investment.

Resources

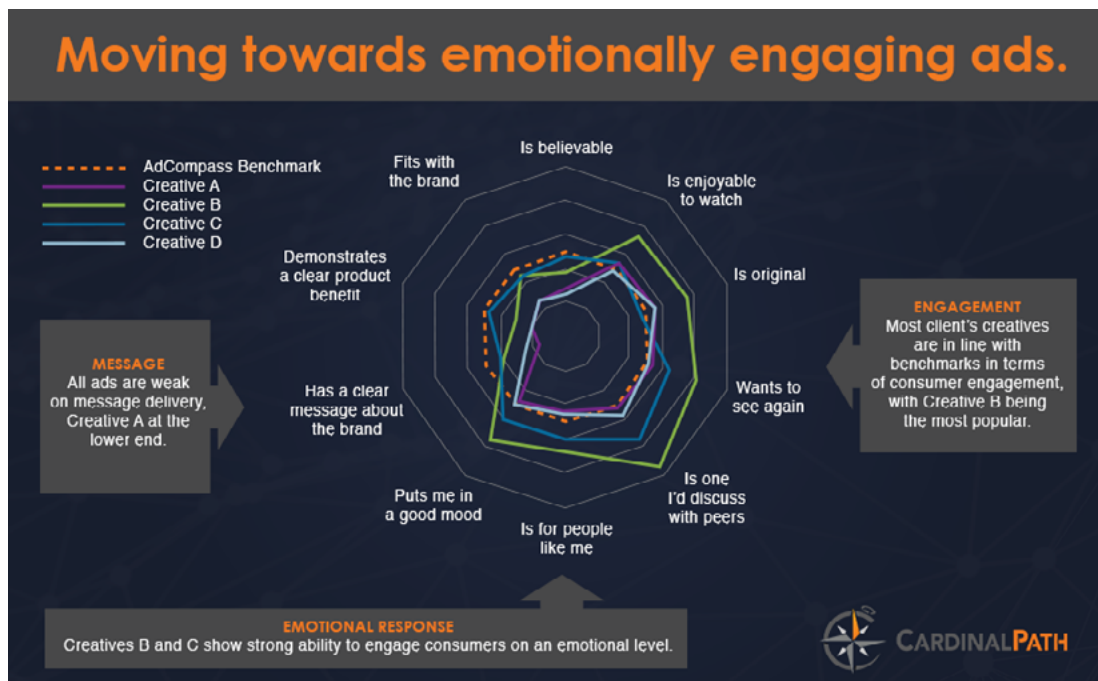
[Solution Sheet: Advanced Campaign Analytics](#)

AdCompass

Creative execution is one of the most powerful ways to improve the profitability of your advertising and it is one of the few factors that is completely within your control.

Our AdCompass approach, which combines primary consumer research with econometric modeling, helps you measure and optimise the impact of your creative, which could improve your ROI by at least 12 times.

- Econometrically derived advertising impact on sales has been linked with key consumer measures
- Differentiation is a key determinant of sales driving ability
- Key drivers also include a number of engagement and involvement measures



Media Mix Modeling

This well-proven technique quantifies both short and long-term advertising impacts on ROI.

The results can be benchmarked against learnings from businesses in equivalent markets and industries, for a truly comprehensive understanding into how channels are performing.

We kick things off with a series of pre-modeling interviews to gain a clear picture of the business and factors that drive channel performance. These factors are key inputs into the modeling task, to find true drivers and build organizational buy-in to model outputs. Model development leads to an understanding of advertising response curves, saturation points, the 'decay' of advertising campaigns and halo effects between brands and advertising efforts.

Case study: Higher ROI with video

We have consistently found higher ROIs from online video as compared to TV, and these findings were replicated in a [recent study by Google](#). Using traditional industry-accepted media mix modeling techniques, and supplementing them with our [Ecosystem Modeling](#) approach, allowed us to segment YouTube from other online video platforms. The results were consistent with those we've uncovered in the past: higher YouTube ROIs with optimizations across a range of clients, suggesting spend should be 2- 6x higher.



Polestar

This media budget optimization software uses both econometric modeling outputs and benchmarks to achieve the right balance of speed and accuracy.

Polestar helps an organization:

- Achieve the best possible ROI by recommending the optimal spend and allocation for a media plan.
- Optimizes across geographies, brands, channels, and time.

Implemented for some of our biggest global clients, PoleStar has been instrumental in driving ROI improvements by up to 100%.

Case study: Steadying the ship in a declining market

This world-renowned brand wanted to redistribute its media spend across their global portfolio to drive sales in a declining market. Using PoleStar we:

- Re-allocated budget across 7 brands within 12 markets
- Identified the optimal media mix and weekly phasing
- Used client's modeled markets/brands and our benchmark database to forecast the effectiveness of markets and channels that had not been measured historically.
- Provided long-term investment recommendations to drive sales – advertising the Masterbrand drives higher sales halo effects than individual brand advertising.

The outcome was an 85% improvement in ROI and \$42MM in incremental sales value identified.



Ecosystem Modeling

Ecosystem Modeling provides a holistic evaluation of marketing across paid, owned, and earned channels.

This solution allows you to address your key challenges such as:

- Determining what role digital channels interact in driving sales
- Discovering how effective owned and earned activity is in amplifying the impact of paid media
- Evaluating the optimal allocation of media budget across paid, owned and earned channels

Traditional marketing mix models are designed to measure the impact of paid media on sales. However, there is an increasing need to understand the role of owned and earned media in the consumer's path to purchase. Cardinal Path's Ecosystem Modeling Analysis provides a holistic evaluation of marketing across the consumer journey by incorporating paid, owned and earned channels.

We use ecosystem models where owned and earned KPIs for the specific brand are introduced in the analysis alongside paid media and sales. This approach allows us to measure the interactions between the POE marketing channels and put a commercial value on a visit to the website or a brand mention on a blog or social network site.

Learn more!

Contact Cardinal Path today to talk about a data science solution that suits your unique business needs.

480.285.1622

info@cardinalpath.com

www.cardinalpath.com