

AUDIO ATTRIBUTION



ATTRIBUTION

INTRODUCTION



Simply stated, marketing attribution is the analytical science of determining which marketing tactics are contributing to sales or conversions.

To accurately attribute which marketing and media touchpoints have the greatest impact on a consumer's purchase journey is complex. However, there are several popular models used by marketers today, such as multi-touch attribution, lift studies, time decay and other models to help inform, measure and improve ROAS.

Attribution, as it is known today, got its start in digital marketing providing the ability to deliver, in real time, granular data with actionable metrics regarding campaign performance.

AUDIO ATTRIBUTION

INTRODUCTION



Audio's digital platforms can deliver parallel insights to digital-only media.

Broadcast radio attribution methodology has come a long way in the past decade and includes the ability to measure actions such as search, website traffic, phone calls, store traffic, word of mouth, commerce through a smart speaker and sales via ROI modeling.

Due to traditional AM/FM radio's analog broadcast format, pixels and cookies that easily track a consumer from exposure to purchase is currently not technologically feasible.

The phase-out of third-party cookies will impact digital revenue and also cause the marketer to lose valuable data about their target audiences, including browsing habits. However, many providers have already addressed and applied changes. By way of example, Veritone is fully compatible with Google's GA4 product, which is not reliant on cookies and offers proprietary tracking tags which send website visitation information without using cookies.

According to a report published by Borrell Associates on behalf of the National Association of Broadcasters, "the phase-out of third-party cookies is likely to deliver more benefit than loss to (radio) broadcasters" as they continue to establish first-party data relationships with listeners. Those attribution partners featured in this document have all developed methodology for audio that do not require a reliance on cookies.

AUDIO ATTRIBUTION 2023 & BEYOND



PURPOSE:

- ▶ Showcase all attribution methodology currently available to measure effectiveness of radio by and across platforms.
- ▶ Outline capabilities, identify challenges and forecast possibilities.

RESEARCH PROVIDERS:

- ▶ To understand the current attribution landscape available for radio across platforms, RAB reached out to providers that have the capability to measure attribution/results for audio campaigns (list on following page).
- ▶ Those that responded and opted to participate are included in the following pages with methodology currently available to deliver against the following KPIs:

- | | |
|--------------------|-------------------------------------|
| • Brand lift | • ROAS |
| • Brand reputation | • Online leads/conversion |
| • Web lift | • Word of mouth/brand conversations |
| • In-store lift | • Content engagement |
| • Sales lift | |

METHODOLOGY

BY OBJECTIVE



ATTRIBUTION

- AnalyticOwl
- ArtsAI
- Claritas
- LeadsRX
- Media Monitors
- Nielsen
- Pound 250
- Provoke Insights
- Two-Tiered Attribution (Oxford Road)
- Validate
- Veritone
- Veritonic
- Vivvix



BRAND EFFECT

- ABX
- Coleman Insights Ascend
- Engagement Labs
- IPSOS
- IRI
- Kantar
- Maru
- Nielsen
- Provoke Insights
- Signal Hill
- Veritonic



TRANSPARENCY & ACCOUNTABILITY

- Eastlan
- Kantar
- MRI-Simmons
- Nielsen
- Triton Digital
- Validate
- Veritone



RETURN ON AD SPEND

- Analytic Partners
- Nielsen
- Vivvix
- Media Mix Modelers

ANALYTIC OWL

▶ KPIs Measured:

- ▶ Spikes in web traffic in close time proximity to the airing or streaming of an audio commercial.
 - ▶ Average spikes in traffic per creative, daypart, day of week, etc.
 - ▶ Over-delivery based on % share of airings versus response
 - ▶ Average increases in daily traffic when on/off-air and in/out-of-stream
 - ▶ Changes in user engagement metrics like Time On Site, Pages Per Visit, Mobile Usage, Bounce Rate (until it is removed from Google later this year), etc.

▶ Methodology – Google Analytics-Based

- ▶ Web traffic – typically from Google Analytics, to identify spikes in engagement in close time proximity to the measured audio.
 - ▶ Post logs (or other relevant time-stamped information provided by radio to inform when audio was delivered to an audience.
 - ▶ Web data from the intended destination of the response – usually from Google Analytics (data feed from the client's google analytics properties).



ARTS AI

▶ KPIs Measured:

- ▶ Digital conversions
 - ▶ Any conversion on an advertiser website or app where a pixel can be placed and where a click occurs:
 - ▶ Site visit, registration, sign-up, purchase, video view, click on a web page, email submit, coupon download, etc.
- ▶ Six KPIs per campaign
- ▶ This capability is consistent across broadcast radio, podcasting, streaming audio, and other nonaudio channels.

▶ Methodology – Pixel-Based

- ▶ ArtsAI provides impression and click trackers to all publishers that are placed by the publisher to capture impressions at the line-item level.
 - ▶ Signals used include location, device, user history, conversion data.
 - ▶ For broadcast: ArtsAI works with the broadcaster to determine the descriptors that will be available in the spot logs and the frequency of transmission (real time/daily/weekly).
 - ▶ Data will vary but generally includes date/time/station/ commercial length/ campaign R/F/station penetration.
- ▶ Modeling via Machine Learning (ML):
 - ▶ Digital: Individual matches are made and then aggregated up to the campaign attribution.
 - ▶ Broadcast: Modeling remains the same but begins with aggregated inputs, whether spots or total impressions and results in outputs that reflect total radio from all sources (over the air, streaming and app) to provide an accurate view of total impact.

[Learn more and connect with ArtsAI](#)



CLARITAS

► **KPIs Measured:**

- Digital conversions (digital audio only, not broadcast).
- Accurately track how podcast/streaming audio advertising is impacting both offline and online conversions using a unique methodology that attributes conversions by connecting exposures to residential IP.

► **Methodology – Pixel-Based**

- Captures ad exposures via a pixel and matches it to the associated online or offline conversion via a proprietary identity graph.
- Matching the residential IP address without requiring vanity URLs or promo codes.
- Leveraging the Claritas ID graph, the point-of-sale channel performance (in-store, online, etc.) is isolated regardless of the exposed listener's path to purchase to reach their preferred channel, providing a true ROI for podcast ad buys.

LEADS RX

- ▶ **KPIs Measured:**
 - ▶ Web lift
 - ▶ Call lift
 - ▶ Multi-touch attribution
 - ▶ ROAS
- ▶ **Methodology – Pixel, Google Analytics, Survey-Based**
 - ▶ Broadcast
 - ▶ Call tracking technology
 - ▶ URL tracking
 - ▶ Attribution modeling
 - ▶ Podcast
 - ▶ Conversion tracking pixels
 - ▶ Dynamic promo codes
 - ▶ Post-campaign surveys with consumers who have heard the ads.
 - ▶ OTT/Streaming
 - ▶ Multi-touch attribution (brings all pieces together to track contribution by audio channel).
 - ▶ Conversion and engagement tracking via pixels and engagement metrics.
 - ▶ Data integration from various sources including spot logs, call tracking, URL tracking, and other tracking technologies, to create a complete view of the advertising impact.

MEDIA MONITORS

▶ **KPIs Measured:**

- ▶ Web lift

▶ **Methodology – radio, TV and cable ad monitoring data; Google Analytics**

▶ Media Monitors monitors the following audio media types:

- ▶ Broadcast radio (98 local markets)
- ▶ Online radio (National)
- ▶ Podcast (approx. 3,500 national podcasts, monitored from local field sites to detect localized advertisements).

▶ Media Monitors attribution reports combine Media Monitors radio, TV and cable ad monitoring data (indicating precisely when and where specific creative aired) with user activity pulled directly from clients' Google Analytics properties to provide the following metrics:

- ▶ Daily, weekly and monthly comparisons of website activity (Total Users, New Users, User Sessions and Page Views) to ad instances, impressions and estimated ad expenditure (MediaMonitors AdRev[®]).
- ▶ Change in website activity (Total Users, New Users, User Sessions and Page Views), on Days with Ad Activity within 24 hours, 15 minutes and 8 minutes after creative airplay versus days without Ad Activity.
- ▶ Average users, sessions and pageviews on days/weeks/months with ad airplay versus days/weeks/months without ad airplay.

NIELSEN

► KPIs Measured:

- Brand effect
 - Ad recall, aided awareness, familiarity, affinity, favorability, consideration, purchase/seek information Intent, recommendation intent, message association, brand attributes, brand fit
- Content engagement
 - Content rating/enjoyment, Intent to view/seek, uniqueness, intent to share, host/character likeability

► Methodology – Opportunity to Hear, Contact Estimation, Tags, leveraging Nielsen's PPM/Diary Panelists

- Broadcast
 - Contact Estimation is a more granular approach to Opportunity to Hear (OTH) which combines respondents' audio listening behavior along with the actual GRPs delivered to a particular market.
 - Contact Estimation is Nielsen's proprietary method, where survey data on media consumption, actualized media data (impressions, targeting group information, frequency and the delivery pacing of impressions) and time effect variables are all synthesized to determine the likelihood of people's exposure to a certain media.
- Podcast
 - Tags placed on dynamically inserted ads.
 - Live-Reads measured through Opportunity to Hear (OTH).
- OTT/Streaming
 - Tagging to positively identify exposure followed up with validation questions to panelists.
- Cross-channel
 - Simulated methodology serves media content with the ad/sponsorship to a group of respondents (exposed/post) and compares impact to a group of respondents that received the same content (control/pre) without the ad, measuring lift at different statistical significance levels to determine perceived brand and talent fit.

POUND 250

▶ **KPIs Measured:**

- ▶ Call lift
- ▶ Click-throughs to text-reply landing page links

▶ **Methodology – Call tracking - volume and duration**

- ▶ #250 as an *existing* speed dial on virtually any mobile phone, removes the need to remember 10-digit phone numbers, while retaining attribution by enabling immediate response and preserving emotional intent to buy.
- ▶ #250 provides attribution to broadcast media like TV & Radio (where no click-through digital trail exists)
- ▶ Marketer's CTA is #250 with an associated, unique keyword or phrase (e.g. brand name, slogan) for each channel or creative execution.
- ▶ Measurement is strictly by inbound call volume (and associated click-throughs from optional text reply).
 - ▶ Call duration is a quality indicator.

VALIDATE

► KPIs Measured:

- Real time impressions, reach, frequency and CPM for campaigns.
- Conversions and insights on listener traffic
 - Website Conversions within 90 days of exposure
 - Average Times Exposed: The average number of times listeners who have visited the advertiser's website have been exposed to a radio campaign.
 - Average Ad Exposures Needed: The average number of exposures to a campaign among listeners visiting an advertiser's website.
 - Average Time Since First Impression: The average number of days between a listener's exposure to a campaign and a visit to the advertiser's website.
 - Over-delivery based on % share of airings versus response
 - Average increases in daily traffic when on/off-air and in/out-of-stream
 - Changes in user engagement metrics like Time On Site, Pages Per Visit, Mobile Usage, Bounce Rate (until it is removed from Google later this year), etc.

► Methodology:

- Validate measures broadcast radio campaigns by tracking exposure to ads on stations' streams and extrapolating the streaming audience to the total audience across broadcast and streaming.
 - This extrapolation is based on multipliers calculated from minute-by-minute data on the proportion of the total audience that is listening to radio stations via streaming.
 - Station metadata from the automation system, is used to inform what commercial content is delivered to audiences in real-time
 - Traffic data is ingested daily, to group creative into campaigns, and calculate CPMs
 - Streaming audience counts are collected from the streaming provider, to measure number of impressions delivered digitally
 - An audience tag for radio station players is used to tag and uniquely identify listeners
 - A conversion tag is provided to advertisers, to use on their websites to connect visits back to streaming impressions

VERITONE

► KPIs Measured:

- Web lift and engagement; correlating multiple types of playout data to multiple types of web data to measure web based KPIs including:
 - Campaign lift, industry averages, lift by days ads aired, period-over-period traffic benchmarks, Daily visits, Incremental (new) ad attributed users, ad cost averages, creative A/B testing, lifts by stations/dayparts/day and date and geolocation, page paths, device lifts.

► Methodology – Pixel, Google Analytics and Data Lake, Adobe Analytics

- Veritone uses time-series correlation to correlate ad-occurrences (via post log data) to website visits and visitors via the advertiser's website traffic data.
- The approach is unique in that Veritone can correlate multiple types of playout data to multiple types of web data:
 - **Playout/Post-Log Data**
 - Direct/automated integration with Wide Orbit Traffic or email ingest workflow
 - Optionally, Veritone can detect and timestamp non-logged mentions (billboards, presenting sponsorships, endorsements, live mentions, promos, etc.) via audio feed transcription
 - Option to direct-upload any on-air traffic log data
 - **Website Traffic Data**
 - Google Analytics 4 (GA4)
 - Google Data Lake (provides minute-by-minute data and fidelity that was lost in Google's move to GA4)
 - Veritone's custom tracking code pixel
 - Adobe Analytics

[Learn more and connect with Veritone](#)

VERITONIC

► **KPIs Measured:**

- Impressions
- Reach & Frequency
- Conversion Rate
- Incremental Lift
- Brand effect/Creative effectiveness

► **Methodologies – Tracking pixel or prefix URL for digital attribution; survey platform based for brand lift/creative**

► **Attribution**

- Conversions for all digital audio channels.
- Ad impressions are served and either a tracking pixel is deployed through the campaign ad server(s) or a prefix URL is deployed by the publisher hosting the stream.
 - Pixels are typically used for dynamically-inserted ads, while prefix URLs are typically used for baked in ads, such as host-read or similar ad integrations.
- Comparison of a set of exposed IPs against a set of IPs that have performed a tracking action. IP matching to a Household Identifier using Neustar device graph.
 - The overlap of HHIs within the attribution window represents the number of converted HHIs. For the unmatched IPs, comparison is at the IP level. The sum represents the number of conversions for the campaign.

► **Brand Lift/Creative Effectiveness**

- Brand lift and creative effectiveness studies can be run for target audiences of any size, measuring both controlled and organic exposure across broadcast radio, streaming audio, podcasts using a proprietary survey-based platform.

ADVERTISING BENCHMARK INDEX

(ABX)

▶ KPIs Measured:

- ▶ 14 creative KPIs (brand recall, messaging, brand reputation, call-to-action, likeability)
- ▶ Gender and cultural measures
- ▶ Media consumption (radio, TV, social, newspaper, magazine)
 - ▶ Stations/programs listened to
 - ▶ Frequency of listening
- ▶ Category/Product purchase
- ▶ Devices used
- ▶ Demographics/Gender/Faith/Diversity
 - ▶ Global gold standard for gender equality measurement
- ▶ All KPIs and measures are consistent across all media types and platforms globally

▶ Methodology – Survey-Based

- ▶ 6,000 interviews per day 50/50 U.S./Global, 18+ with supplemental sample for 13-17
- ▶ GISS™ Platform (Global Integrated Single Solution) – all media types, markets, regions and DMAs
- ▶ Daily real-time measurement with daily reporting

[Learn more and connect with ABX](#)

ABX
ADVERTISING
BENCHMARK
INDEX

COLEMAN INSIGHTS ASCEND

► KPIs Measured:

- Brand lift metrics customized to the brand needs and often include:
 - Unaided Awareness and Aided Awareness
 - Advertising Recall
 - Brand Favorability
 - Brand Consideration/Purchase Intent
 - Message Association
 - Attribute Association

► Methodology – Survey- and Pixel based depending on nature of campaign.

- Analog
 - Online surveys conducted with an advertiser's target audience immediately prior to and immediately following the completion of a broadcast campaign.
 - This is available across all audio platforms.
- Digital
 - Pixels inserted in podcast and/or streaming ads to compare KPI movement among listeners exposed to a campaign versus a control group of listeners not exposed to a campaign.
 - Match exposures via known mobile ad IDs (MAIDs), IP addresses, and direct server to server integrations.
 - This is not available for broadcast radio.

ENGAGEMENT LABS

▶ **KPIs Measured:**

- ▶ Brand conversations (volume and sentiment), awareness, consideration, purchase intent, favorability, recommendations to buy, cultural relevance, brand imagery

▶ **Methodology – Survey-Based**

- ▶ Proprietary, ten-year database of unique brand, industry and competitive intelligence using a patented methodology.
- ▶ Representative national sample of people balanced to census on demographics that include age, gender, region, race and education.
- ▶ Data is collected daily and regularly updated every week.
- ▶ Survey collects data on word of mouth about brands, as well as the media consumption of the sample.
- ▶ Listening to or streaming radio, podcast listening; live TV viewing, DVR/on-demand/streaming TV viewing; social media; newspapers and magazines.

KANTAR INSIGHTS

▶ **KPIs Measured:**

- ▶ Sales outcomes
- ▶ Brand metrics

▶ **Methodology – Survey-Based**

- ▶ Consistent measurement approach across clients, ad formats and media platforms enabling relative comparisons across a broad range of choices:
 - ▶ Sales or volume analyses estimate the impact of advertising across all available media platforms down to the campaign/copy level (depending on data), in terms of effectiveness (sales/volume throughput) and efficiency (ROI).
 - ▶ Brand Equity analyses estimate the impact of advertising across each platform/campaign/copy combination on measures including awareness, preference, purchase likelihood, repeat purchase behaviors and advocacy.
 - ▶ Impact of advertising across platforms versus Kantar specific composite measures such as demand power, price power, future power and activation power.

MARU

► KPIs Measured:

- Brand effect
 - Implicit Association Test (IAT): Brand association to the platform where the ad appears (fast implicit, slow implicit or no association at all).
 - Emotional Equity: Measuring how consumers feel about the brand and how aligned those emotions are to how consumers want to feel (projective technique).

► Methodology – Survey-Based

- Programmatic solutions rooted in behavioral science work that demonstrates how people feel, behave and think. Therefore, uncovering which emotional and rational elements are forming the “motivational pathways” that drive consumer choice.
- IAT is a time pressured, gamified sorting exercise. Consumers are asked by platform/channel to sort advertised brands quickly into bipolar choices.
 - Brand choice is driven by fast, implicit, positive associations.
- To capture emotion, a patented validated global library of over 10,000 images grounded in visual semiotics is utilized to expose to consumers. Nine emotional territories that encompass 72 emotions are used to identify emotional equity for the brand exposed to consumers.

PROVOKE INSIGHTS

► KPIs Measured:

- Brand effect
 - Advertising Recall (Brand & Messaging), Familiarity, Likeability, Likelihood to learn more, Call to Action (Likely to Purchase)
 - Other attributes include
- Content engagement
 - Memorability, uniqueness, believability, informative, engaging

► Methodology – Deterministic Survey (with Pixel), Probabilistic Survey Based

- Broadcast
 - Using the client's media plan, survey will ask respondents about their media habits during a specific timeframe to determine who has been exposed/unexposed your campaigns.
 - This approach will provide an accurate view of what is happening in the market.
 - This is available across all audio platforms.
- OTT/Streaming/Podcast
 - Creative is tagged with a pixel (or other cookieless solutions.)
 - Match exposures via known mobile ad IDs (MAIDs), IP addresses, and direct server to server integrations.
 - Survey then launched among those who are exposed and unexposed to the creative.
 - This is not available for broadcast radio.

SIGNAL HILL INSIGHTS

► KPIs Measured:

- Brand effect
 - Advertising recall, Familiarity, Affinity, Favorability, Consideration, Purchase/seek information intent, Recommendation intent, Message association, Brand attributes, Brand fit, Halo effect from sponsored content.
- Content engagement
 - Content rating/enjoyment, Intent to view/seek, uniqueness, intent to share, host/character likeability.
 - Primarily measured for podcasts and specialty branded content. This includes, but is not limited to, fully branded podcasts and content, bonus podcast episodes and mini-series, product integration for commercial broadcasters and sponsored content for public broadcasters.

► Methodology – Survey Based

- Broadcast & YouTube
 - Opportunity to hear (OTH) is used to identify likely exposed listeners.
 - Call to action (CTA) is used to recruit listener directly through media channels.
 - Pre-Post lift studies using OTH and CTA recruitment methods.
 - Controlled exposure in a simulated environment.
- Streaming/Podcast
 - Server-side tag on dynamically served or inserted ads to identify exposed listeners, matched to a nationally representative survey panel.
 - For podcasts, call to action (CTA) used to recruit listener panelists directly through media channels, with Pre-Post lift available.
 - Controlled exposure in a simulated environment.
- Other Digital
 - Server-side tag on dynamically inserted ads to identify exposed, matched to a nationally representative survey panel.

AUDIO ATTRIBUTION

CROSS-CHANNEL IS KEY



As concurred by providers of attribution methodology, it is easier to build the link and directly track the digital delivery of an impression and the direct response from the consumer taking action. However, response cannot be attributed or isolated to the consumer's final digital click as the consumer has been exposed to multiple media throughout their journey.

Attribution providers can implement cross-channel attribution allowing advertisers the ability to understand the effect and amplification that occurs between radio advertising and other digital marketing channels. According to LeadsRx, "By analyzing how radio ads impact consumer behavior across different touchpoints, a more holistic view of attribution emerges."

AUDIO ATTRIBUTION

APPROACH VARIES, AI TRANSFORMS



As stated in the introduction, digital attribution models and methods have set the bar for the advertising industry and are constantly changing. According to Maru, “While digital has enjoyed the benefit of ‘data’ that the consumer has been served an ad or exposed, its impact on the consumer has never been one of cause and effect.”

ArtsAI, now owned by Claritas, among other providers featured in this document, have transformed ad tech for audio by providing AI-driven measurement across its entire audio spectrum. According to the company, “While the exact approach varies by medium due to the different inputs available, the core AI/machine learning ‘brain’ is consistent. That’s the most important element in having comparable and accurate results.”

AUDIO ATTRIBUTION

PIXELS CAN BE USED FOR RADIO



Though pixels and other digital watermarks are not technologically able to track a listener from the actual AM/FM broadcast, there are workarounds. Pixels can be embedded across radio's digital platforms and within the advertiser's website. It enables providers to track inbound website traffic, regardless of its source. Digital attribution capabilities complemented by broadcast data (such as reach/impressions/ratings and day/date/time post logs) from radio groups, attribution to radio across channels can be achieved. In fact, certain providers are currently testing over-the-air measurement solutions that could track conversions happening further into the funnel, such as lead generation and, ultimately, purchases.

AUDIO ATTRIBUTION

AKIN TO DIGITAL



It is critical to note that digital attribution is not always the primary KPI and may be one of many. According to Nielsen, “Radio campaign impact is easier to measure when we can collect live exposure across radio-driven campaigns as they happen naturally, without having to rely solely on self-reported incidents of exposure.” This is where their Contact Estimation tool truly shines as it takes the actual GRPs/Impressions delivered by channel into account to estimate a number of exposures at the individual respondent level and breaking out differences in KPI results by channel in a way that is very similar to what is done for digital exposures.

AUDIO ATTRIBUTION

BEYOND THE CLICK



Many marketers, especially direct response advertisers, set out to drive call volume. Phone calls have historically converted at a higher rate than clicks, often 10 times higher, according to Pound 250. Vanity phone numbers and Pound 250 among others enable immediate response, preserving emotional intent-to-buy created in the spots and directly attributes the credit for radio activity beyond a limited period.

Brand effect KPIs are attributable across radio platforms through a variety of survey-based methodologies. Aptly stated by ABX, “One of the strongest support points for audio is how it improves reach and impact when added to other media types. It is this reach that broadcast radio provides that is missing from digital and other media.” Brand effect measurement consistently proves that this is the case.

Engagement Labs released a study for RAB that shares the overall volume of brand conversations among radio listeners as compared to consumers of other media. Their survey design segments consumers by media consumption enabling lift measurement for each individual KPI, cross-media.

RECOMMENDED METHODOLOGY

OBJECTIVE BASED



ATTRIBUTION

- AnalyticOwl
- ArtsAI
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Web lift
Call lift
Digital conversions
Foot traffic



BRAND EFFECT

- ABX
- Coleman Insights Ascend
- Engagement Labs
- IPSOS
- IRI
- Kantar
- Maru
- Nielsen
- Provoke Insights
- Signal Hill
- Veritonic

Awareness
Recall
Purchase intent
Word of mouth
Brand affinity
Engagement



TRANSPARENCY & ACCOUNTABILITY

- Eastlan
- Kantar
- Media Monitors
- MRI-Simmons
- Nielsen
- Triton Digital
- Valdiate
- Veritone

Ratings
Impressions
Spending
Occurrences
Metadata tagging



RETURN ON AD SPEND

- Analytic Partners
- Nielsen
- Vivvix
- Media Mix Modelers

Media mix modeling
ROAS
Sales effect

AUDIO ATTRIBUTION

THE FUTURE IS BRIGHT



Today, broadcast radio and its digital channels can currently be measured through multi-touch attribution methodology to prove search activity, website traffic, phone calls, store traffic, word of mouth, commerce through a smart speaker, brand metrics and sales via ROI modeling.

In a consistently evolving data and technological world, attribution methodology will continue to advance to further enhance technological innovation and capability.