



AND



ROI/Attribution Providers

A Comparison of Leading Providers of Media Performance Analyses



RESEARCH PROVIDED BY



Participants

MARKETING MIX MODELERS WITH ATTRIBUTION PRODUCTS

Analytic Partners
in4mation insights
IRI
Marketing Evolution
Millward Brown, a Kantar subsidiary
(m)Phasize, a Publicis company
Neustar
Nielsen

ATTRIBUTION SPECIALISTS WITH CROSS-PLATFORM PRODUCTS

Conversion Logic
Convertro, owned by Oath, a subsidiary of Verizon
C3 Metrics
Google Attribution 360
Merkle, owned by Dentsu Aegis
Visual IQ, a Nielsen company

TELEVISION OR DIGITAL ATTRIBUTION PROVIDERS

Data + Math
iSpot
Placed
Samba TV
SMI
TVSquared
WyWy, owned by TVSquared

SINGLE SOURCE PROVIDERS

Concentric
IRI Lift
Nielsen Catalina
Oracle
TiVo

Please note that providers have been grouped according to their core, or original, offering – a somewhat subjective grouping. Most providers are constantly refining their offering, so this view of their products may be incomplete. We encourage readers to reach out to the providers for the most updated information.

Introduction

CIMM/4A's 2016 study of current practices in attribution and marketing mix modeling identified a range of analytics providers using a variety of data sources and techniques.

It's a complicated and frequently overwhelming space for the industry.

A comparison of the companies, offerings and approaches will help buyers become more comfortable with the providers and their techniques.

Overview

This is a comparison of current offerings in digital, cross-platform, multi-touch and television attribution and marketing mix modeling companies available in the US market today. It is descriptive, not evaluative.

In the guide, providers are grouped according to their main offerings (Marketing Mix Modelers, Digital/Television Attribution Specialists, Single Source Providers), although it's important to recognize many providers offer a suite of analytic products depending on the needs of the client and availability of data.

The list of providers and the variables with which to compare providers were based on recommendations from CIMM and the 4A's Media Measurement committee.

Provider Comparison Contents

Company Positioning

Short overview of company's main reason for being

Primary Offerings

Rough share of business from attribution and marketing mix projects; can exceed 100% due to multiple offerings; in some cases percentages unavailable

Approach

Statistics most commonly employed (see glossary)

Use Cases

Applications of the analytics in digital, cross-platform or full marketing mix assessment

KPIs Delivered

Online traffic/conversion, offline retail traffic/sales and brand metrics

Optimization Areas

Digital or cross-media channels, across sales and brand metrics

Media Covered

Full range of media vehicles included in the models

Source of Television Data

Modelers have a range of television viewing data, including Nielsen, Smart TV and set top box data

Level of Media Granularity

Level of detail at which the modeler works

Model Inputs

Other marketing variables (e.g., price/promotion), external influences (e.g., weather, etc.) and competitive behavior modeled at a similar level

Advertising Parameters

Diminishing returns, adstock, long-term effects, media interactions and halos, baseline and incrementality

Data Integration Methods

Process for combining cross-platform datasets in the model

Collinearity Work-Arounds

Statistical approach to teasing out events or investments that occur at the same time

Model Validation

Method for determining the accuracy of the model findings

Data Delivery Options

Dashboards, inflight-optimizers, programmatic media, data feeds to other applications

Cycle Time

Typical model update intervals

.....
An exhaustive glossary of key terms begins on Page 33.



Marketing Mix Modelers With Attribution Products

Marketing mix modelers (MMM) are the originators of ROI modeling, with the first commercial firms offering these services in 1989. Ironically, both Marketing Management Analytics (MMA) and Hudson River Group, the two veterans of 1989, declined to participate in this study. Accenture, the consulting firm with a significant analytics practice, is also not included here for the same reason.

MMM firms originally built regression models at the “market” level — DMAs or other sales territories — with observations by week. Today, they all offer more granular analytics with finer geographies and shorter time periods, and have also developed attribution capabilities within their MMM framework, “Unified Models.” Simple linear regression has given way to more advanced statistical techniques, frequently hierarchical Bayes (see glossary). However, the regression model built on weekly DMA level data is still a common denominator.

Marketing mix models typically incorporate all of the controllable (trade spending, for instance) and uncontrollable factors (weather, for instance) of the marketing mix, and produce a sound estimate of the

sales contribution and ROIs of each. As a result, they provide valuable strategic insights. The “negative” often associated with these models is the flip side: They require 2-3 years of historical data, making them backward-looking, and are not sufficiently granular to drive tactics.

Marketing mix models are also able to estimate both the short-term and long-term (quarterly, annual or multi-year) effects of advertising. However, this is not frequently done since advertisers focus almost exclusively on short-term performance.

Not all of these modelers are the same. Nielsen and IRI have exclusive access to their store-level data, which provides the perfectly defined view of retail promotion tactics so important to CPG marketers. Marketing Evolution and Millward Brown both have consumer-level techniques that look below the market level, more like attribution modelers. But their ability to provide a more comprehensive view of the marketing mix gives us reason to group them here. The unique benefit of these approaches is that they can be both strategic and tactical, and offer insights into consumer segments.

Analytic Partners



PRIMARY USE CASE — Measure, forecast and optimize the impact of marketing investments, short-term and long-term for multiple KPIs, including revenue, profit, brand equity, acquisition, unique visits, store traffic, etc.

PRIMARY OFFERINGS

Marketing Mix Models.....	24%	TV Attribution	30%
Digital Attribution.....	8%	Unified Models	60%
			(20% location)

APPROACH

Integrated store/market/geo/segment-level econometrics and person/user/HH-level discrete choice attribution models using machine learning

MEDIA COVERED

All addressable and non-addressable paid, owned and earned media that influence performance, such as TV, Radio, Magazines, Out Of Home, Mobile (Display, Video, Search, In-app, Social), Digital Display, Online Video, Native Ads, Social, Paid Search, Organic Search, Word Of Mouth, Influencer Programs, PR, etc.



SOURCE OF TV DATA
Rentrak, Kantar, NMR

LEVEL OF GRANULARITY

Geography varies by media type, person/user/HH, DMA, Zip, daily, weekly or event-level media type, genre, sub-type and property; creative at the individual execution-level. Outcomes: customer segment, market or store-level

DATA INTEGRATION

CRM data linked by person/customer; non-addressable media aligned on geography and time, partner with panel providers, device maps and onboarding partners

COLLINEARITY WORKAROUND

Granular data, raw data transformation, experimental design, statistical techniques

MODEL/RESULTS VALIDATION

Normative database and model fit statistics; Experimental Design Holdout, Forecast Accuracy



CYCLE & REFRESH TIMING

Real-time (daily and/or weekly) data updates and weekly, monthly or quarterly model refreshes

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

in4mation insights



PRIMARY USE CASE — Marketing mix — returns on marketing investments, resources allocation, profit optimization, sales performance and change drivers with highly disaggregated data.

PRIMARY OFFERINGS

Marketing Mix Models.....	75%	TV Attribution	0%
Digital Attribution.....	0%	Unified Models	0%

APPROACH

Econometrics (Hierarchical Bayesian and network models) integrating behavioral and attitudinal metrics, geo-location and other metrics

MEDIA COVERED

Digital impressions by DMAs, device types, Display/Video, and campaign. TV and Radio by dayparts, day of week, positions in break, program genre, source and spot length, Magazines and OOH

SOURCE OF TV DATA
Client provided

LEVEL OF GRANULARITY

Geo-location (e.g., store) up to national, daypart, daily, weekly or monthly, media type, genre, source, and spot length; campaign-level; outcomes at national, market, or store-level

DATA INTEGRATION

Store and market-level data are harmonized by time and geography

COLLINEARITY WORKAROUND

Bayesian priors, Bayesian variable selection methods and other related techniques

MODEL/RESULTS VALIDATION

Holdout samples and model fit statistics

CYCLE & REFRESH TIMING
Typically quarterly

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

IRI



PRIMARY USE CASE — IRI provides a full suite of solutions — both marketing mix modeling and attribution solutions as well as matched market or matched store testing. Focused on the CPG industry.

PRIMARY OFFERINGS


Marketing Mix Models.....✓ TV AttributionN/A
 Digital Attribution.....✓ Unified Models✓

APPROACH

Marketing mix modeling and attribution studies

MEDIA COVERED

TV, Digital, Social, Print, Radio, Mobile and OOH



SOURCE OF TV DATA
Rentrak or client

LEVEL OF GRANULARITY

Data at store, zip or DMA level

DATA INTEGRATION

Ingests, normalizes and harmonizes disparate datasets within their data platform.

COLLINEARITY WORKAROUND

Correlation analysis prior to modeling and store-level granularity, data grouped as needed

MODEL/RESULTS VALIDATION

R-Squared, MAPE, Durbin Watson, Pvalue, internal benchmarks



CYCLE & REFRESH TIMING
6-8 weeks

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects (On demand)
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Marketing Evolution



PRIMARY USE CASE — Holistic understanding of all business drivers and detailed in-campaign pricing, message, targeting, and media mix optimization. Brings together marketing mix, attribution and brand tracking in one platform.

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A** TV Attribution **N/A**
 Digital Attribution..... **N/A** Unified Models **100%**

APPROACH

Integrated econometrics, person/HH-level attribution



SOURCE OF TV DATA
 Media Agency, Smart TV and Set Top Box

MEDIA COVERED

Online (Desktop and Mobile) by Display, Video, Search, etc.; Traditional (TV, Magazine, Newspaper, OOH, Radio, etc.); as well as Owned (Email, Direct Mail, etc.)

LEVEL OF GRANULARITY

Every impression: Log-level media files that capture every digital impression. Person-based analysis measuring every individual impression of offline media, including every TV program, every out-of-home billboard, every direct mail piece, every radio station, etc.

DATA INTEGRATION

Merged at the individual level

COLLINEARITY WORKAROUND

Experimental design

MODEL/RESULTS VALIDATION

Experimental design



CYCLE & REFRESH TIMING
 Weekly reporting cycles

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Millward Brown, a Kantar Subsidiary



PRIMARY USE CASE — Short-term sales and brand outcomes with brand health metrics and digital and cross-media, consumer journey and digital engagement lifts.

PRIMARY OFFERINGS

Marketing Mix Models.....	70%	TV Attribution	5%
Digital Attribution	20%	Unified Models	5%

APPROACH

Integrated macro-level marketing mix models, micro-level multi-touch attribution and agent-based models



SOURCES OF TV DATA
Media Agency and Samba

MEDIA COVERED

All paid, owned and earned digital media; tagged/coded elements of digital advertising (media and content).

All offline media, direct marketing, shopper marketing and events.

LEVEL OF GRANULARITY

As granular as possible. Media type and sub formats such as Property, Daypart, targeting method, CPC versus CPM, and individual-level data across time and geography

DATA INTEGRATION

Data fusion and proprietary algorithms for matching and de-duping. Vendors also do match backs using blinded PII data

COLLINEARITY WORKAROUND

More granular data, Nested hierarchical models

MODEL/RESULTS VALIDATION

Test/control or advanced simulations



CYCLE & REFRESH TIMING

From measurement to reporting: typically 1-2 months; daily data refresh and real-time reporting

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

(m)Phasize, a Publicis company




PRIMARY USE CASE — Sales and business drivers who optimize financial resource allocation, forecast future marketing plans, validate media strategies and re-allocate budgets.

PRIMARY OFFERINGS

Marketing Mix Models.....	70%	TV Attribution	N/A
Digital Attribution	25%	Unified Models	✓
	(3/4 with retail traffic KPI)		

APPROACH

An integrated suite of approaches, including MMM, MTA and Digital Attribution, based on a variety of statistical techniques



SOURCE OF TV DATA
Nielsen

MEDIA COVERED

TV, Print, Radio, OOH, PR, OLA, OLV, Search, Social; report both paid and non-paid digital channels and content (from log files). Report at granular level within the ad server (e.g., site, strategy, device type, placement, audience, creative concept, version, keyword, etc.).

LEVEL OF GRANULARITY

Publisher, Campaigns, Dayparts, Origination, Unit Length, Genre, Network Types

DATA INTEGRATION

Utilize first-, second- and third-party data, including in-store sales data. For outside integrations, Digital (m)PACT ingests unified data sets directly; no need to tag or manage integrations

COLLINEARITY WORKAROUND

Variable specification and transformation

MODEL/RESULTS VALIDATION

Structured and randomized holdout samples

CYCLE & REFRESH TIMING

Most start with monthly reports, then move to semi-monthly and then weekly

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Neustar


neustar PRIMARY USE CASE — Portfolio-level marketing optimization with customer-level attribution. Budget allocation, driver analysis, long-term and short-term balance return on media performance.

PRIMARY OFFERINGS

- Marketing Mix Models.....✓
- Digital Attribution.....✓
(some location)
- TV Attribution.....✓
- Unified Models.....✓

APPROACH

Econometrics, especially Hierarchical Bayes. Cross-Channel Attribution via Logit models at the person/HH level. TV attribution based on immediate response



SOURCES OF TV DATA
Rentrak, Simulmedia

MEDIA COVERED

Online and offline media, addressable and non-addressable. Search, Display, Video, Email, Affiliate, Social, Mobile, Direct Mail/Catalogue, TV, Radio, Magazine, Newspaper, Cinema, Outdoor, etc.

LEVEL OF GRANULARITY

Addressable media: individual impressions, by customer ID, media channel/type, publisher/ad network, website/program, creative, campaign and placement/keyword.

Non-addressable media is typically analyzed at the media channel/type/sub channel, tactic, segment, campaign by DMA/store and day of week

DATA INTEGRATION

Proprietary identity graph system links device IDs to offline identifiers; also third-party tag management system and integrates client SDK and ingests log files

COLLINEARITY WORKAROUND

Bayesian priors

MODEL/RESULTS VALIDATION

Normative database, holdout samples, model fit statistics, tests

CYCLE & REFRESH TIMING

Market-level models estimated monthly; attribution models updated daily

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Nielsen



PRIMARY USE CASE — Holistic coverage of all business drivers via MMM. Allocate proportional credit to online and offline marketing touchpoints. Impacts budgeting and planning, spend adjustments based on campaign results and ROI metrics.


PRIMARY OFFERINGS

- Marketing Mix Models.....✓
- Digital Attribution.....✓
- TV AttributionN/A
- Unified Models✓

APPROACH

Store-level econometrics using pooled time-series cross-sectional models

Attribution via Logit-based discrete choice or predictive-score models



SOURCE OF TV DATA
Nielsen

MEDIA COVERED

For attribution: All digital media that take the Nielsen tracking pixel. Walled garden publishers, such as Google, provide impressions via log files.

For marketing mix: all measured media.

LEVEL OF GRANULARITY

Digital: site, creative, publisher, placement, campaign, search engine, device type and media format level and audience segments

Marketing mix: store level

DATA INTEGRATION

Attribution: information provided by onboarding partners; connect individual exposure data to household purchase

Marketing mix: integrate Nielsen-owned, client-owned and third-party data sources

COLLINEARITY WORKAROUND

Variance Inflation Factors and other techniques

MODEL/RESULTS VALIDATION

Modeling techniques were validated through experimentation and synthetic data testing

CYCLE & REFRESH TIMING

Clients can choose a model refresh cadence that best fits their needs (monthly, quarterly, etc.)

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources



Attribution Specialists With Cross-Platform Products

Attribution modeling was born in the digital media ecosystem as a way of attributing credit to the various digital touchpoints on the path to conversion.

The earliest methods were arbitrary, leading to the notorious “last click attribution” that has been shown to grossly overstate the value of digital search. Over the past few years, there has been a dramatic infusion of science into attribution with all major attribution modelers now using advanced statistical models, most often logistic regression or hierarchical Bayes.

Importantly, these modelers now incorporate all digital touchpoints, qualifying as Multi-Touch Attribution (MTA). However, their treatment of non-digital media, non-media marketing factors and uncontrollable factors like weather and economy are highly varied. When the majority of the causal factors driving sales — or other consumer outcomes — are not included in the model, the chance of mis-attribution and misleading ROI estimates is material. Under these circumstances, relative tactical decisions can still be supported; for example, whether copy “A” is more effective than copy “B.”

Data is a bigger challenge for attribution modelers than it is for marketing mix modelers, although inadequate data is the Achilles’ heel for all modelers. Attribution requires identifying the same consumer wherever they may be exposed — mobile phone, tablet, work computer, home computer or other media.

Device graphs, a map that links an individual to all the devices they use, are the linking data sets used for this purpose. There are many proprietary device graphs, some with impressive scale, but we have seen very little validation work. The potential problem is that despite starting with a comprehensive and representative data set, after all of the variables have been matched to each other, the resulting data set will be much smaller and potentially biased. It is always wise to review the fully matched data set and make sure it portrays your consumers as you know them.

As with the mix modelers, this group is not perfectly homogeneous. Merkle, which was not born in the media world, originated in direct marketing. But the parallels today are striking.

Conversion Logic



PRIMARY USE CASE — Help marketers measure and optimize conversion events for online or offline sales, leads, registrations, mobile installs, etc., and enables long-term planning and budgeting decisions. Cross-Channel attribution.

PRIMARY OFFERINGS

Marketing Mix Models.....	N/A	TV Attribution	59%
Digital Attribution	76%	Unified Models	59%

APPROACH

Person/HH level attribution using machine learning in proprietary ensemble framework



SOURCE OF TV DATA
Client log files

MEDIA COVERED

User-level — Display, Video, Affiliates, Social, Mobile, Search, Email, Direct Mail, Native

Offline — TV, Radio, Shared mail

LEVEL OF GRANULARITY

For offline channels: station, program, campaign, promotion, length, geo, reach down to creative campaign, etc.

For digital: impressions, clicks, campaign, placement, publisher etc.; sub-daily and at user-level support an open schema for granularity limited only by statistical significance

DATA INTEGRATION

Person level + time series for TV and radio; deterministic matching

COLLINEARITY WORKAROUND

Approximated Shapley values in cooperative game theory

MODEL/RESULTS VALIDATION

20% Holdout samples



CYCLE & REFRESH TIMING

Designed to run in real time; refreshes hours/days/weeks

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Convertro, owned by Oath, a subsidiary of Verizon



PRIMARY USE CASE — Consumer-level framework that can solve for entire range of marketing measurement, attribution and optimization use cases across all verticals. Map markets to consumers through a unified theory of how consumers behave. Single, cohesive, theoretically consistent framework.

PRIMARY OFFERINGS

Marketing Mix Models.....	3%	TV Attribution	✓
Digital Attribution.....	97%	Unified Models	40%
	(30% used retail location)		

APPROACH

Unified Logit model using both person-level and market-level data



SOURCES OF TV DATA
iSpot, Rentrak, Fourthwall Media, Kantar media and proprietary sources like Verizon FiOS

MEDIA COVERED

TV, Radio, Print, Direct mail, Catalog, OOH, Sponsorships and Events, Email, Search, Display, Video, Affiliate across all Digital Paid/Owned/Earned

LEVEL OF GRANULARITY

Media platform, channel, vendor, inventory, content, genre, program, placement, key word, creative, copy

DATA INTEGRATION

Built on cross-device database of deterministic login data. Graph enriched with data from AOL/VZW/Millennial Media and from providers like Liveramp.

COLLINEARITY WORKAROUND

Leverage large panels, Ridge regularization to eliminate unidentified parameters and execute

MODEL/RESULTS VALIDATION

Model fit statistics, random control tests and automatic updating of model with test results; ongoing test and learn

CYCLE & REFRESH TIMING



Updated daily; weekly

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

C3 Metrics

C3 Metrics PRIMARY USE CASE — Machine-learning-algorithmic attribution platform natively incorporates viewable impressions, directly integrates with every programmatic trading desk, DSP, and ad network


PRIMARY OFFERINGS

Marketing Mix Models..... 15%
 Digital Attribution 85%
 (30% use location/traffic data)

TV Attribution ✓
 Unified Models N/A

APPROACH

Machine learning, Bayesian model



SOURCE OF TV DATA
Post logs

MEDIA COVERED

Paid, owned and earned: Digital, TV, Radio, OOH, Print, Catalog

LEVEL OF GRANULARITY

Impressions-level Date/Time/DMA/Creative, individual occurrence

DATA INTEGRATION

Digital impressions linked to individuals using tags; offline impressions linked by exact time.

COLLINEARITY WORKAROUND

Algorithmic time decay

MODEL/RESULTS VALIDATION

No information

CYCLE & REFRESH TIMING



Updating in real time

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Google Attribution 360



Attribution 360

PRIMARY USE CASE — Evaluate TV and digital marketing’s impact on short-term, long-term sales/revenue profit and other KPIs

PRIMARY OFFERINGS

- Marketing Mix Models.....✓
(Through MMM Partners)
- Digital Attribution.....✓
- TV Attribution.....✓
- Unified ModelsN/A

APPROACH

Person/HH-level digital and TV attribution

SOURCE OF TV DATA
Rentrak

MEDIA COVERED

Display, search, programmatic, email, and affiliate, TV network, daypart, program and individual spots

LEVEL OF GRANULARITY

If data permits, at ad-level impression; creative, length, network, daypart, and even down to individual airings for specific programs. Impression, click and conversion events: collected through tags or through log files

DATA INTEGRATION

Merged at the individual level through CRM integrations, cookie, person or transaction ID. Also leverage third-party audience data sources. Proprietary device graph based on known sign-in activity.

COLLINEARITY WORKAROUND

No information provided

MODEL/RESULTS VALIDATION

Holdout samples and compare predicted with actual outcomes

CYCLE & REFRESH TIMING



Within 24 hours

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Merkle, owned by Dentsu Aegis

MERKLE PRIMARY USE CASE — Integrated, connected attribution framework for cross-channel attribution at scale. Focused on measurement at all stages of the funnel, from awareness to optimizing customer contact strategies and digital targeting opportunities.

PRIMARY OFFERINGS


Marketing Mix Models..... **50%** TV Attribution **N/A**
 Digital Attribution **40%** Unified Models **✓**
 (2/3 with location KPIs)

APPROACH

Integrated media mix econometrics and person/HH-level attribution, A/B testing, market-level ANCOVA

MEDIA COVERED

Integrated holistic application of multiple event streams; all paid, owned and earned media



SOURCE OF TV DATA
Rentrak, Nielsen, client-provided

LEVEL OF GRANULARITY

Media vehicles, content, creative, offer, message

DATA INTEGRATION

Proprietary PII data-matching reference file for 95% of US HH; includes device ID connected at individual or HH level

COLLINEARITY WORKAROUND

Ameliorated by proprietary algorithm

MODEL/RESULTS VALIDATION

Controlled holdout tests

CYCLE & REFRESH TIMING

Quarterly for planning/strategy; weekly/daily for content-related tactics

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Visual IQ, a Nielsen company



PRIMARY USE CASE – Combined audience data with attributed measurement in a single view, providing cross-channel marketing and advertising performance insights and optimization based on audience segments

PRIMARY OFFERINGS

- Marketing Mix Models.....✓
- Digital Attribution.....✓
- TV Attribution.....✓
- Unified ModelsN/A

APPROACH

Market-level regression (MMM) with patented HH/person-level attribution based on test/control lift along consumer’s path (MTA)

MEDIA COVERED

Digital, direct mail, POS, TV, Radio, Print, OOH

SOURCE OF TV DATA
Nielsen

LEVEL OF GRANULARITY

Placement/keyword, tactic, publisher, creative, etc. Dimension level: recency, frequency, publisher, placement, keyword, creative, size, tactic, etc.

DATA INTEGRATION

Data partners for MTA integrations across offline sales (Liveramp), cross device (Facebook, Tapad), audience data (Lotame). Offer pixel and tagging management through platform.

COLLINEARITY WORKAROUND

No information provided

MODEL/RESULTS VALIDATION

Data quality controls; model validation; in market testing/analysis

CYCLE & REFRESH TIMING



Designed to run in real time; refreshes hours/days/weeks

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources



Television or Digital Attribution Providers

This set of providers are more recent additions to the analytics marketplace and, while quite varied, are unified to some degree in their focus on either specific media or specific outcomes.

These providers are squarely in the attribution camp, attributing causality to media exposure based on a highly granular analysis of the sequence of events. For instance, exposures that occurred prior to a conversion, retail visit or purchase event. While this may not be entirely suitable for estimating ROI, the granularity and rapid tempo of these models is well suited to driving tactical decisions.

The diversity among these providers is interesting. TVSquared and WyWy are now one company. Along

with iSpot and Samba, they leverage Smart TV data to attribute digital activation outcomes to preceding television exposures. However, TVSquared also employs marketing mix models, in a minority of cases, to provide a more comprehensive assessment and also an estimate of the impact on offline sales.

Placed is focused on location data and estimates the impact of television, digital and OOH media on location-based outcomes, like store visits. SMI's roots are in media spend data and focus on the value of modeling the effectiveness and ROI of competitors' marketing, which requires granular and accurate competitive spending data.

Data + Math




PRIMARY USE CASE — Multi-touch attribution to measure the upper and mid-funnel impact of multi-screen TV campaigns on various marketing outcomes. Our solutions provide timely campaign lift readouts and differential scoring of campaign tactics, such as audience target, frequency, program/network/daypart and creative to support campaign optimization.

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A** TV Attribution
 Digital Attribution..... **N/A** Unified Models **N/A**

APPROACH

Attribution modeling



SOURCES OF TV DATA
 MVPDs, SmartTV ACR
 and network group
 digital platforms

MEDIA COVERED

Linear, time-shifted and OTT delivered television

LEVEL OF GRANULARITY

Household or device level

DATA INTEGRATION

Integrate multiple datasets at a household or device level into the model. Partnerships with Experian and Acxiom/Liveramp to integrate signals from multiple sources into the model with set-top and ACR data in a privacy-compliant manner.

COLLINEARITY WORKAROUND

Multiple models are trained with different feature sets, enabling us to extract the importance of individual predictors. We use synthetic control techniques to reduce bias and isolate the impact of exposures, as well as regularization and cross-validation to avoid over-fitting.

MODEL/RESULTS VALIDATION

Hold-out samples and cross-validation; internal controls

 **CYCLE & REFRESH TIMING**
 Daily

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality (Unexposed control group)

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

iSpot



PRIMARY USE CASE — Measures the conversions of TV ads exposure to digital business outcomes and related KPIs. Used for in-flight optimization of creative and media placements, campaign planning as well as TV investment decisioning.

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A** TV Attribution **100%**
 Digital Attribution **N/A** Unified Models **N/A**

APPROACH

Fractional or full attribution of conversion credit based on a variable look-back window at the individual HH/person level

MEDIA COVERED

TV, Live/SD — 30 days, Broadcast, Cable, Spot, Satellite, VOD and OTT

SOURCE OF TV DATA
Inscope

LEVEL OF GRANULARITY

Individual exposure/conversion level analysis, reported for individual creative executions, networks, programs, genre, daypart, media unit

DATA INTEGRATION

Proprietary device/ID graph to connect web users to TV IDs

COLLINEARITY WORKAROUND

Assigns (full or partial) credit to all exposures in the look-back window

MODEL/RESULTS VALIDATION

Internal and external audits/benchmarks

CYCLE & REFRESH TIMING
Daily

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign (TV cont. to digital KPIs)
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality (Unexposed control group)

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Placed



PRIMARY USE CASE — Identifies the impact of cross-channel advertising on in-store visitation.

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A**
 Digital Attribution..... **100%**
 (100% location KPIs)


TV Attribution **+ OOH**
 Unified Models **N/A**

APPROACH

Exposed versus matched unexposed to measure incremental visits and lift

MEDIA COVERED

Mobile, Tablet, Desktop, Linear TV, Addressable TV, Over-the-top and Out Of Home



SOURCE OF TV DATA
STB and Smart TVs

LEVEL OF GRANULARITY

Individual person level for each campaign. Factors include 3-hour time granularity for visitation, as well as a large set of person-level descriptors

DATA INTEGRATION

Mobile, web, desktop and TV: We use a mix of third-party and proprietary probabilistic device-matching algorithms; proprietary path analysis algorithm matches a person's path to OOH

COLLINEARITY WORKAROUND

No information provided

MODEL/RESULTS VALIDATION

Surveys validate visits, visits projected against store counter and internal transaction data



CYCLE & REFRESH TIMING
Weekly

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign (Digital, TV & OOH contribution to retail traffic)
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels (TV and OOH)
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality (Repeat vs. new visitors)

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Samba TV



PRIMARY USE CASE — Offers essential TV insights to make audiences more addressable and measurable. Through software embedded in over 18M smart TVs globally, amplified by set-top boxes and mapped to connected mobile devices, laptops and PCs, Samba TV helps marketers activate cross-screen campaigns and measure the impact of their media investment by bridging the gap between digital and television

PRIMARY OFFERINGS

Marketing Mix Models..... N/A TV Attribution✓
 Digital Attribution.....✓ Unified Models N/A

APPROACH

Measures tune-in rate, conversions, RF and brand lift (with Kantar MB), single source matched panel at a HH/individual level

MEDIA COVERED

TV, Digital



SOURCE OF TV DATA

12 Smart TV brands + STB data

LEVEL OF GRANULARITY

Down to the exact ad occurrence — can report on media, time, geography, consumer segments on a HH basis

DATA INTEGRATION

Direct match, Device IDs

COLLINEARITY WORKAROUND

Not applicable due to data granularity; don't use marketing mix models

MODEL/RESULTS VALIDATION

Retesting, A/A testing



CYCLE & REFRESH TIMING

Daily, weekly or monthly depending on the need

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign (TV + Digital)
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors (If provided by client)

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

SMI




PRIMARY USE CASE — Digital/TV attribution and spend optimization, mix optimization, ROI versus competitors. Household-level attribution planned for early 2018.

PRIMARY OFFERINGS

Marketing Mix Models.....✓
 Digital Attribution.....N/A
 TV AttributionN/A
 Unified ModelsN/A

APPROACH

National time series regression



SOURCE OF TV DATA
Media Agencies

MEDIA COVERED

TV, Digital in all their sub-types and forms

LEVEL OF GRANULARITY

Program-level

DATA INTEGRATION


Time series

COLLINEARITY WORKAROUND

No information provided

MODEL/RESULTS VALIDATION

A/B tests to verify predictions



CYCLE & REFRESH TIMING
Monthly

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign (TV+ Digital)
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics (Custom)

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality (In CPG)

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

TVSquared



PRIMARY USE CASE — Attribution models estimate TV's immediate impact on web and online sales metrics. Marketing mix models utilize all available data inputs, online and offline, to provide an accurate measurement of marketing's short- and long-term impacts.

PRIMARY OFFERINGS

Marketing Mix Models..... **15%** TV Attribution **100%**
 Digital Attribution..... **N/A** Unified Models **N/A**

APPROACH

Multi-stage attribution process; continuously adjusting baseline constructed to identify spikes that can be explained by the presence of TV

MEDIA COVERED

TV and SMS Digital — Computer and Mobile (App/Web)

SOURCE OF TV DATA
Client provided

LEVEL OF GRANULARITY

TV spot logs, including network, creatives, spot length and audience; location using IP addresses; attribution looks at direct site traffic, and organic and paid search

DATA INTEGRATION

Partner with key cross-channel vendors, like LiveRamp, to provide cross-device matching

COLLINEARITY WORKAROUND

Large samples from 3+ years of data at the DMA level, plus partial least squares models, where necessary

MODEL/RESULTS VALIDATION

Holdout samples with +/- 10% MAPE



CYCLE & REFRESH TIMING

Same-day attribution reporting, MMM typically 6-month cycles

USE CASES

Contribution Assessment

- Digital Campaign (TV Attribution)
- Cross-Media Campaign (Via MMM)
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels (TV Optimization)
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects (MMM)
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

WyWy, owned by TVSquared

wywy **PRIMARY USE CASE** – Measures the direct impact of TV on website and app traffic (visits and conversions), identifying which daypart, channel, creative or program has the highest viewer engagement; daypart, channel, creative optimization.

PRIMARY OFFERINGS


Marketing Mix Models.....N/A TV Attribution100%
 Digital Attribution.....N/A Unified ModelsN/A

APPROACH

Anomaly detection based on graph analysis to determine “unusual spikes” in website traffic; overlay TV schedule

MEDIA COVERED

Linear TV program



SOURCE OF TV DATA
Fingerprint

LEVEL OF GRANULARITY

Airing-level: daypart, channel, creative and program, geography, consumer segments

DATA INTEGRATION

TV Exposure and online events linked by time of occurrence

COLLINEARITY WORKAROUND

Not deemed relevant to this method

MODEL/RESULTS VALIDATION

Technique has been validated with simulations. In production, model results are checked versus graphs.

CYCLE & REFRESH TIMING

Overnight

USE CASES

Contribution Assessment

- Digital Campaign
- (TV Attribution)
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality (Unexposed Control Group)

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources



Single Source Providers

The earliest single source data providers linked television advertising exposures directly to purchases at the household level. IRI's Behaviorscan, the first of many, actually predates the commercialization of marketing mix modeling by a few years. Each of the early providers built their services on the foundation of traditional research panels, which proved unaffordable time and again.

Today's single source providers utilize existing data — notably loyalty card, credit card, prescription records and DMV records — to provide measures of sales. These are linked at the household level with television exposure from set-top boxes and digital exposures captured via tags. Matching cause and effect at the household level resembles and begins to overlap with attribution modelers. The difference

is one of emphasis and genesis. Attribution was born in digital, whereas single source was born in CPG, matching television ad exposures to supermarket sales.

These techniques are data dependent. NCS and IRI utilize their purchase and store panels, and NCS also employs the Nielsen television and radio ratings data.

The providers grouped here are not completely homogeneous. Oracle's DataLogix service has roots in direct marketing, not TV like NCS and TiVo. Concentric is the most different; it does not have proprietary data sets, but its agent-based models (ABM) can utilize any suitable data. It is grouped here because it operates at the individual household or consumer level.

Concentric

concentric **PRIMARY USE CASE** — Software application that simulates individual consumers interacting with each other and with the marketing of brands; accounts for how people make decisions and share information through a unified marketing impact analytic framework.

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A** TV Attribution **N/A**
 Digital Attribution **N/A** Unified Models **100%**
 (12% with location KPIs)

APPROACH

Agent-based models, behavioral economics, network science, marketing analytics, and machine learning with reinforced learning



SOURCES OF TV DATA
Nielsen, Kantar

MEDIA COVERED

TV, Radio, Magazines, Out Of Home, Digital/Mobile Display, Video, Native Search, Social, In-app, Organic Search, Word Of Mouth, Influencer Programs, PR, In-store, Events, etc.

LEVEL OF GRANULARITY

Ranges from the highest level of granularity to a respondent-level or individual ad impressions — varies by business question and available data

DATA INTEGRATION

Data integration through the Agent Training Process — two forms: standard API that pulls from the customers database(s) or a data parser that pulls data from multiple sources

COLLINEARITY WORKAROUND

Agent-level analysis rarely suffers from collinearity

MODEL/RESULTS VALIDATION

Compare system forecast with in-market results for multiple metrics

CYCLE & REFRESH TIMING

Real time, weekly or quarterly depending on client needs

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

IRI Lift



PRIMARY USE CASE — IRI provides a full suite of solutions — both marketing mix modeling and attribution solutions as well as matched market or matched store testing. Focused on the CPG industry.

PRIMARY OFFERINGS

- Marketing Mix Models.....✓
- Digital Attribution.....✓
- TV Attribution✓
- Unified Models✓

APPROACH

Attribution studies

MEDIA COVERED

TV, Digital, Social, OOH



SOURCES OF TV DATA
Lotame, Simulmedia and Shareablee

LEVEL OF GRANULARITY

Household/Frequent Shopper Card

DATA INTEGRATION

Deterministic match at household level through Experian, LiveRamp, etc.

COLLINEARITY WORKAROUND

Statistical significance (p-value check), correlation check, Multi collinearity check, Variance Inflation Factor (VIF)

MODEL/RESULTS VALIDATION

Test/control matching/validation via Kolmogorov Smirnov Test, p-values, multi-collinearity, covariate balancing, goodness of fit test, data hygiene



CYCLE & REFRESH TIMING

Within weeks of the campaign beginning

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Nielsen Catalina



PRIMARY USE CASE — Purchase-based audiences for better targeting, in-flight tracking the impact of advertising on retail sales during campaigns, and sales lift measurements to analyze how advertising drove incremental sales after the campaign

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A** TV Attribution **N/A**
 Digital Attribution **N/A** Unified Models **100%**

APPROACH

Test — control ANCOVA, machine learning, in extreme reach cases



SOURCE OF TV DATA
Nielsen

MEDIA COVERED

Digital (including Mobile, Video, Social and Programmatic) to linear TV, addressable TV, Print, Radio, and CRM

Media type, genre, type, property (e.g., program, website, title), campaign, creative execution

LEVEL OF GRANULARITY

Analysis at the individual impression and transaction level; reported by media type, genre, type, property (e.g., program, website, title), campaign and creative execution

DATA INTEGRATION

Direct HH match or via indirect match with on-boarders like Neustar and LiveRamp

COLLINEARITY WORKAROUND

Exposed/unexposed HH purchases compared to averages between groups

MODEL/RESULTS VALIDATION

Normative database, holdout samples, model fit statistics, synthetic data comparison



CYCLE & REFRESH TIMING

Weekly in-flight; 4-6 weeks for sales effect or cross-media

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales (CPG only)
- Brand Metrics

Budget Optimization

- Across Digital Channels (Indices provided for manual optimization)
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Oracle


ORACLE® PRIMARY USE CASE — Determines short- and long-term, offline and online, sales outcomes for digital media and direct mail. Evaluating overall campaign effectiveness and providing a deep dive into the effectiveness of target segments, media types, new and existing buyers, creative, demographics and frequency

PRIMARY OFFERINGS

Marketing Mix Models..... **N/A** TV Attribution **N/A**
 Digital Attribution..... **100%** Unified Models **N/A**

APPROACH

Exposed/unexposed, test-control and custom analytics



SOURCE OF TV DATA
No information

MEDIA COVERED

Digital and Direct Mail: media platform, creative, placement (e.g., Video or display), targeted segment

LEVEL OF GRANULARITY

Conducted at the household level, but is typically reported at the population, subpopulation or media cut level

DATA INTEGRATION

Utilize data from dozens of sources to create PII to household-level links, and validate with robust truth set based modeling process that updates these connections

COLLINEARITY WORKAROUND

Propensity models identify how variables compensate based on the severity. Also utilize gradient boosted regression models

MODEL/RESULTS VALIDATION

Internal quality control checks



CYCLE & REFRESH TIMING

No post period required; 5 weeks to compile and run analysis

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

TiVo



PRIMARY USE CASE — Measure cross-platform R&F, the impact of Internet/Mobile and TV ads on business outcomes and related KPIs, and optimization of creative and media placements, campaign planning as well as TV investment decisioning.

PRIMARY OFFERINGS

Marketing Mix Models.....	N/A	TV Attribution	N/A
Digital Attribution.....	N/A	Unified Models	100% (a few with location KPIs)

APPROACH

HH-level sales lift logistic regression modeling; exposed/unexposed tests and custom analytics

MEDIA COVERED

Digital, Mobile, TV, CRM data, segments, third party

SOURCE OF TV DATA
TiVo STB

LEVEL OF GRANULARITY

HH-level data: platform, network, program, website, creative and ad format level; TV exposure second by second

DATA INTEGRATION

Direct match; household level; deterministic match to Experian, LiveRamp and Acxiom

COLLINEARITY WORKAROUND

Not a problem due to granularity and volume of data

MODEL/RESULTS VALIDATION

Internal checks and industry benchmarks

CYCLE & REFRESH TIMING

Custom modeling takes 3-5 weeks

USE CASES

Contribution Assessment

- Digital Campaign
- Cross-Media Campaign
- Full Marketing Mix

KPIs

- Online Traffic
- Online Conversion
- Offline Retail Traffic
- Offline Sales
- Brand Metrics

Budget Optimization

- Across Digital Channels
- Across Cross-Media Channels
- Across Sales & Brand Metrics

MODEL INPUTS

- Other Marketing Variables
- External Influences
- Competitors

ADVERTISING PARAMETERS

- Diminishing Returns
- Adstock
- Long-term Effects
- Media Interactions and Halos
- Baseline/Incrementality

DATA DELIVERY & APPLICATIONS

- Dashboard
- Optimizers
- Programmatic
- Data Feeds to Other Sources

Glossary

Web/Wikipedia-Sourced, Sequent Partners Adapted

A/B Testing

A controlled experiment involving two variables. Used extensively in digital to optimize messaging performance. It is essential that all contextual factors, audience, content environment, time, etc. be perfectly matched to isolate the comparative effect of A versus B.

Adstock

Term coined by Simon Broadbent to describe the prolonged or lagged effect of advertising on consumer purchase behavior. It's an essential model specification for capturing the full extent of advertising's contribution.

Agent-Based Models

Model for simulating the actions and interactions of autonomous agents (e.g., consumers) with a view toward assessing the effects of causal factors (e.g., advertising) on their behaviors (e.g. purchasing) and the system as a whole (e.g., market). Provides explanatory insight into the collective behavior of agents following known behavior patterns (e.g., repeat purchase distributions) or simple rules (e.g., average purchase size).

Algorithm

Procedure or formula for solving a problem, based on conducting a sequence of specified calculations or steps. For example, a media optimizer uses an algorithm to sequentially add the next best medium to the plan.

Attribution

The statistical method of assigning credit to the media stimuli consumers encounter along the path to “conversion” — taking action, sales, etc. — a “bottom up,” consumer- and transaction-level model.

Baseline/Incrementality

In modeling, sales that would have occurred without any marketing efforts are considered base sales. Incrementality reflects the sales lift associated with

media/marketing stimuli. Important to distinguish between the two to avoid misattributing to a medium, the value of sales that would have occurred naturally. Not measureable, this is a model inference.

Bayesian Priors

In Bayesian statistics, a prior probability distribution — often simply called the prior — of an uncertain quantity is the probability distribution that would express one's beliefs about this quantity before some evidence is taken into account. This enables facts taken from other sources to be imposed on a model. It also enables a model to work with data sources of different levels of granularity.

Behavioral Economics

Study of the effects of psychological, social, cognitive, and emotional factors on the economic decisions of individuals and the consequences for market prices, returns, etc.

Collinearity

A condition in which some of the independent variables are highly correlated; a linear relationship exists between two explanatory variables. Results in an inability to tease out the effects of either variable, as in television flight running the same time as a digital campaign.

Covariate Controls

Any method for statistically removing the effects of contextual variables from the variables being evaluated. This could be as simple as analyzing two groups separately (e.g., deal-prone vs. full-price consumers) or more complex — fitting a multivariate model and adjusting dependent variable estimates to simulate the average, not actual, level of the covariates.

Cross-Platform Attribution

The process of assigning credit to the touchpoints consumers encounter along the path to conversion, when all touchpoints, online and offline are included. Sometimes driven by “rules” or algorithms that

arbitrarily assign credit to one touchpoint. More often by statistical models that infer the contribution of each touchpoint to conversion, (e.g., traffic or sales). When only online touchpoints are included, Multi-Touch Attribution is a more descriptive name.

Dependent Variable

The variable to be predicted by the model (e.g., sales).

Diminishing Returns

The saturation effect where sales increases reach a limit after which each additional advertising dollar has a decreasing incremental effect and, eventually, reaches a ceiling with near zero incremental effect.

Discrete Choice

Model of choices customers make between products or services. By identifying patterns in these choices, models predict how different consumers respond to competing products. Allows marketers to examine the share impact of pricing, service bundling, etc., on different classes of customers.

Econometrics

Statistical models used in econometrics that specifies the statistical relationship between variables.

(See also [Regression](#))

Exposed vs. Unexposed

Commonly-used approaches for measuring ad effectiveness in which the subsequent behavior of individuals exposed to an ad is compared to individuals not exposed to the ad. Due to collinearity and the effect of unobserved contextual variables, this approach does not necessarily reveal whether or not ads have a causal effect on outcomes such as purchases and site visits. (See [A/B testing](#))

External Influences

Factors that occur entirely beyond the marketers control, but exert influence on the way advertising in a particular category behaves. For instance, weather, consumer confidence, gas prices, etc. (also known as Exogenous factors).

Game Theory

Used to fairly distribute credit or value to each individual player/participant. Game theory attribution assigns (with the help of algorithms) each touchpoint fair credit for a conversion based on their true contribution.

Granularity

The level of detail considered in a model. The greater the granularity, the deeper the level of detail and potential for actionable insight. Granularity can also be a solution for collinearity.

Hierarchical Bayesian

A statistical modeling technique that enables a multi-layered approach (e.g., an upper branding model that identifies consumer preferences and a lower conversion model where brand preference is one of the causal factors).

Holdout Samples

Sample of observations withheld from the model fitting process. Model predictive validity can be estimated by its ability to predict the data. Sometimes the holdout is chosen for convenience, but a mixture of random and designed holdouts (to provide a set of specific situations) is preferred.

Independent Variables

The variables that, in combination, predict the dependent, or outcome, variable (e.g., sales). They represent the causal factors that drive the outcome variable.

Logit Models

A regression model where the dependent variable is categorical (e.g., brand chosen) at the person/HH level. This is the classical statistical model for individual person/HH transaction data.

Long-term Effects

Cumulative effect of advertising on consumers' brand choice behavior, lasting over several years. Measures of loyalty to a brand or consideration set of brands. It can also reflect customer lifetime values. Lacks consistent definition and, in some cases, long-term effects of digital advertising are measured on a "next quarter" basis.

Lookback Windows

Defines a time span during which advertising is analyzed prior to a conversion. The period of time the model "looks back" at the ad exposures that may have contributed to a conversion.

Machine Learning

An application of artificial intelligence (AI) that provides systems the ability to automatically learn

and improve from experience without being explicitly programmed. In its current rudimentary form, multiple modeling techniques are assembled in a framework. The framework determines which model, or combination of models, best fits the historical data.

Market Level ANCOVA

Analysis of covariance. Isolates the effect of a potential causal categorical factor (e.g., an ad exposure) on a dependent outcome variable (e.g., purchase), while statistically controlling for the effects of other continuous variables that are not of primary interest (e.g., price), known as covariates.

Media Interactions and Halos

Degree to which media enhance or detract from each other's effects — coordinated, sequenced for maximum performance. Often called synergies.

Marketing Mix Models

Models involving the application of regression and other statistical approaches to estimate the impact of marketing elements on incremental sales. Historical data is used to fit the model, which then can be used for prediction of future outcomes (e.g., sales). They assess the effectiveness of spending by channel over and above a baseline of sales that would have occurred without any marketing efforts. Often called "Top Down" models. These models explain a high proportion of the variance in sales and typically include explanatory factors like seasonality, competitive activities, and trade and consumer promotion. They are most frequently used to inform budget allocation across channels.

Multi-Touch Attribution

The process of assigning credit to the touchpoints consumers encounter along the path to conversion. Sometimes driven by "rules" or algorithms that arbitrarily assign credit to one touchpoint. More often by statistical models that infer the contribution of each touchpoint to conversion (e.g., traffic or sales). In practice, MTA most often refers to digital touchpoints and is used to compare the impact of digital vehicles. When online and offline touchpoints are included, Cross-Platform Attribution is a more descriptive name.

Other Marketing Variables

Aspects of product marketing besides media and advertising that drive sales. Price, promotion, product

features, in-store variables, competitive trade deals and impact provide the full picture of marketplace pressure and consumer response. Models that do not include these factors fail to provide a holistic view and implicitly overstate the contribution of advertising.

Random Control Tests

Popular in digital analytics but an elemental research approach involving creating random test and control groups as a way of determining the behavioral lift (e.g., visits, conversions) associated with exposure to a specific campaign. The estimation of the measured effect is only as good as the controls associated with assigning subjects to each exposed vs. unexposed condition.

Regression

A broad set of statistical techniques for estimating the relationships among variables. Helps determine how the typical value of the dependent variable (e.g., sales, conversions, etc.) changes when any one of the independent variables (media weight, media mix) is varied, while the other independent variables are held fixed. Developed in the early 19th century for astronomy, it has been used extensively by marketers for predicting and forecasting sales outcomes for over 30 years.

Unified Models

Relatively new statistical approach for integrating strategic marketing mix and tactical digital analytics into a holistic model. Considered best practice in theory; generally involves broader marketing mix model results being applied as constraints for highly granular digital outcomes. Complicated by lack of standard approaches.

Validation

A measure of the accuracy and precision of modeled results. There are two common and complimentary approaches. Goodness of fit (MAPE: Mean Average Percent Error, or R2: percent of variance explained) describes how well the model replicates the historical data to which it was fit. Predictive validity: the same statistics can be used to evaluate how well a model replicates hold-out, or future data not used in the original model fitting process. In essence, the extent to which modeled results are well-founded and correspond accurately to real world results.