ARF | RESEARCH INITIATIVES

ARF ATTENTION MEASUREMENT VALIDATION INITIATIVE

PHASE 1 (UPDATED)

CONTENTS

FOREWORD

Initiated in 2022, this project stems from the advertising industry's heightened focus on attention measurement. Energy and resources dedicated to this area have soared, partly because of the loss of behavioral signals (due, in turn, to privacy restrictions), which subsequently has led to an interest in additional ways of targeting and other metrics for evaluating attention. Growing frustration with the limitations of ad viewability as a measure for ad efficacy and for planning has led to a desire for better proxy signals. Additionally, there has been a growth of inexpensive biometric tools, such as eye tracking and eye fixation, and galvanic skin response (GSR) that can be applied not only in labs but "in the wild." Relatedly, significant advances have been achieved in AI and machine learning (ML) as techniques to scale up measurement. Finally, the broader debate about how to measure impressions across platforms, along with reach and frequency in the media measurement side of the business, has placed greater emphasis on the contextual quality of ad placements in media.

The ARF's Attention Measurement Validation Initiative goals are as follows:

- Broaden market understanding of the current landscape of attention measurement suppliers, the range of approaches and methods, and their congruence with peer-reviewed academic work on cognition and behavior.
- Through a series of experiments, assess the replicability, reliability and validity of existing approaches and methods.
- Propose steps to improve transparency and practices, common definitions and audit standards.
- Publish a guide suggesting questions that prospective buyers should ask vendors.
- Identify promising directions for further research and methodological development.

The project was divided into three distinct phases, each serving a specific purpose. This report is the culmination of the first phase.[1]

[1] This is the updated report that now includes analysis of 29 measurement companies.

PHASE ONE MAIN OBJECTIVES

- **Establish an advertiser and academic advisory board to provide guidance and expertise throughout the project.**
- **Conduct a comprehensive survey among attention measurement providers.**
- **Publish a compendium that encompasses various aspects, such as methodologies, key performance indicators (KPIs) and profiles of participating companies.**

COMMONLY AGREED PERSPECTIVES ON ATTENTION IN ADVERTISING

From information gathered thus far in academia and industry, attention is necessary at some level (i.e., there cannot be zero attention or inattention). Clearly, ads work well also at low levels of attention (often associated with psychologist Daniel Kahneman's System 1 thinking) as can be seen in much TV-focused research. Research and various case studies also demonstrate that attention can take place without visuals (mostly guided through audio signals), and at short duration spans (perhaps even shorter than two seconds, the current digital viewability standard).

Focused attention (System 2 thinking) seems to be relatively rare in advertising. This kind of attention is typically a function of the interests and predispositions of the audience. In this regard, it is an indirect effect of how effectively an ad was targeted and how it was placed in front of the relevant audience.

Attention can be misleading since there are instances where negative attention occurs, i.e., a long duration dwell time due to people actively scanning the screen in search of a "skip" button.

Pre-testing ads can improve odds of getting over the attention hurdle. At the same time, in-field success depends also on additional elements of good marketing, such as aligning the ad with the audience and the media context.

Coefficients of attention measures do not demonstrate a direct relationship with outcomes. Understanding the interactions is likely what will drive to market results such as good sales. Additional effects include wearin, wearout, and diminishing returns.

Not only are there different forms of attention, but there are also different styles of paying attention that depend on device and display surface, and the conversion of raw signals into attention metrics. Within this context it is useful to acknowledge different attention switching tactics that are employed by the viewers.

KEY THEMES AND QUESTIONS ON ATTENTION IN ADVERTISING

- What are different types of attention and how are they relevant to advertising?
- Are some easier to measure or to treat creatively?
- How should we interpret time duration? As a gatekeeper/threshold? How do we address the issue of diminishing returns?
- How do we account for attributes of individuals?
- How do we account for properties of devices and viewing situations?
- How to understand attention in the context of different ad KPIs? How to overcome ad resistance and ad avoidance?
- How good is good enough? Can proxy measures suffice? What is the optimal level of direct measurement of human signals of attention?
- Where in the process can algorithms take over?
- What is the budget for attention measurement? What are the costs and benefits dimensions for global brands?
- On the social aspect of ad attention: Is the process for improving ad attention potentially harmful to the audience or sub-sections of the audience? If ad attention is successful, can this avoid negative externalities? Conversely, if this fails, will this encourage adverse tendencies of humans? Might this in turn create greater aversion to advertising?

METHODOLOGY

All firms that we could identify that were involved in attention measurement and prediction were asked to participate in the Request for Information Survey. The objective was to gather comprehensive data and "map the space," creating a descriptive catalog that will act as a Market Atlas. This atlas provides an overview of current vendors and services in the field. The survey covered the following areas:

- Current use cases, products, services and deliverables offered by the participating companies.
- Underlying definitions and theoretical foundations that guide their work.
- Measurement methods and analytical approaches employed.
- Scope of business operations, staff capabilities and data integration capabilities.
- Relevant validation studies, white papers or other demonstrations of efficacy conducted by the various companies.

Following this survey, interviews were conducted to address any questions that remained unclear and obtain a more complete understanding of the company and its offerings within the market.

Additionally, comparative analysis was conducted, to include a comprehensive overview of the field of the attention measurement companies at large. In what follows we present a high-level view of an emerging field.

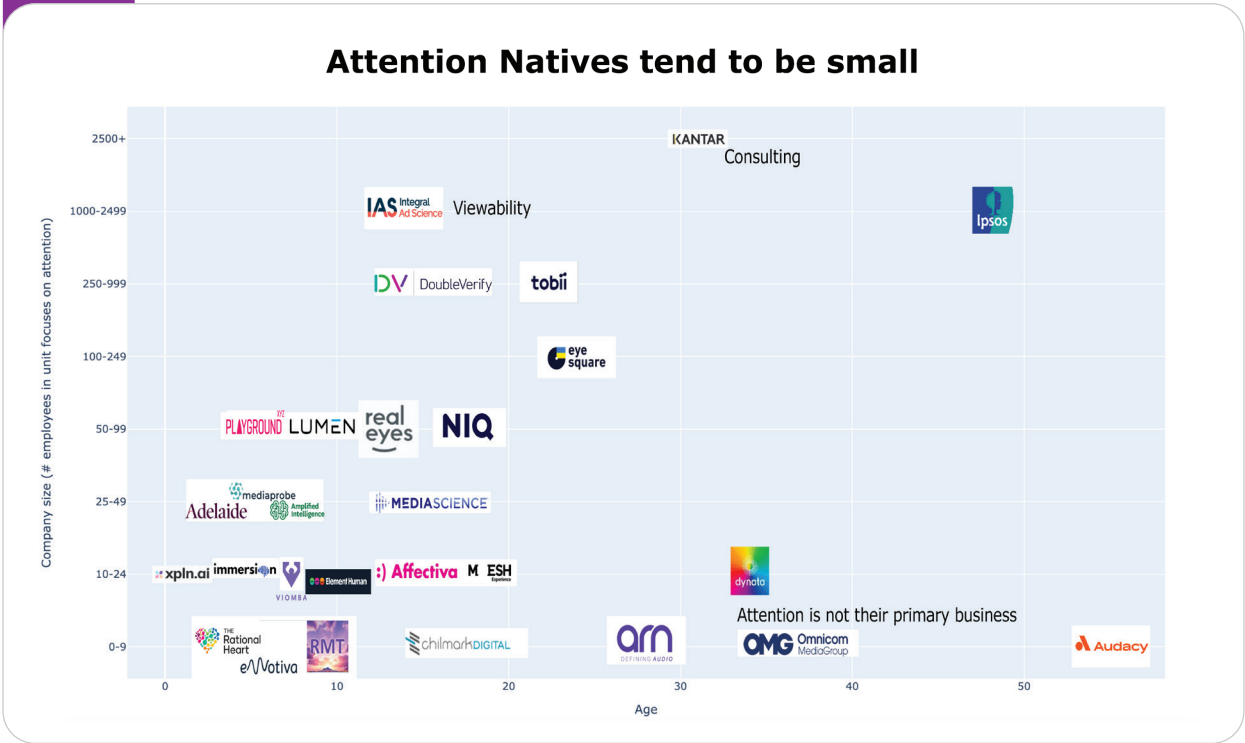
FINDINGS

Profiling Attention Measurement Companies: A Comparative Analysis

ATTENTION NATIVES AND ATTENTION NOT-NATIVES

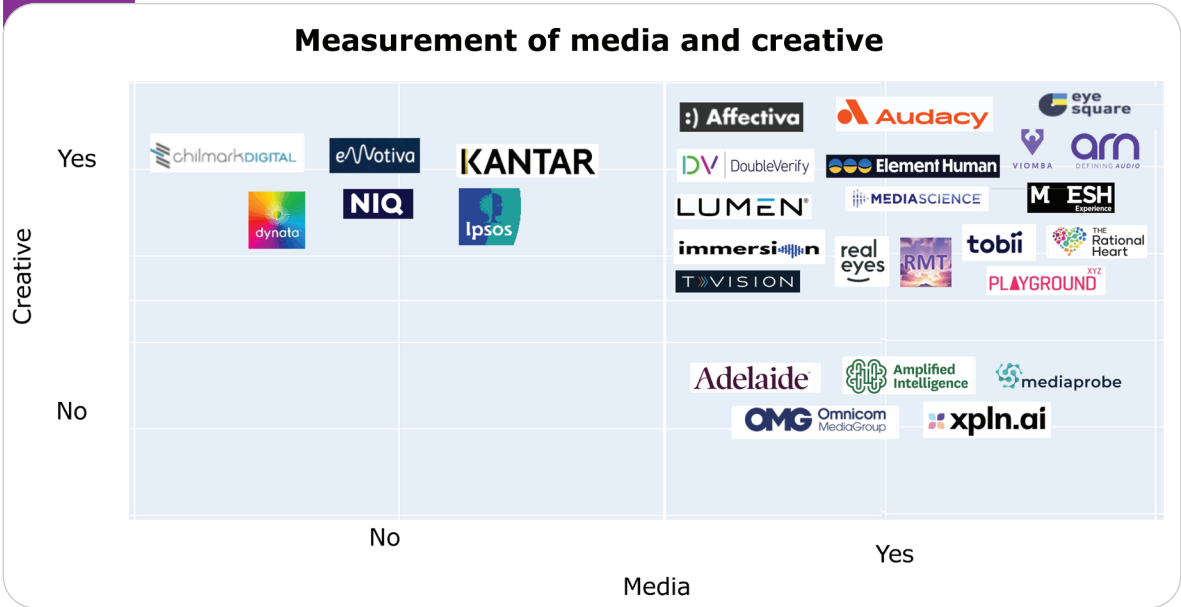
We identified several companies that we term "Attention Natives," namely, companies that were specifically founded to study attention. These companies are relatively new and tend to use some of the newer tools such as eye tracking in the wild and facial coding (more on this below). Attention Natives also tend to be small (see Figure 1). Other companies that have attention units within them tend to be larger and part of older corporations.

FIGURE 1



Most companies that measure attention report on measuring both media and creative (see Figure 2).

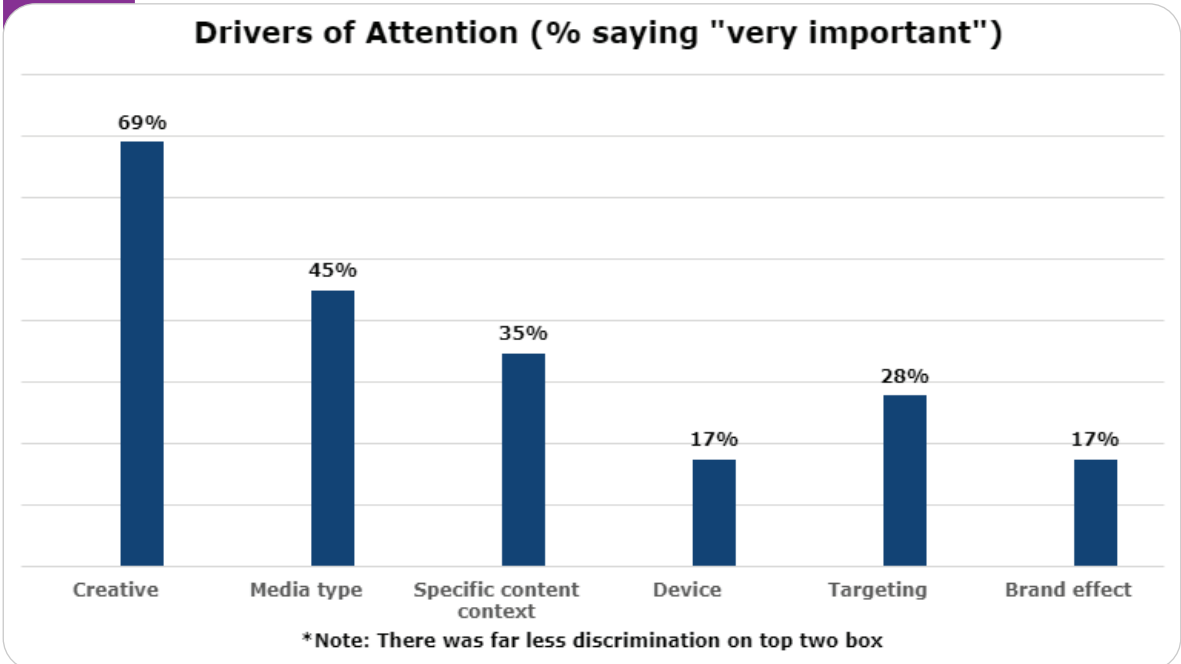
FIGURE 2



At the same time, measuring attention to different media platforms is relatively new. To this extent, companies that solely measure media average only six years of age, whereas companies that exclusively measure creative average 18 years, and companies that do both average 14 years.

As can be expected, what companies measure (media vs. creative) is closely related to what they identify as the primary drivers of attention. To this extent, creative and media are the top two most important drivers of attention, at 69% and 45% respectively (see Figure 3).

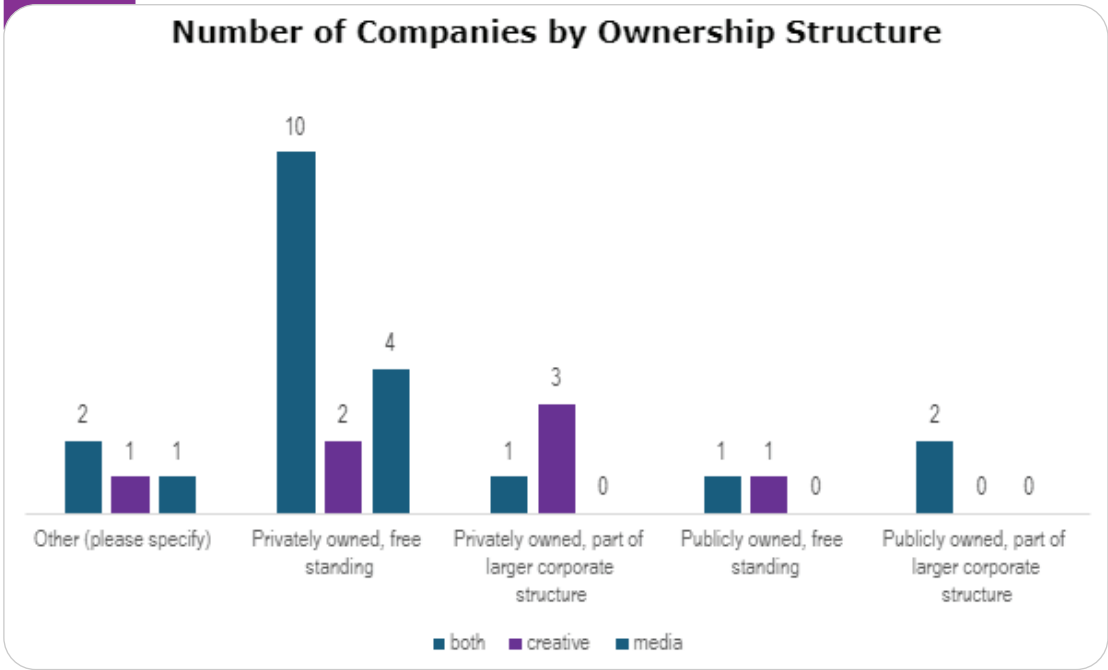
FIGURE 3



OWNERSHIP STRUCTURE

Most companies that measure both media and creative are privately owned, free standing or part of a larger private corporate structure (see Figure 4). Only four of the 29 companies are public or part of public companies. Taken together with the previous finding of company age, this reflects the relatively nascent maturity of the attention measurement field.

FIGURE 4



COMPANY REACH

Analysis shows company reach is widespread in international and sector experience. The U.S., Europe, Canada and rest of Asia are the top areas in which companies operate (at 90%, 83%, 76% and 69% respectively; see Figure 5). In terms of experience in/with sectors, almost all companies are experienced with entertainment, 90% with consumer electronics, 90% with insurance, retail, and food/beverage (see Figure 6).

FIGURE 5

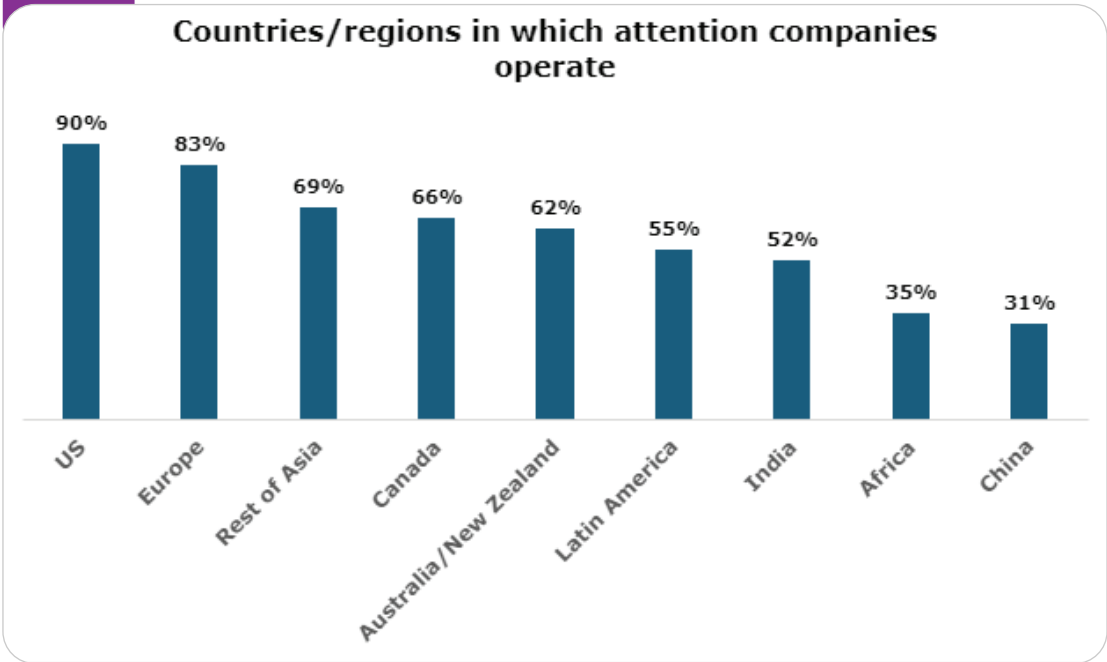
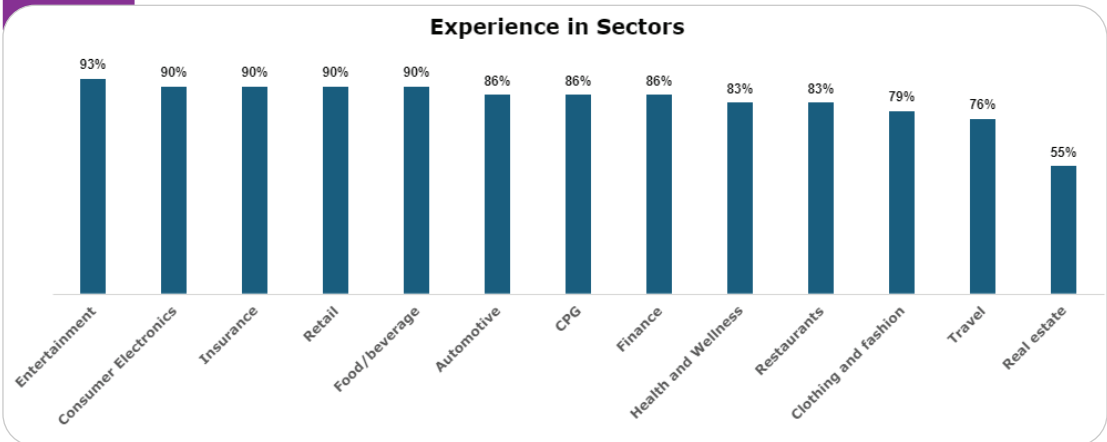


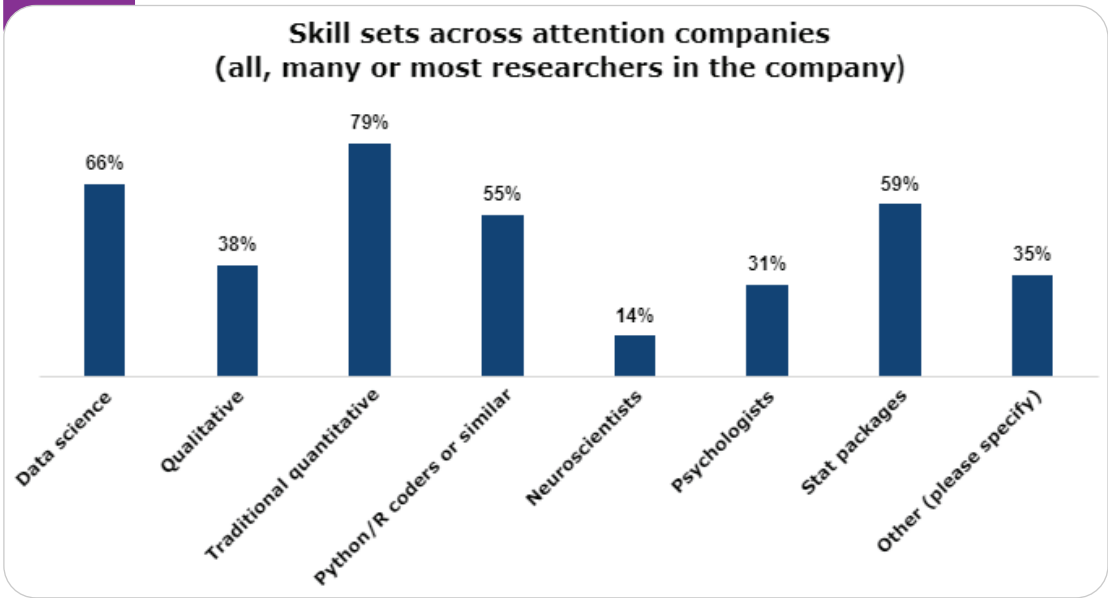
FIGURE 6



ATTENTION EMPLOYEES' SKILL SETS

Attention is, perhaps unsurprisingly, largely a quantitative business (see Figure 7). Seventy-nine percent of employees that work on attention hold traditional quantitative skills, 66% are data scientists, 59% hold/are fluent in stat packages and 55% are Python/R coders. These findings reveal the central role of modeling and the growing importance of ML and AI. By contrast, only 38% of the companies employ mostly those with qualitative skills and 31% employ mostly psychologists. Interestingly, neuro, a more expensive and laboratory-oriented technique, is rare, with only 14% of the companies employing neuroscientists.

FIGURE 7



Attention Measurement Companies' Missions of Service, Attention Definitions and Perceptions of the Relationship between Attention and Other Factors: A Comparative Analysis

Reviewing the declarative missions of the participating companies, the following themes and similarities are revealed:

1. **Attention Measurement Focus**

   The core of the participating companies' mission is to advance the measurement of consumer attention, aiming to deeply understand and improve engagement with media content.

2. **Data-driven Optimization and Effectiveness**

   Much emphasis is on the use of data and technology for optimization and effectiveness. Some of the companies focus on transforming the industry by driving change and establishing new standards in the industry. Specifically, they seek to elevate industry discourse, provide validation and promote transparency in attention measurement, media quality and campaign evaluation. Others emphasize how leveraging attention metrics can help drive better outcomes and increase efficiency of marketing campaigns, content and media. These companies focus on helping brands and agencies optimize their marketing efforts by improving creative performance, media planning and buying, and campaign evaluation. Cutting-edge technologies are leveraged to refine attention measurement and analytics, providing more precise and actionable insights.

3. **Transparency and Ethical Standards**

   Ensuring fairness and accountability in media trading by utilizing these advanced measurements to foster a transparent and ethical media ecosystem.

4. **Emotional Response**

   Several companies highlight the importance of emotional response in understanding audience behavior. They state a commitment to understand the deeper, affective aspects of consumer engagement through the measurement and analysis of emotional and cognitive reactions to content.

HOW ATTENTION IS DEFINED

The participating companies present diverse perspectives on defining attention, ranging from biological and psychological processes, sensory processing, mental resource allocation, to the role of emotion and memory. This broad range of definitions highlight the complexity of attention, involving both conscious and subconscious elements, and the variety of methods to measure and operationalize it.

Notably, while the multifaceted nature of attention is underscored, most of the definitions highlight what best aligns with the company's way to measure attention. Put differently, it seems that the tool or method that is employed to measure attention drives the operational definition of attention. At the same time, there appears to be widespread consensus among the participating companies regarding the significance of attention in advertising.

Most definitions acknowledge that capturing and maintaining attention is a fundamental aspect of the advertising process. Attention is viewed as a prerequisite for achieving other desirable outcomes, including engagement, emotional resonance and memory. As such, it is commonly accepted that an advertisement must first capture and retain the viewer's attention at some minimal level in order to have a chance at fulfilling its intended objectives. Without attention, or in the case of inattention, the message or content of the advertisement might go unnoticed or fail to make a lasting impact on the audience.

RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING

The importance attributed to attention, viewability, engagement and emotion in advertising varies among the different companies. However, several recurring themes and patterns can be identified:

1. **Attention:** Many companies emphasize attention as a fundamental aspect, considering it a prerequisite for other factors like engagement and emotion. Attention is often seen as the catalyst for generating emotion and driving engagement.

2. **Viewability:** While there may be a consensus that for an advertisement to succeed in capturing attention and achieving its objectives, it must first be viewable, there is no consensus on the value of the MRC's viewability standard. Some companies assert that the current two-second/50% of pixels standard is easily gamed. Some further assert that the notion of duration is meaningless given the regularity of a four-second skip icon. At the same time, several companies differ in their perspectives on the relationship between viewability and other aspects of advertising. While most agree that viewability is a necessary condition, some companies assert that it is not sufficient for guaranteeing attention, engagement and emotion. They argue that mere viewability does not ensure that people are actively paying attention to the ad or that it will have the desired impact.

3. **Engagement:** When it comes to engagement, there appears to be a lack of consensus among the participating companies. The term "engagement" is considered vague and susceptible to multiple interpretations, leading to divergent viewpoints. Some companies perceive engagement as a desirable outcome of attention, where users actively interact with or respond to the ad. They may define engagement in terms of measurable user interactions, such as clicks, cursor hovering, or other actions that indicate active involvement with the ad. Still other companies regard engagement as a stage in the cognitive processing of the ad, where users actively work to understand and extract meaning from the content. They may see engagement as a measure of how deeply users are processing the message conveyed by the ad and how well they comprehend it. Overall, the absence of a clear consensus on the definition and understanding of engagement suggests that it remains a subjective and multifaceted concept in the field of advertising. Different companies may adopt their own interpretations and metrics to evaluate engagement based on their specific goals and approaches.

4. **Emotion:** The companies offer diverse perspectives on the role of emotion in advertising, and a clear consensus on its definition and understanding remains elusive. Different companies approach emotion from distinct angles and emphasize varying aspects. Some acknowledge the significance of emotion as a catalyst for attention and engagement. They perceive emotion as a cue that captures and sustains attention, believing that positive emotional responses can create a favorable context for brand decision making. These companies view emotional stimuli as potent tools for capturing and retaining viewer attention. By contrast, other companies underscore the connection between emotion and memory. They consider emotional responses as crucial factors in shaping long-term memory and brand impact.

Positive emotional experiences are often linked to enhanced memory recall and future behavioral shifts. Notably, certain companies consider emotional arousal as a component of attention or engagement, as they believe that emotional stimuli can heighten the processing of advertising content and generate more meaningful experiences.

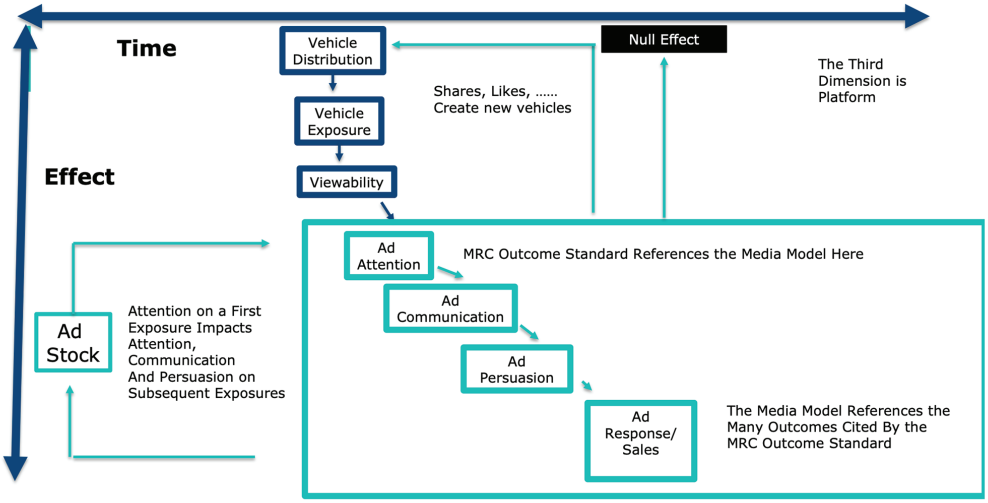
In general, the relationship between these aspects can be depicted as a sequential process:

Viewability lays the foundation for attention by ensuring that an ad is visible, thus creating the possibility of capturing attention. Attention serves as the gateway to engagement since an ad must successfully attract and maintain the audience's focus. In turn, engagement presents an opportunity for emotion to be evoked. Emotion acts as a powerful amplifier, intensifying attention and engagement, and contributing to a more memorable and impactful advertising experience.

Importantly, this sequence is not strictly linear, and there are feedback loops and interdependencies among these elements. For instance, emotion can also influence attention and engagement, while engagement can impact attention and subsequent emotional responses. The specific dynamics may vary depending on factors such as the campaign's context, target audience and creative execution. The recursive nature of the dynamic is illustrated by the new ARF Media Model shown below for linear television (see Figure 8).

FIGURE 8

The new ARF Media Model (illustrating linear television)



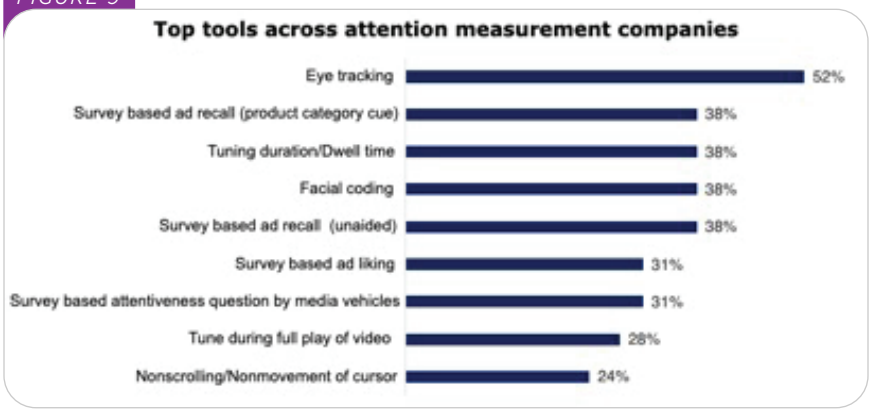
Of course, modern media including linear television is almost infinitely recursive. If an ad persuades you, does that mean you are likely to pay more attention to the same ad the next time you are exposed to it? Even more recursive, is there an auto-attentive effect, meaning that once the message of an ad is communicated, do you pay even more attention to it on the very same exposure?

Such an auto recursive effect would have every node pointing to almost every other node including to the several prior nodes once attention is paid. Since the objective is to create an empirical model, for the present the ARF is simply trying to characterize the effects as pictured in Figure 8.

How Attention Is Measured: A Comparative Analysis

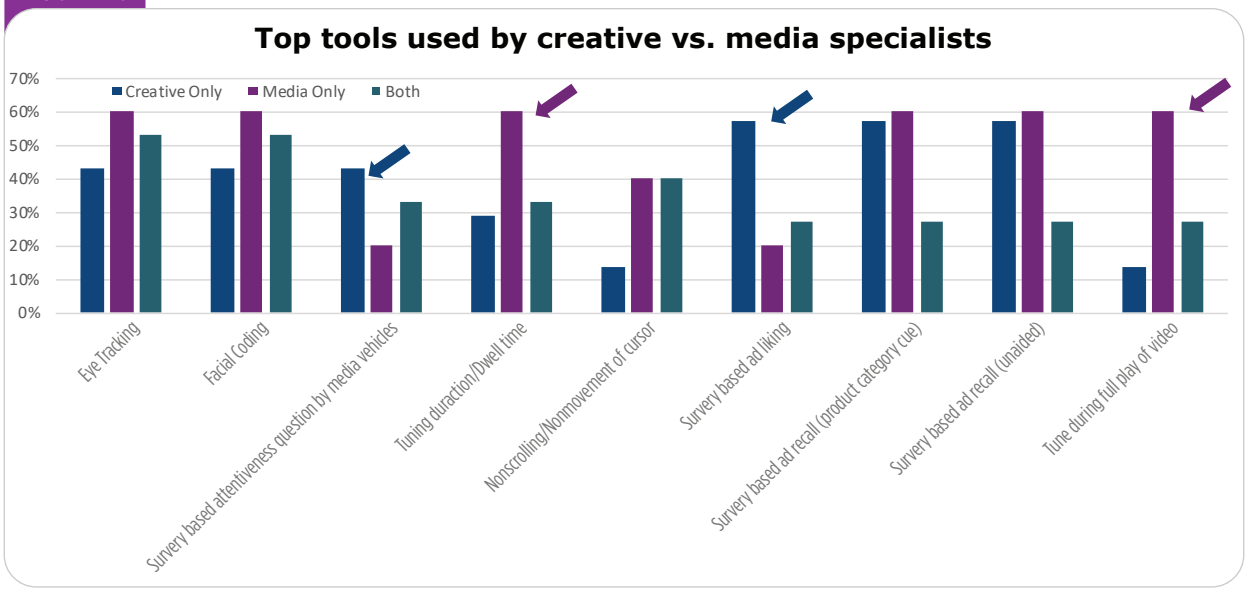
The top tools used across all companies are eye tracking (52%), survey-based ad recall (38%), tuning duration/dwell time (38%) and facial coding (38%) (see Figure 9). Notably, when combining all various survey measures, surveys become the No. 1 method to measure attention.

FIGURE 9



Surveys are ubiquitous, but central to creative tests. Media specialists, in contrast, rely more on duration metrics (see Figure 10). These are proxy measurements because they are not directly measuring attention but rather inferring attention from mouse tracking, dwell time and other non-cognitive behaviors.

FIGURE 10



Relatedly, "Attention Natives," namely, companies that were founded to measure attention, make a much broader use of tools and methods. Eye tracking and facial coding, in particular, are a favorite method to measure attention with numbers as high as 67% and 39% respectively (in comparison to "Not-Native" companies with 27% engaging in eye tracking and 36% engaging in facial coding.) (see Table 1).

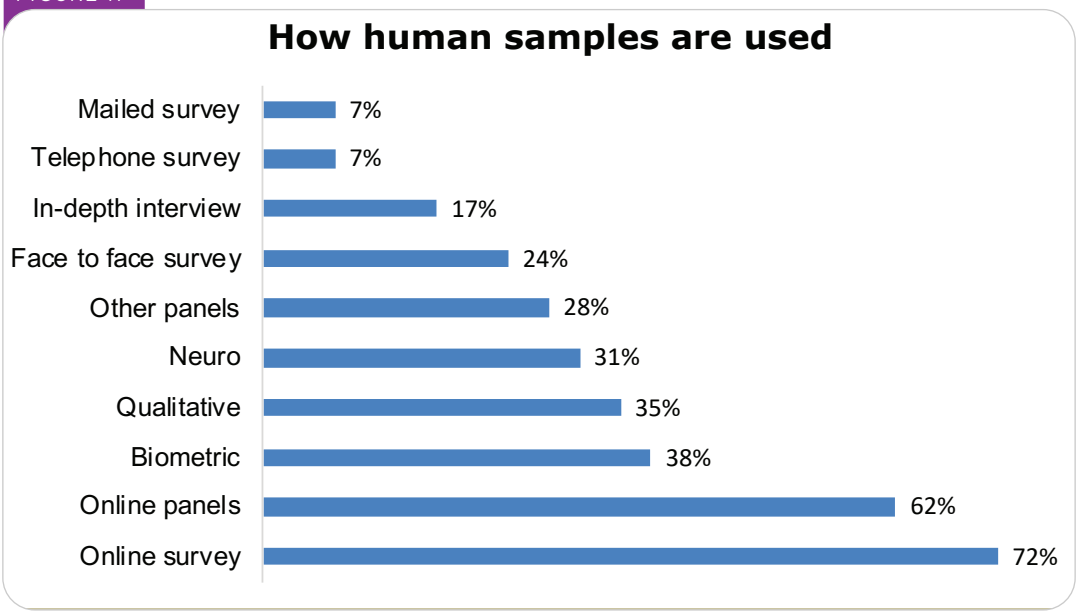
TABLE 1

Native vs. Not-Native use of eye tracking and facial coding

Method	Native	Not Native
Eye Tracking	67%	27%
Facial Coding	39%	36%

The vast majority of companies (81%) use human samples, however, the use of these human samples varies widely (see Figure 11). Most often, human samples are drawn as quota samples for an online panel or survey. In some cases, proxy signals and AI models replace human measurement. Specifically, this can be done by collecting human data early in the process and then training an algorithm on creative features that support attention to replicate the results without actually exposing the creative to humans.

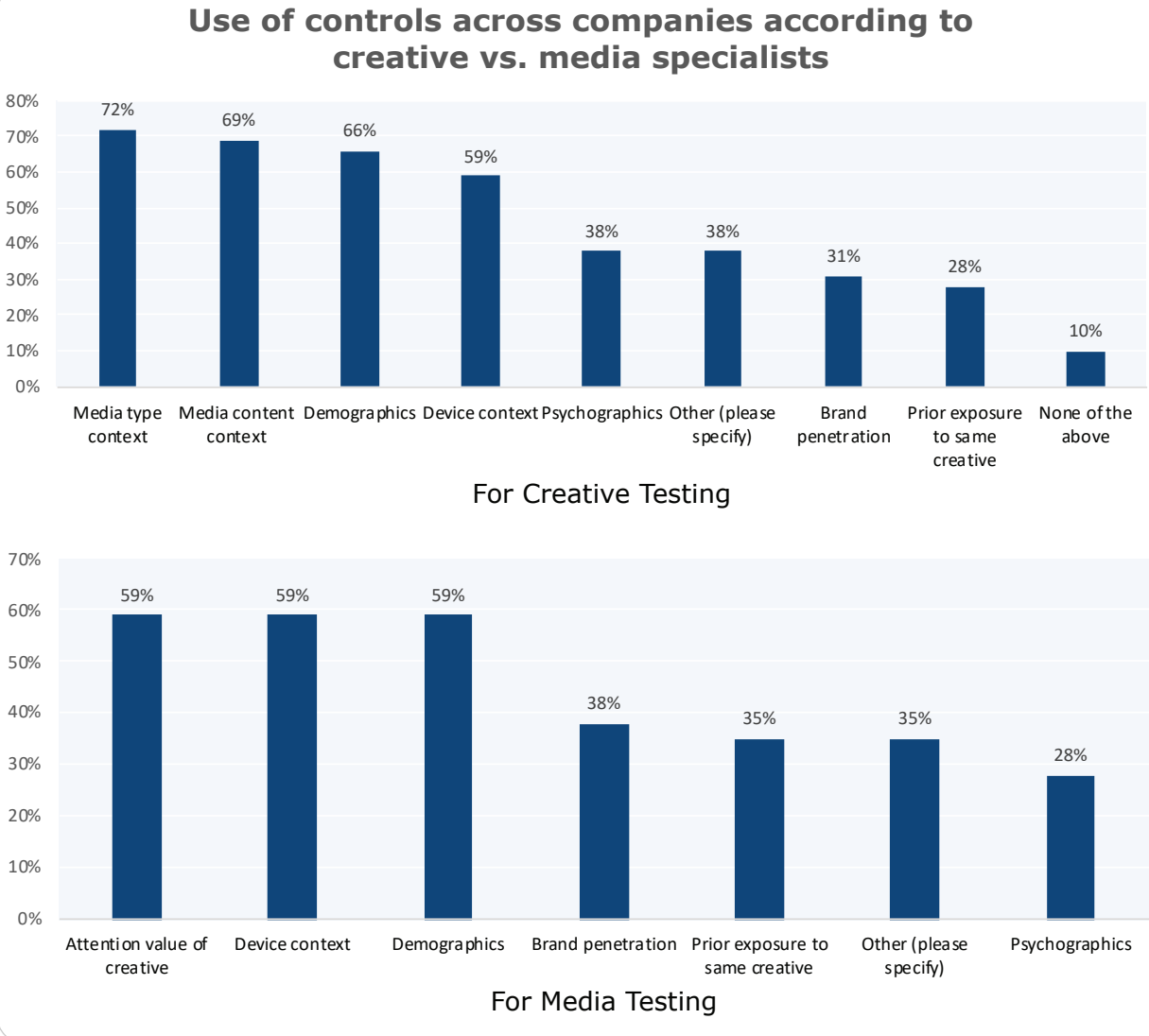
FIGURE 11



APPLICATION OF CONTROLS

Almost all companies claim to be trying to control for other variables as they measure attention. When companies test for creative, they generally and unsurprisingly control for media context. Similarly, when testing for attention to media, companies often control for creative and device (see Figure 12). Exercise of other controls is more similar between creative and media testing, but also less often for both. Isolating these variables is challenging, and this remains an interesting area for further engagement in Phases 2 and 3 of this initiative.

FIGURE 12



PLATFORMS MEASURED

Across all companies, CTV, video, social media and programmatic predominate (see Figures 13 and 14). Curiously, AR/VR/Metaverse is measured by only a small minority of companies despite the fact that this is the most complex and costly creative to create.

FIGURE 13

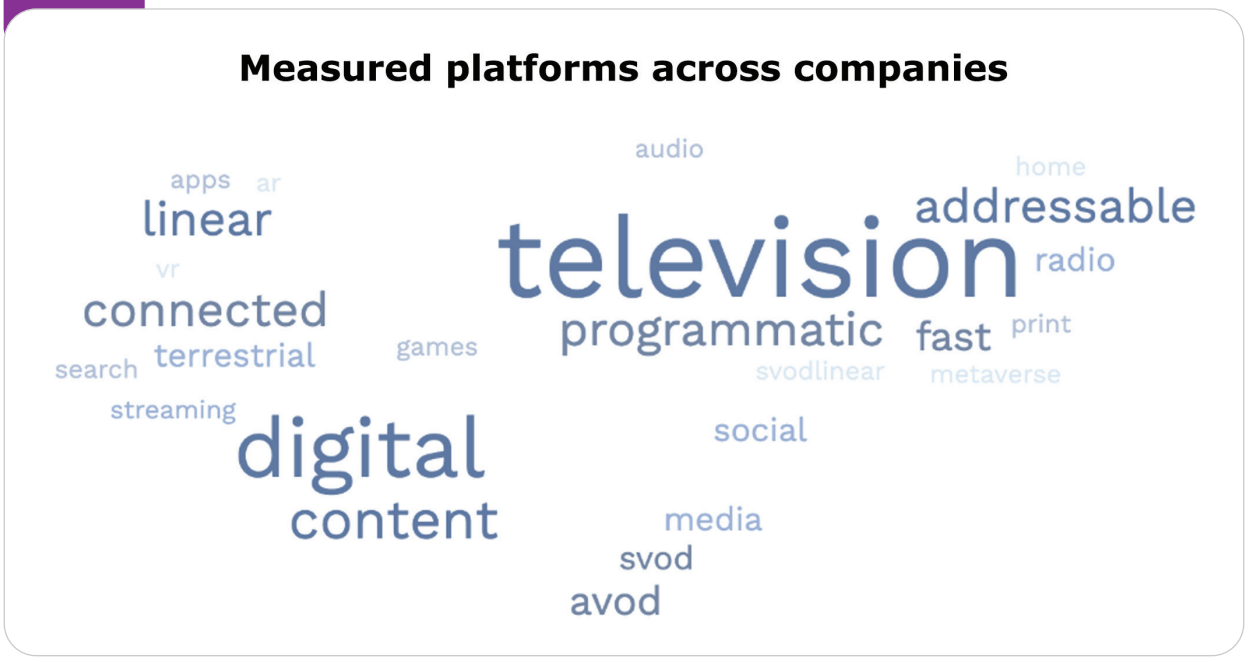
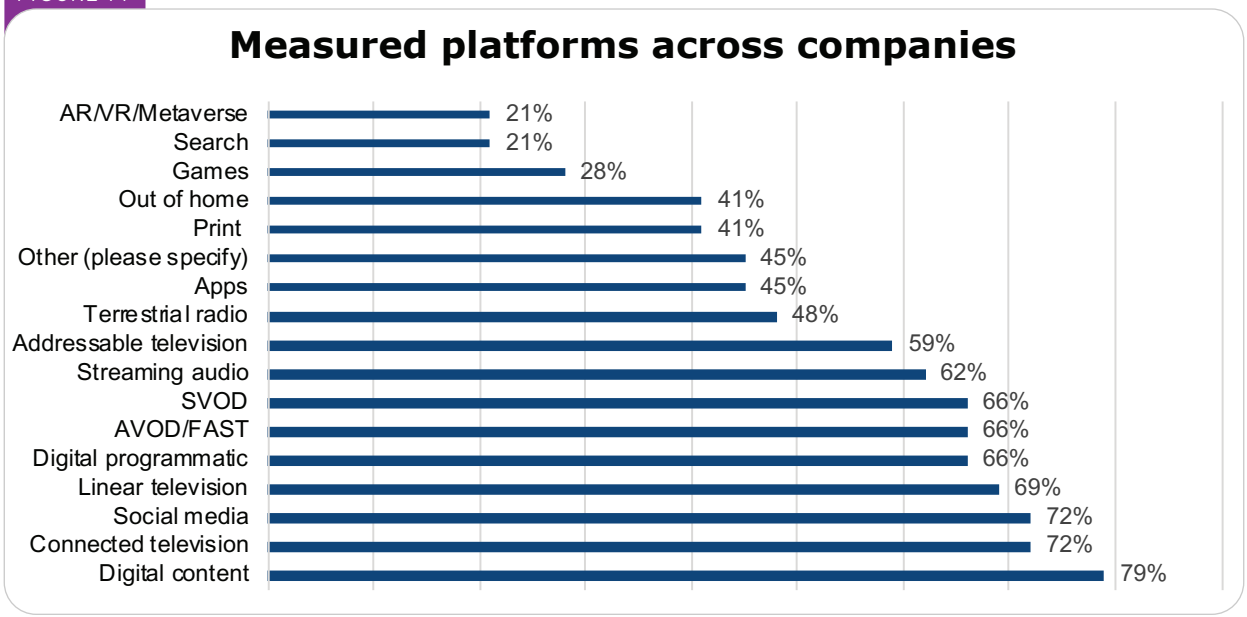


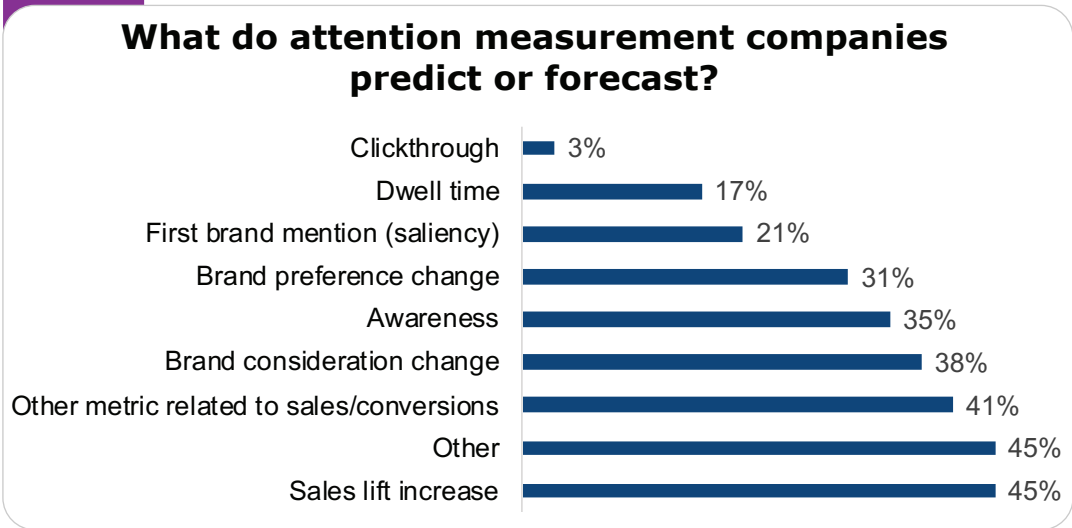
FIGURE 14



What Do Attention Measurement Companies Report?

More than half the companies (58%) predict outcomes (see Figure 15). Among these, sales or sales-related metrics are most often predicted.

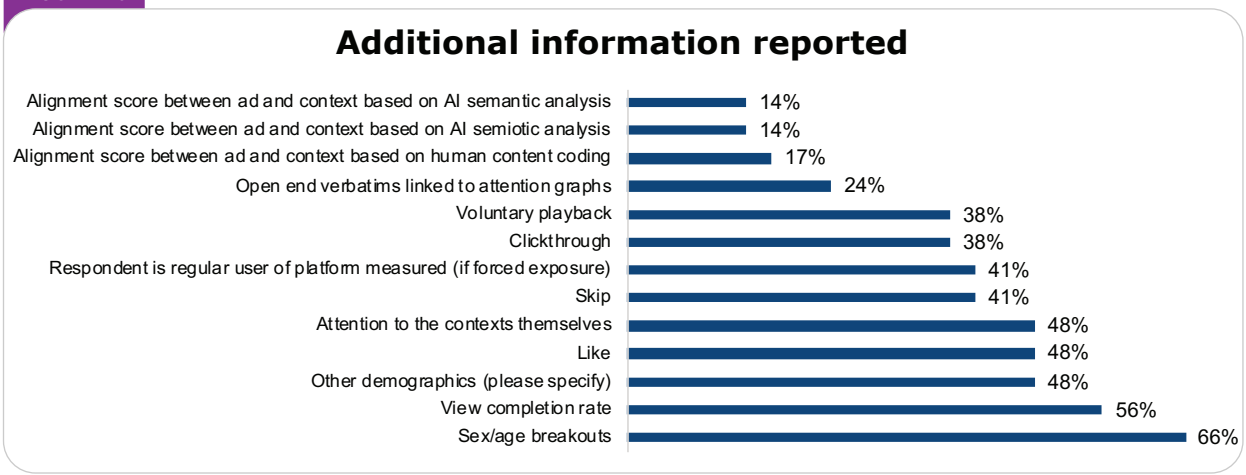
FIGURE 15



ADDITIONAL INFORMATION REPORTED

In addition to attention, companies tend to report demographics (66% report on sex/age breakouts; 48% report on other demographics; see Figure 16). Fifty-six percent of companies report on view-completion rate, and attention to context, and nearly half of the companies report "like." Additional information includes "skip," "clickthrough" and "voluntary playback."

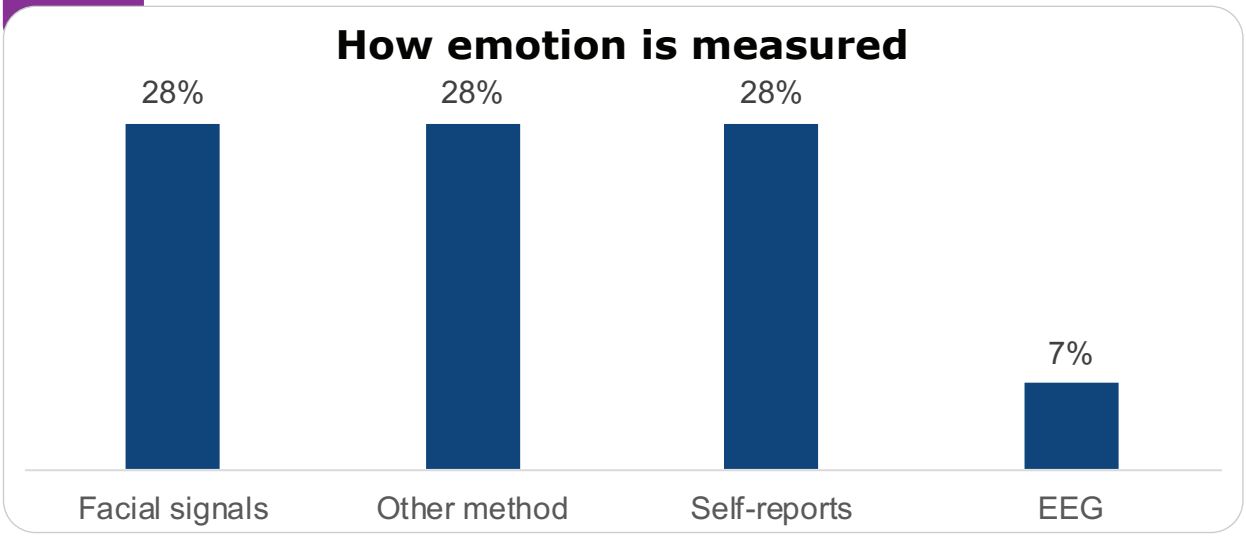
FIGURE 16



ATTENTION AND EMOTION

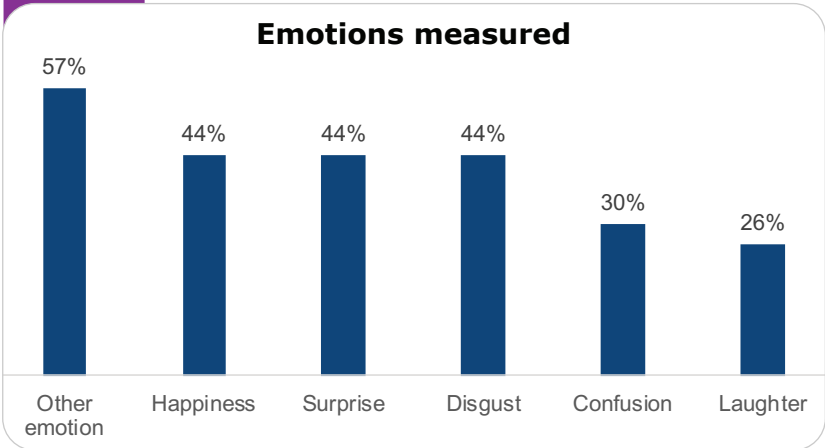
More than half of the companies also report on emotion (54%). Measurement of emotion varies, with 28% of companies using facial signals, 28% using self-reports and 7% using EEG (see Figure 17). Other measures most often include some form of survey response (28%).

FIGURE 17



In terms of measured emotions, happiness, surprise and disgust are at the top, each with 44%. Thirty percent of companies measure confusion, and 26% measure laughter. Fifty- four percent measure “other emotion,” including a variety of negative emotions such as contempt (see Figure 18).

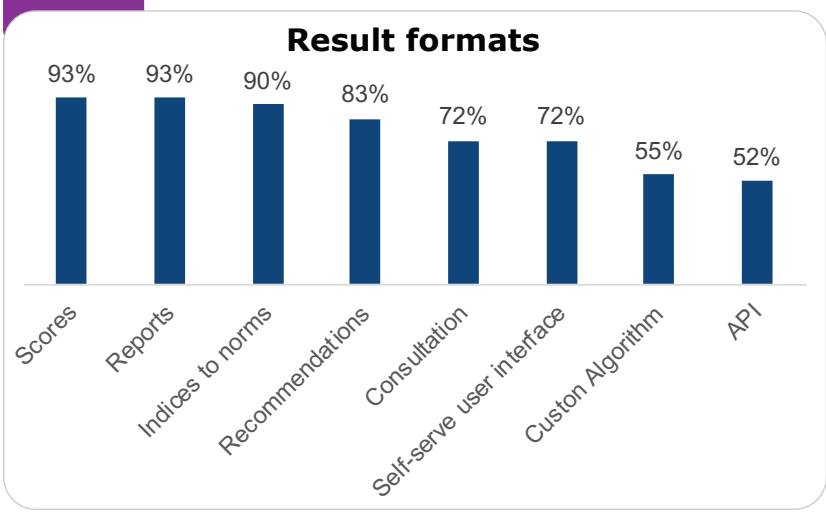
FIGURE 18



RESULTS VARY YET ARE DELIVERED FAST!

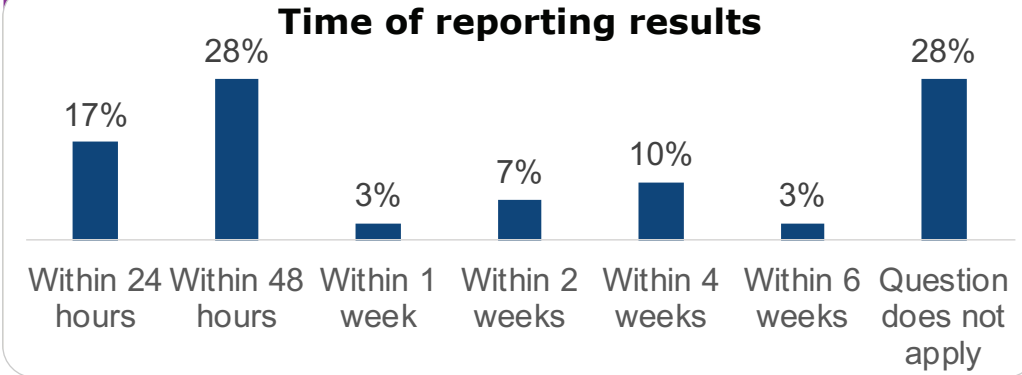
The majority of results are reported through either scores or reports (93% for each; see Figure 19). Ninety percent of companies report results via indices to norms, while 83% submit results through recommendations and 72% through consultation or self-serve user interfaces.

FIGURE 19



In terms of typical time from receipt of stimuli to report to clients, 17% of companies report within 24 hours and 28% within 48 hours (see Figure 20).

FIGURE 20



Validation Samples, Techniques and Evidence Reporting

VALIDATION SAMPLES AND TECHNIQUES

More than half of companies (59%) use a sample size of greater than 10,000 for validation and calibration (see Figure 21). In terms of statistical measures, 59% of companies use correlation, 55% use multiple regression analysis and 48% use random control trial (see Figure 22). Importantly, in the survey, firms could select multiple methods and sample sizes.

FIGURE 21

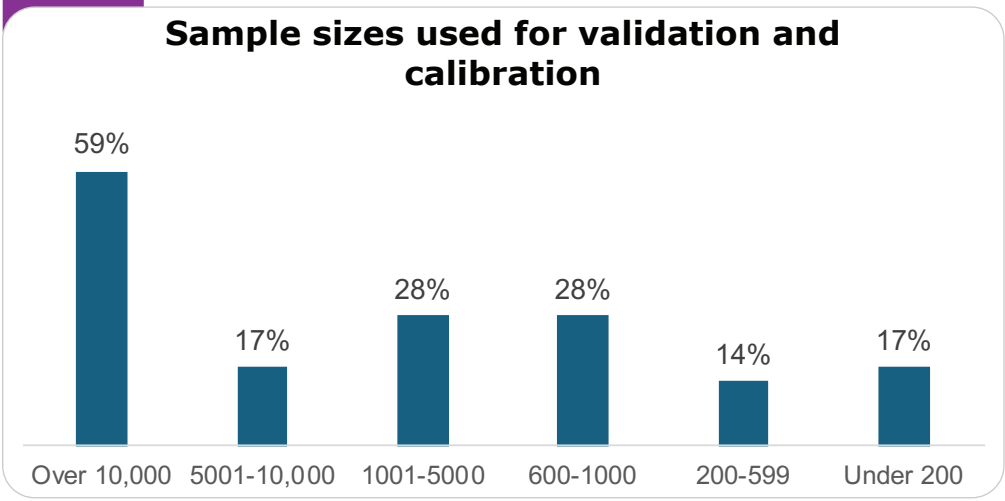
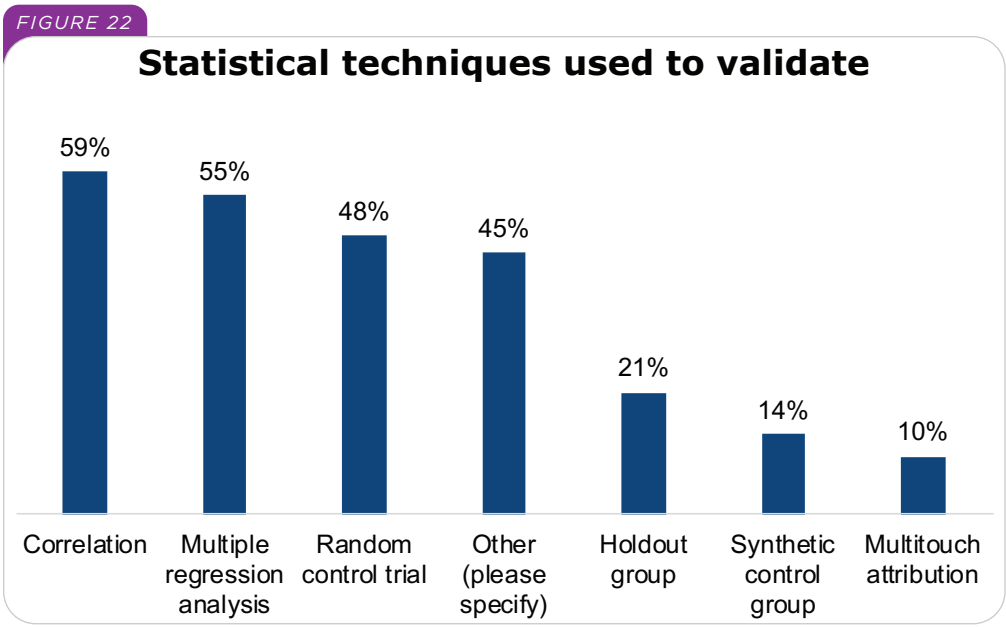


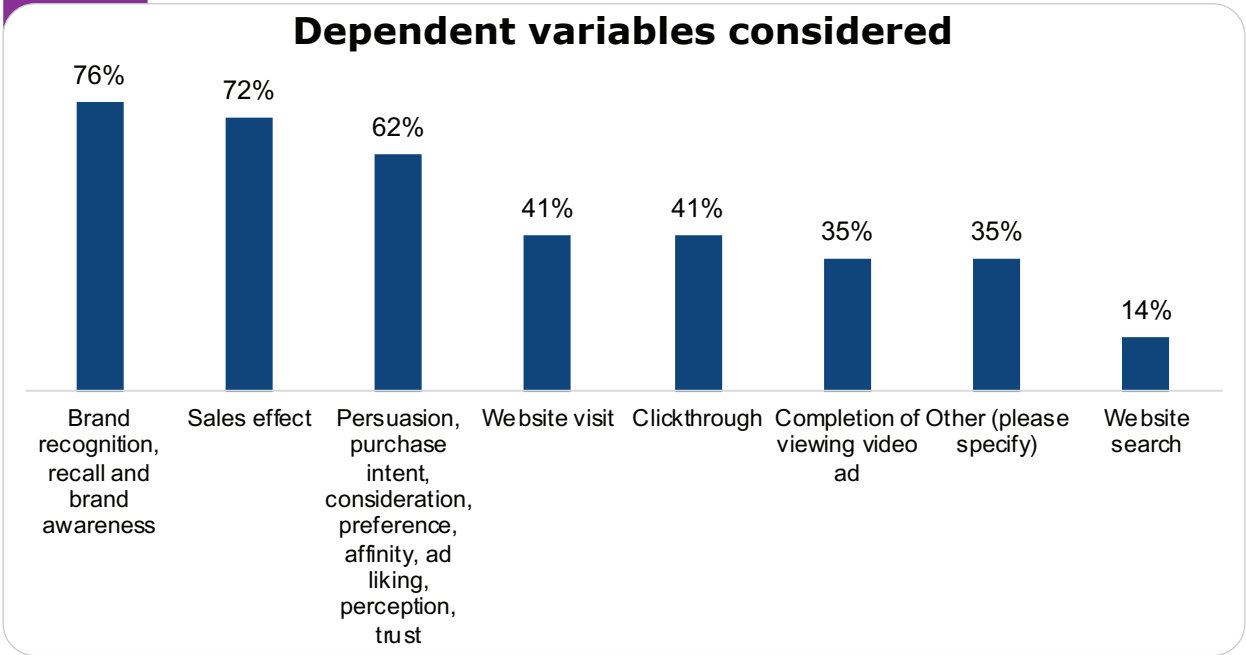
FIGURE 22



VALIDATION EVIDENCE FOR CLIENTS

Many companies conduct case studies for clients as evidence for success. Questions about brand recognition, recall, awareness, persuasion, intent, consideration, preference, affinity, liking, perception and trust all require some form of panel of respondents who can provide feedback. Sales, web visits and clickthrough may be measured directly.

FIGURE 23



SUMMARY

The following key findings can be discerned from the comparative analysis of the attention measurement companies' responses:

- Most companies (69%) report on measuring both media and creative. Six companies measure creative only, and seven companies focus on media measurement only.
- "Attention Natives," namely, companies that were specifically founded to study attention, are relatively new and small, and tend to use some of the newer tools such as eye tracking in the wild and facial coding.
- There are different views on viewability and duration. Specifically, although the various companies tend to agree that to achieve attention an ad must first be viewable, they disagree about the value of the MRC's viewability standard and whether viewability is sufficient for guaranteeing attention. Overall, duration is relatively highly scored as a measure (at 38%, it's the third highest measure) and is one of the central measures for media specialists.
- Human samples are prominently used yet their utilization widely varies. Proxy signals and AI models seem to be increasingly employed, specifically, by collecting human data early in the process and then training an algorithm to replicate results.
- To have any kind of impact, an ad must overcome inattention. This binary distinction is critical.
- There is a sequential relationship between attention, viewability, engagement and emotion, yet it is not strictly linear, and these elements are interdependent. Viewability ensures ads are visible, attracting attention, which serves as a gateway to engagement and provides an opportunity to evoke powerful emotions, intensifying the overall impact of advertising.

COMPANY BY COMPANY PROFILES

Building upon our comprehensive exploration of the attention measurement landscape, the following section presents in-depth profiles of 29 key companies operating in this dynamic domain, organized in alphabetical order. Each company's profile spans 5-7 pages, offering an intricateand well-rounded analysis of their perspectives and definitions of attention, attention offerings, methodologies and technological innovations. Through these profiles, the ARF's Attention Measurement Validation Initiative aims to offer a comprehensive resource that equips stakeholders across the media industry with the knowledge and insights necessary to make informed decisions in an era where attention is an invaluable outcome. Facilitating a thorough evaluation of this competitive landscape, these profiles underscore the pivotal role these actors play in shaping the broader media ecosystem and illuminate the multifaceted world of attention measurement.

ADELAIDE*

ORGANIZATION'S PROFILE:

Adelaide, founded in 2020, is a privately-owned, free-standing company that operates in the U.S., Canada, United Kingdom, Australia/New Zealand, India, Latin America, Europe, Africa and the rest of Asia. Adelaide is planning to expand further into even more markets within LATAM, APAC, MENA and the EU.

Attention was part of the original purpose and focus of the company at its founding as a spin-off from Parsec Media, the first cost-per-second ad network. Over six years, Parsec sold more than $20 million in attention-based media and was acquired by Kargo in 2022.

There are 25-49 employees in the unit focused on attention measurement. Of these employees, 0-9 are researchers working on attention, many of whom hold data science, qualitative, traditional quantitative and stat package skill sets, and are Python/R coders. None are currently neuroscientists nor psychologists.

Adelaide also uses external advisors and consultants for marketing, technical, statistical, research and corporate/product strategy.

ORGANIZATION'S MISSION OF SERVICE:

Adelaide supplies the market with a single omnichannel metric, the AU (Attention Unit), which represents media quality and is consistently proven to predict outcomes. They equip the media ecosystem with a normalized quality score to optimize spend across buying scenarios and replace viewability and other incumbent metrics as the basis for media quality in contracts. Their outcome-based model helps advertisers make smarter investment decisions, solve increasing attribution challenges and navigate the ever-evolving activation and optimization landscape. Their mission is to establish a more fair and transparent market by repairing the broken incentives caused by today's digital metrics.

AU incentivizes publishers to create fewer, higher-quality placements and buyers to place greater value in them–realigning interests around quality over quantity and helping the industry cope with issues like the degradation of identity-based targeting.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Media Types Organization Operates in:

Linear television, connected television, digital programmatic, digital content, audio podcasts, AVOD/FAST, SVOD, social media, apps.

Future planned measurement for cinema, AR/VR/metaverse, games, out of home, streaming audio and terrestrial radio.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, QSR, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage, beer, wine and spirits, hospitality, home and garden, pharmaceutical, ecommerce, telecommunications, courier services and energy.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is a measure of focus by a person on another person or thing. For advertising, Adelaide defines attention as a measure of focus on creative, driven by media quality, creative relevance and audience. While attention has repeatedly been proven to correlate with outcomes, it is a prime example of Goodhart's Law. Maximizing attention, or optimizing toward all three aforementioned inputs at once, can cause undesirable biases around pre-existing awareness, age/other demographic variables and creative. Instead, advertisers should focus their spend on media placements that offer the greatest value in terms of their opportunity to capture attention, impact business outcomes and increase cost efficiency.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

To reiterate the point above, optimizing toward duration of attention (e.g., "attention time" or "attention seconds") creates undesirable demographic, frequency, creative and pre-existing awareness skew. There is a large and growing body of research that shows that duration is a bad optimization target: Link #1

ORGANIZATION'S ATTENTION OFFERING(S):

Adelaide's AU is an omnichannel measure of media quality derived from measurement and research. It represents the probability of attention (rather than the duration of attention) and subsequent outcomes. Their goal is to score placements with a broadly applicable 0-100 rating that represents media's ability to drive attention and impact. Adelaide sees AU as an eventual currency that replaces viewability and other incumbent metrics currently central to buying.

Most clients use AU to understand media quality. They receive a dashboard to monitor real-time performance, a post-campaign wrap report and a Client Success team that offers optimization recommendations to maximize outcomes. Clients leverage their norms data for three purposes:

- Building planning tools
- Activation of pre-bid segments or custom bidders inside DSPs
- Curated marketplaces of high-attention media.

Adelaide launched the last item, high-AU PMPs, just a few months ago with more than a dozen DSPs and SSPs, representing most of the programmatic market.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, podcast audio, display/static, walled gardens (Facebook/Instagram, Twitter, YouTube, Snap, Reddit, TikTok, LinkedIn, & Pinterest). Working toward measurement for games, AR/VR/metaverse, cinema, radio and digital out of home.

Attention Measures of Creatives: Control of Variables:

Media type context, media content context, device context. Adelaide has two high-level approaches to reduce the influence of non-media factors from the AU, and in particular noise created by different creative and audience targeting. These are applied at different steps in their modeling process. First, during the training phase when they are often dealing with more fully observed data sets, they can explicitly allow for their models to observe features related to these potential sources of bias. In so doing, Adelaide learns to control for them in direct relation to those variables which are inherently media-based. Then when they are creating the algorithms that apply the trained models on new data at scale, they are able to essentially "zero out" coefficients related to those non-media influences. This allows them to construct the AU score itself using only the predictors which they deem to be inherent to the placement itself, rather than tactical or creative qualities.

Attention Measures of Media Context: Control of Variables:

Attention values of creative, device context, brand penetration, demographics, prior exposure to the same creative.

MEASUREMENT OF ATTENTION:

Methods:

1. Measure real consumer reaction: Consumer reactions are features of their AU model and underlying components of their media measurement.
2. Digital KPI proxy for consumer reaction: Adelaide predicts the likelihood of consumer reaction on a per exposure basis for use as a proxy at scale and in environments where direct measurement of consumer reaction is prevented.
3. Other: Adelaide also uses machine vision in the form of contextual and media experience assessment.

The first step is to figure out what signals should be brought into the algorithm. On the web, these are coverage, clutter, position, duration, page velocity and audibility. These are then gathered in the wild through a JavaScript tracker or log file ingestion or using a web scanner to render and scrape the page for vital descriptors. Typically, a combination of all these methods is used. These variables

are then run through the naïve version of algorithms—coefficient with simple weights—generating a naïve AU. Following this, outcome data attached to the processed exposures is brought in to train the algorithm using machine learning techniques. In this manner the algorithm is trained so that it becomes as close of a proxy for outcomes as possible.

Methods to Measure/Predict Attention:

Eye tracking, survey-based attentiveness questions by media vehicles, survey-based ad recall (product category cue), survey-based ad recall (unaided), survey-based ad liking, survey based post-only persuasion, tuning duration/dwell time, tune during full play of video, nonscrolling/nonmovement of cursor, website visit, store traffic, online sales, offline sales.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure in laboratory and natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

Camera on laptop/desktop computer, camera in TV viewing area, eye tracking glasses.

Methods:

Eye on screen duration, number and duration of fixations.

Positive and Negative Attention:

Adelaide differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

While they don't take sentiment into account directly, they feel it shows up in the outcomes they use to train their AU algorithms. If negative sentiment were present (and mattered), it would result in lower lift.

If eyes are closed, it will not be considered contributory to their collected eye tracking data and research. However, their general measurement is not limited to the collection of eye tracking measurements. If someone hears a jingle or is otherwise influenced by an ad, it will show up in their outcomes model.

METHODS TO PREDICT ATTENTION:

Adelaide uses viewability, duration of exposure, context norms, ad unit norms, placement on page norms and alignment between ad and context to predict attention.

Calibration Method by Which Algorithm was Developed to Predict Attention:

In their efforts to predict attention specifically in terms of its ability to drive outcomes, Adelaide recognizes that simply tuning their models to such metrics as gaze duration would be insufficient. As a result, they ultimately end up utilizing a variety of calibration methods throughout the

process, representing different stages in the user journey where attention can be paid or manifest itself. These may include internal and third-party eye tracking studies, specially commissioned brand lift studies and client reported conversion data. At each step, they implement strict methods of normalization and controls to eliminate variance and isolate variables of interest with regards to attention. In addition, they compare performance against their historical benchmarks as well as industry research. They do this to ensure consistent model improvement that isn't a result of overfitting or random selection bias and check for potential out-of-sample issues or other unintuitive results that could suggest unsoundness in the raw data or methodology.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Adelaide believes it is the media's responsibility to provide the optimal environment for creative to hold attention and impact memory. Viewability can be considered a precursor to attention—but the relationship between the two is weak and inversely correlated in many cases. Engagement is a result of attention but shouldn't be used as an optimization target for the reasons listed previously. Emotion and emotional response are more reflective of creative's ability to hold attention and drive impact on a user.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context, device, targeting and brand effect are all important in driving attention to ads.

Attention and Emotion:

Adelaide does not report on emotion.

Reporting Additional Information:

Adelaide also reports on attention to contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metrics related to sales/conversions, awareness, brand preference, brand consideration change, validation studies, technical appendix or methodology description.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, website search, clickthrough, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Adelaide uses machine learning to better understand the influence of media characteristics on the ability of placements to drive attention and outcomes. Adelaide's machine learning model is composed of an ensemble trained on upper- and lower-funnel outcome data associated with observed exposures. It is routinely iterated upon and retrained as it ingests more data to ensure their signal selection is geared towards meaningful attention and outcomes. The model generates a resulting probability score that is Adelaide's AU metric.

Data AI/ML Models Based/Trained on:

Adelaide uses both third- and first-party outcome data to train their machine learning models, collected through proprietary research or via partnerships with Lucid, DISQO and TVision. Adelaide also leverages additional forms of third-party outcome data such as sales data, site visitations and conversions, footfall and tune-in.

Commercial Arrangements:

Custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 through holdout group, synthetic control group, multitouch attribution, multiple regression analysis and correlation.

Organization's Utilization of Third-Party Data:

Adelaide accesses or utilizes the following types of third-party data: attention data for television sets, demographic data, ad occurrence data, smart TV data, streaming server data, VOD server data, content coding data, other metadata, sales data, consumers segments.

Organization's Utilization of Human Subjects:

Adelaide uses human subjects in the following ways: qualitative, online surveys, in-depth interview, online panels, eye-tracking panels, face to face surveys.

Delivery of Results to Clients:

Predictive AUs are available from the onset of campaign activation. Post-campaign results are typically delivered 1-4 weeks after receiving the test stimuli, conversion data or authorization. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API, Custom algorithms.

Organization's Share of Data Through Third-Party Workflow Systems:

Adelaide shares data through Xandr, part of Microsoft Advertising, Google Display & Video 360, The Trade Desk, Magnite, PubMatic, Sovrn, TRUSTX, Sharethrough, Adelphic/Viant, MiQ, Verve Group, OpenWeb (Adyoulike), Teads, Media.net, MediaMath and OpenX.

*Adelaide submitted the following validation studies: 2023 Outcomes Guide and technical appendix or methodology description.

AFFECTIVA*

ORGANIZATION'S PROFILE:

Affectiva, founded in 2009, is publicly owned, part of a larger corporate structure (Smart Eye AB) and operates globally.

Attention was part of the original purpose and focus of the company at its founding.

There are 10-24 employees in the unit focused on attention measurement. Of these employees, 0-9 are researchers working on attention, many of whom hold traditional quantitative skills, are Python/R coders or similar and use stat packages. Some of these researchers hold data science, qualitative skill sets and are neuroscientists and psychologists.

ORGANIZATION'S MISSION OF SERVICE:

Affectiva measures people's unbiased emotional and cognitive responses accurately, cost effectively and at scale, using proprietary Emotion AI technology. In doing so, they help businesses understand how they make people feel, so they can deliver better experiences and content, which forges better relationships between customers, business and stakeholders.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media and campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital content, AVOD/FAST, SVOD, social media.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Affectiva distinguishes between passive attention and engagement but classifies them both as representing differing degrees of attention.

Passive attention is defined as physical or mental orientation towards a stimulus, that allows for sensory processing to happen. Engagement reflects a degree of mental involvement with the stimulus, involving the allocation of limited, higher order resources in the individuals "mental workspace" to derive meaning. In short, engagement involves doing something with the input, which then enables action, not merely sensory processing.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

The idea that there is a distinction between passive, low level attention and more active attention that recruits limited resources is very widely accepted and there would be a very long list of references here. For a useful summary see: Link #1.

ORGANIZATION'S ATTENTION OFFERING(S):

Affectiva's Emotion AI system uses deep learning algorithms to anonymously analyze the facial expressions in videos of research participants (obtained with consent). This yields insight into a wide range of responses, including two measures particularly relevant to attention:

1. A measure of passive attention, which uses head pose, gaze direction, eye closure and speech detection to determine if the viewer is watching content displayed on the screen and is not distracted.

2. A measure of engagement, which additionally measures the extent to which the content on screen is evoking reactions, as measured by changes in expression across the viewer's face. This is aggregated from separate algorithms detecting specific facial expressions.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Ads, trailers, long and short form entertainment content.

Measurement/Prediction of Types of Formats:

TV/video and audio.

Attention Measures of Creatives: Control of Variables

Out of context testing is used to isolate attention measures of creative.

Attention Measures of Media Context: Control of Variables

In-context A/B testing can be used as an experimental design to isolate attention measures of media context.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction:

1. A measure of passive attention, which uses head pose, gaze direction, eye closure and speech detection to determine if the viewer is watching content displayed on the screen and is not distracted.

2. A measure of engagement, which additionally measures the extent to which the content on screen is evoking reactions, as measured by changes in expression across the viewer's face.

Methods to Measure/Predict Attention:

Facial coding.

Means to Measure/Predict Attention:

Forced exposure, or in-context exposure.

Positive and Negative Attention:

Negative attention is the inverse of Affectiva's passive attention metric which uses a variety of head, gaze and other facial signals to detect distraction. Their measure of engagement is indicative of a strong form of positive attention—i.e., the viewer is paying enough attention to do something with the content and respond cognitively or emotionally to it.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

There is a hierarchy here:

Viewability > passive attention > engagement > memory > action. Viewability is first, as no attention is possible to something not in view. Passive attention is next as active attention is impossible without sensory input. Engagement is necessary to create meaning from the content—which is then necessary for impact on the memory structures of the brand—which is needed to shape action at a later date. Emotion is both a cue to engagement and memory as we attend to and remember emotional stimuli, and positive feelings create a positive context for later brand decision-making.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative is very important in driving attention to ads. Media type, specific content context, device, targeting and brand effect are all important in driving attention to ads.

Attention and Emotion:

Affectiva reports on emotion through facial signals. They report on happiness, surprise, disgust, confusion. Additionally, they include 30+ metrics derived from facial signals, including specific facial action units, which are often more useful. To this extent, the individual expression metrics provided to the client allow them to apply their contextual knowledge to understand the response and translate the expression into emotion.

Reporting Additional Information:

When included alongside survey and/or behavioral data, Affectiva also reports on these additional metrics, such as voluntary playback, likes, clickthrough, skip, view completion rate, sex/age breakouts and any survey metric (attitudinal or demographic) and these can be used to cross-analyze facial data in their system.

Prediction/Forecast of Additional Measures:

Affectiva signals can be used to predict/forecast sales lift increase, awareness and brand consideration change.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, unaided or aided ad recall, copy points recalled, sales points recalled, persuasion, purchase intent, brand affinity.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Affectiva uses AI to understand the responses evoked by content, among test audiences or research samples, usually obtained from commercial research panels. Their Emotion AI system uses deep learning algorithms to anonymously analyze the facial expressions in videos of those research participants, obtained with consent, while they view marketing content. They, therefore, use AI to analyze real people's responses to content, rather than using AI to try to predict responses purely from the content itself.

Data AI/ML Models Based/Trained on:

Videos used to train their algorithms were drawn from a dataset of millions of people viewing marketing and entertainment content. These were obtained by Affectiva or their research partners, with explicit consent by research panelists (which was obtained anew prior to every recording). This is real-world viewing data, drawn from over 90 countries around the world and diverse in age, gender, ethnicity and nationality, which allows their algorithms to operate with minimal bias.

Commercial Arrangements:

Custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 through multiple regression analysis, correlation and custom experimentation. Validation studies are carried out at an ad level and so aggregate across multiple studies, netting up to over 10,000.

Organization's Utilization of Third-Party Data:

Affectiva accesses or utilizes survey data provided by research partners regarding demographic and attitudinal variables.

Organization's Utilization of Human Subjects:

Affectiva uses human subjects in the following ways: online survey, neuro and face to face survey.

Delivery of Results to Clients:

Results are typically delivered <24 hours after receiving the participant videos from a study. Results are delivered through scores, indices to norms, self-serve user interface, API and custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

Affectiva doesn't share data through third-party workflow systems.

*Affectiva submitted the following validation studies #1, #2, #3, #4, #5.

AMPLIFIED INTELLIGENCE TECHNOLOGIES*

ORGANIZATION'S PROFILE:

Amplified Intelligence Technologies, founded in 2017, is a privately-owned, free-standing company that operates in the U.S., Canada, Australia/New Zealand, Latin America, Europe, the rest of Asia and the U.K.

Attention was part of the original purpose and focus of the company at its founding.

There are 25-49 employees in the unit focused on attention measurement. Of these employees, 10-24 are researchers working on attention, most of whom hold data science skill sets and are Python/R coders. Four are PhDs (computer vision, machine learning, media science), and some are traditional quantitative. All have stat package skill sets. None hold qualitative skills, are neuroscientists nor psychologists.

ORGANIZATION'S MISSION OF SERVICE:

Amplified Intelligence Technologies believe that media trading should be fair and accountable. They know human attention will aid in fairness and accountability, so they provide access to impartial cross-platform attention data, which can be used as performance signaling in the media planning and buying ecosystem. This helps advertisers make better and more informed decisions about their ad dollars and drives transparency in the industry. Amplified Intelligence Technologies deliver data that is valuable, stable and universal. Finally, they commit to guiding rules around data quality (human, privacy safe, natural, accurate and consistent) and apply a strictly scientific approach to everything they do. Only with strict rules will an attention economy endure.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, games, out of home, AR/VR/Metaverse and cinema.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, insurance, restaurants, retail, travel and food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

When a human stops what they are doing and ignores other things around them, even if for a fleeting moment, to understand or learn something (literature backed). How they operationalize this definition: active, passive and non-attention data collected from humans while using real media in real time via computer vision techniques and audio fingerprinting (informed consent) (literature-backed, high/low attention processing). How they scale for mass usage: Amplified Intelligence Technologies uses the accuracy of the observed data and combines it with tracking pixel data to train models that can predict human attention inflight and at the point of transaction.

Key Academic or Journal References and/or Organization's Research That Supports This Definition:

Full list to be found in this link.

ORGANIZATION'S ATTENTION OFFERING(S):

Amplified Intelligence Technologies is an attention measurement business that collects audio and visual data via computer vision techniques (including gaze tracking, facial detection and pose estimation) while viewers are using real platforms in real-time (informed consent). This data is then used as ground truth providing a feedback loop to a VAST 2-4.2 tag for the purpose of scale at the impression level. Their four offerings:

- AttentionTRACE: Tracks eyes/faces in real-time. Serves as a benchmark for brands.
- AttentionPLAN: An advanced media planning tool to create attention-optimized media planning scenarios.
- AttentionTRADE: An algorithm that allows you to bid and buy using an attention-based strategy.
- AttentionPROVE: An algorithm that can optimize campaigns in flight via the VAST tag. A VAST tag runs on mobile, static, video, PC and CTV (and soon to be audio).

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, display/static, games, AR/VR/metaverse, outdoor, cinema, CTV and linear, Google on TV.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration and demographics.

Attention Measures of Media Context: Control of Variables

Attention values of creative, device context, brand penetration and demographics.

MEASUREMENT OF ATTENTION:

Methods:

1. Measure real consumer reaction: Person-level human data (observed): AIT collects audio and visual data via computer vision techniques (including gaze tracking, facial detection and pose estimation) while viewers are using real-time platforms (18 countries). The collection is carried out on an informed consent basis. Facial landmarks (privacy safe) are parsed through three models of attention, active (looking directly at the ad), passive (looking nearby but not at the ad) and non-attention (nowhere near the ad). All technology is proprietary; no data partners are required.

2. Digital KPI proxy for consumer reaction: Impression-level device meta data (inferred): media consumption and media placement data are collected via tracking pixel (VAST tag 2-4.2) appended to creative (web, CTV and audio streaming: PC, mobile, tablet, TV). They use the accuracy of the observed data and the scale of the impression data to train models that can predict human behavior in-flight and at the point of transaction.

Methods to Measure/Predict Attention:

Eye tracking, facial coding, survey-based ad brand recognition, tuning duration/dwell time, tuning during full play of video, non-scrolling/non-movement of the cursor and pose estimation (i.e., verifying the participant is human).

Means to Measure/Predict Attention:

Natural exposure “in the wild.”

Eye Tracking Measurements:

Tools:

Forward camera on smart phones, camera on laptop/desktop computer, camera in the TV viewing areas, cameras set up on outdoor street furniture, cameras set up in cinemas.

Methods:

Eye on-screen duration, number and duration of fixations, inferences of attention/interest from saccadic eye movements and mobile: eye on ad (duration, including attentional shift patterns), eye on-screen but not on ad, (duration, including attentional shift patterns), eye off-screen duration. TV, cinema, outdoor: eye on-screen/ad (duration, including attentional shift patterns), nearby eye on-screen but not on ad (duration, including attentional shift patterns, also includes dual screening), eye nowhere near screen/ad (out of the room).

Positive and Negative Attention:

Amplified Intelligence Technologies differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding an ad (one form of negative attention).

Differentiation is done by the nature of A) the gaze coordinates (relative to the position of the skip button and/or passive attention (focusing on the screen, not the ad), and B) the nature of the individual viewing/attention distribution.

If eyes are closed, the models take into account blinking, and the frame will be assigned to inattention, eyes on the screen or eyes on ad according to the context in which closed eyes occurs.

METHODS TO PREDICT ATTENTION:

Amplified Intelligence Technologies uses duration of exposure, context norms, placement on page norms, alignment between ad and context and alignment between ad and person to predict attention. While they do not use viewability, they use components that comprise viewability, but not the viewability Boolean value. Additionally, they use other norms such as temporal attributes, geological attributes, ad type and device type.

Calibration Method by Which Algorithm was Developed to Predict Attention:

Amplified Intelligence Technologies' solution is "calibration free" for respondents. However, in terms of the development methodology, they collect ground truth gaze data via a customized mobile app that records both the point on the screen a person is looking at along with an image of their face plus the impression data as specified above. This data is then split into test, training and validation sets in a roughly 60/20/20 breakdown. The split is divided by respondents—i.e., for a particular respondent their data is present in only one data subset—there is no case where a portion of a respondent's data is used in training, and another portion used in test or validation. Their reported accuracy metrics are derived from the validation set only.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Time-in-View is the nucleus of the problem and the core reason modern measurement fails us. This failure has significant flow-on effects on any model or measure that relies on it (including viewability). For every second of Time-in-View, there is a 1-in-3 chance a human will look at the ad.

Viewability is directly why around 70% of viewable accredited inventory gets zero active attention (relationship inversely mirrors attention/TIV). Time-in-View and viewability are indicators of BOTH attention and non-attention, hence why impression attention data alone which relies on this metric, fails.

Amplified Intelligence Technologies believes emotion (high arousal in particular) is an attention trigger, but its relationship to outcomes is tempered by platform/format (interaction effect by the media). This means while emotions help, high emotive creative will still only perform within the attention boundaries set by the platform/format.

Engagement is an unclear industry term that can mean multiple things to multiple people. This word is literally why they left academia to pursue alternative research metrics that can be operationalized and have actual meaning.

Organization's Perspective on the Importance of Elements That Drive Attention to Ads:

Media type is very important in driving attention to ads. Specific content context and device are all important; creative, targeting and brand effect are somewhat unimportant in driving attention to ads.

Attention and Emotion:

Amplified Intelligence Technologies does not report on emotion.

Reporting Additional Information:

Amplified Intelligence Technologies also reports on skip, view completion rate, sex/age breakouts, demographics such as income, respondent is regular user of platform measured (if forced exposure), alignment score between ad and context based on AI semiotic analysis and attention to contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metrics related to sales/conversions and brand consideration change. Their sales lift increase is based on discrete choice modeling. Their consideration change is based on mental availability analysis.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust and brand choice (STAS method).

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Amplified Intelligence Technologies has 3x ML models to predict active, passive and non-attention drawn from footage collected in real-time, built separately from iris detection, face detection and pose estimation. They have 1x age estimation model in their TV collection, also drawn from footage collected in real-time. Plus, they have 3x ML models that predict both attention time and attention focus (heavy/light switching, sustained/unsustained gaze) to specifically support their three different applications: planning, buying, inflight measurement. These models are drawn from their enriched database of observed and inferred attention (panels and pixels). (Note: pixel data in isolation cannot predict human attention accurately due to the complexity of human behavior at the individual level. And while observed data is the most accurate, scale for this context is an issue, which is why they use both).

Data AI/ML Models Based/Trained on:

Amplified Intelligence Technologies' usable panel data to date is 108,000 sample/unique ppl, 332,000 ad views, 454,979,485 million data frames. These numbers will increase with a new initiative about to launch (large longitudinal panels, many tens of thousands of live human ad views daily). Their data capture is 100% in-house. All code and all models are built and owned by them.

Commercial Arrangements:

Custom/bespoke, syndicated and CPM based (for pixel and custom algo), subscription based (for Attention PLAN).

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Amplified Intelligence Technologies has two types of validation studies:

1. Validation Studies for Real Human Attention to Outcomes. On each occasion, these studies have been conducted on 600-1,000 through a random control trial, holdout group, multiple regression analysis and machine learning methods. This is for their person-level human data validation studies only (observed attention). To date, their total validation sample (not the total usable sample) has been 21,000 people.

2. Ground Truth Validation Studies for Attention Prediction via Proxy/Pixel Methods. 9,000 unique ppl, 33 million frames, results on the test subset determine whether the model/algorithm goes into production.

Organization's Utilization of Third-Party Data:

Amplified Intelligence Technologies does not access or utilize any types of third-party data.

Organization's Utilization of Human Subjects:

Amplified Intelligence Technologies uses human subjects in biometrics.

Delivery of Results to Clients:

Pixel data is reported in near real-time—dashboards are live. Amplified Intelligence Technologies' human data can be collected in 24 hours before delivering to the client—but if the context of the project is complicated it may take up to two weeks maximum.

Results are delivered through recommendations, reports, indices to norms, self-serve user interface, APIs, custom algorithms and actual attention seconds (not scores), attention profiles (degree of attention switching/sustained glance) and attention adjusted reach curves.

Organization's Share of Data Through Third-Party Workflow Systems:

Amplified Intelligence Technologies shares data through third-party workflow systems, however they prefer not to say which.

*Amplified Intelligence Technologies submitted validation studies, technical appendix or methodology description, technical paper and a client list.

ARN

ORGANIZATION'S PROFILE:

Australian Radio Network was founded in 1994 and was rebranded to ARN in 2019. ARN is a publicly owned, free-standing company that operates in Australia.

ARN's neurolab was launched in 2021 with attention being part of the original purpose and focus.

There are 0-9 employees at ARN who focus on attention measurement, all of whom are researchers. Some of these employees hold data science, qualitative, quantitative and statistical analysis skill sets. Some are Python/R coders, and some are neuroscientists. None are psychologists.

ORGANIZATION'S MISSION OF SERVICE:

The mission of the ARN service is to pioneer audio effectiveness research, positioning ARN as the industry leader in understanding audio effectiveness and "defining audio," both locally and globally.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media planning and campaign post hoc measurement.

Media Types Organization Operates in:

Podcasting, digital content, terrestrial radio and streaming audio.

Brand Types Organization is Experienced With:

Consumer electronics/technology.

ORGANIZATION'S DEFINITION OF ATTENTION:

ARN defines attention along the lines of "selective attention"—it is the process of actively selecting focus on one stimulus, including the external environment or internal sources, while filtering out others.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

- https://link.springer.com/article/10.3758/s13415-019-00703-5
- https://pubmed.ncbi.nlm.nih.gov/28666891/
- https://pubmed.ncbi.nlm.nih.gov/31735839/
- https://pubmed.ncbi.nlm.nih.gov/29702121/

- https://pubmed.ncbi.nlm.nih.gov/34887770/
- https://pubmed.ncbi.nlm.nih.gov/31098306/

ORGANIZATION'S ATTENTION OFFERING(S):

ARN use electroencephalography (EEG) to index attention and simultaneously also use Tobii Pro Glasses and software to monitor eye movements. The aim here being to measure attention both at a brain and behavioral level.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/Video, audio and display/static.

Attention Measures of Creatives: Control of Variables:

Media type context, media content context, device context, demographics, psychographics and prior exposure to same creative.

Attention Measures of Media Context: Control of Variables:

Attention values of creative, device context, demographics, psychographics and prior exposure to same creative.

MEASUREMENT OF ATTENTION:

Methods:

ARN measures real consumer reaction using electroencephalography and eye tracking. EEG was recorded with a 21-channel NeXus-32 amplifier (Mind Media USA Inc.). A NeXus EEG cap with Ag/AgCl electrodes was used to record EEG activity from 21 active scalp sites with a mastoid reference (M1 and M2; 10–20 system of electrode placement). The data was recorded using a sampling rate of 256 Hz and filtered with a bandpass of 0.01–30 Hz. The impedance of recording electrodes was monitored for each subject prior to data collection and was kept below 5 kΩ.

Methods to Measure/Predict Attention:

Eye tracking, survey based attentiveness question by media vehicles, survey based ad recall (product category cue), survey based ad recall (unaided), survey based ad brand recognition (show logos including brands not shown), survey based ad liking, survey based post-only persuasion, survey based on showing ad in context with slider bar to indicate second by second attention, brain measurements and electromyography.

Means to Measure/Predict Attention:

Natural exposure in laboratory.

Eye Tracking Measurements:

Tools:

Tobii Pro Glasses.

Methods:

Eye on-screen duration, number and duration of fixations and inferences of attention/interest from saccadic eye movements.

Brain activity is measured through EEG.

Positive and Negative Attention:

ARN does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

If eyes are closed, this will be read as inattention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

ARN believes that there is potential for these metrics to be meaningful to the market. However, how neural findings are used to imply bottom of the funnel traits needs more clarity and scientific rigor.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context, targeting and brand effect are all very important in driving attention to ads. Device is considered important.

Attention and Emotion:

ARN does not report on emotion.

Reporting Additional Information:

ARN also reports on sex/age breakouts.

Prediction/Forecast of Additional Measures:

ARN does not predict/forecast anything other than attention.

Evidence that Method is Predictive of Lower Sales Funnel Outcomes:

None stated.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

ARN does not use ML/AI.

Commercial Arrangements:

Custom/bespoke and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on under 200 through random control trial.

Organization's Utilization of Third-Party Data:

ARN does not access or utilize third-party data.

Organization's Utilization of Human Subjects:

ARN uses human subjects in the following ways: online survey, neuro and biometric.

Delivery of Results to Clients:

Results are typically delivered eight weeks after receiving the test stimuli or authorization. Results are delivered through scores, reports and indices to norms.

Organization's Share of Data Through Third-Party Workflow Systems:

ARN does not share data through third-party workflow systems.

AUDACY*

ORGANIZATION'S PROFILE:

Audacy is a leading multi-platform audio content and entertainment company that operates in the U.S. Founded in 1968 (Entercom), it acquired CBS radio in 2017 and rebranded as Audacy in 2020.

There are 0-9 employees in the Research and Insights team, part of the company's marketing organization, focused on attention measurement. The researchers that work on attention all hold traditional quantitative skills and use stat packages and media measurement. Most of these employees also hold qualitative skills, some hold data science skills and are Python/R coders. None are neuroscientists or psychologists.

Audacy also uses external advisors and consultants for technical, statistical and analysis services.

ORGANIZATION'S MISSION OF SERVICE:

Audacy provides advertisers and agencies with a view into how audio and other media hold audiences' attention and mobilize them to take action.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative and media/media planning.

Media Types Organization Operates in:

Terrestrial radio, streaming audio and podcasts.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage, home improvement, professional services among others, across local and national brands.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is operationally measured through variations in heart rate when consuming content or going through experiences. Attention, with emotional connection, are part of *Immersion*, which is as a service platform that measures emotional connection and attention. Its attention measurement is based on variations in heart rate when consuming content or going through experiences.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

The Amplifying Effect Trust, Immersion, and Host Influence Have on Determining Consumer Action; How Immersion Connects your Heart to your Brain; Audacy case studies; Audio Amplification.

ORGANIZATION'S ATTENTION OFFERING(S):

Audacy provides thought leadership studies, articles and custom studies for advertisers.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

Audio.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, demographics and psychographics.

Attention Measures of Media Context: Control of Variables

Brand penetration, demographics and psychographics.

MEASUREMENT OF ATTENTION:

Methods:

Audacy measures attention through variation in heart rate.

Methods to Measure/Predict Attention:

The variations in the heart rate are measured using a smartwatch. Additional methods include survey based attentiveness question by media vehicles and Oxytocin prediction based upon biometric algorithm.

Means to Measure/Predict Attention:

Forced exposure, forced exposure to platform, but choice of specific content (simulated natural exposure) and natural exposure "in the wild."

Positive and Negative Attention:

Audacy is also part of pan-industry studies that leverage listen-through as a proxy for attention. If audiences listen through an ad, that gets coined as positive attention. If they skip, or cut short, that gets scored as a drop in attention. If a score is below a certain level, this is registered as a lack of attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Attention is the impetus for emotion. Together, they drive engagement.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Specific content context is very important in driving attention to ads. Creative, media type, targeting and brand effect are all important. Device, too, is important since it is fundamental to the way audio is consumed—car radio, home radio, mobile, connected car, etc. Audacy always looks for correlations between device use and attitudes.

Attention and Emotion:

Audacy also reports on emotion through *Immersion* that includes a measure of emotional reaction.

Reporting Additional Information:

Audacy also reports on likes, open end verbatims linked to attention graphs, sex/age breakouts, demographics such as race, ethnicity, income, respondent is regular user platform measured (if forced exposure) and attention to contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions and action (based on the ad message).

Evidence that Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Audacy's research partners at *Immersion* (www.getimmersion.com) leverage an algorithm to transpose second-by-second data on variations in heart rate from audiences into immersion scores.

Data AI/ML Models Based/Trained on:

Immersion collects these training data. It's based on 25 years of studies across industries and genres.

Commercial Arrangements:

Custom/bespoke and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 through comparison of seconds that hold attention. Notably, *Immersion* studies' unit of analysis is a second, not a survey response. Audacy's neuro studies typically test multiple 30 second ads, listened by a minimum sample of n=35 and in some cases n=100+ participants. This results in hundreds of thousands of data points, based on seconds. More recent listen-through studies Audacy has participated in rely on a more traditional sampling method. They are based on n=1,920.

Organization's Utilization of Third-Party Data:

Audacy accesses or utilizes the following types of third-party data: demographic data, ad occurrence data, sales data, consumers segments and norms for immersion.

Organization's Utilization of Human Subjects:

Audacy uses human subjects in the following ways: qualitative, online survey, in-depth interview and neuro.

Delivery of Results to Clients:

Results are typically delivered four weeks after receiving the test stimuli or authorization. Results are delivered through scores, recommendations, reports, consultation and indices to norms.

Organization's Share of Data Through Third-Party Workflow Systems:

Audacy shares data through Claritas.

*Audacy submitted validation studies, technical appendix or methodology description and technical paper.

CHILMARK DIGITAL*

ORGANIZATION'S PROFILE:

Chilmark Digital was founded in 2006 and is a privately-owned, free standing company operating in the U.S.

Attention was not part of the original purpose and focus of the company at its founding. Original purpose of the company was to develop digital solutions to creative, media and marketing challenges.

There are 3-9 employees focused on attention measurement, some of whom are data scientists, adept at traditional quantitative and qualitative, Python/R coding/stat packages. None are psychologists or neuroscientists.

The company also utilizes external resources for technical, coding, statistical, analysis and/or project management.

ORGANIZATION'S MISSION OF SERVICE:

Chilmark Digital's mission is to provide easy to use, multi-dimensional metrics that lay out a clear and detailed path to understanding the multiple dimensions of attention, so as to accurately determine impact and optimize outcomes for both creative and creative/media combinations in the form of improved viewing levels and more effective matching of commercials with media.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative and campaign pre and post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media Planning.

Media Types Organization Operates in:

Linear television, connected television, digital content, AVOD/FAST, SVOD, social media, streaming audio, search, games, apps.

Brand Types Organization is Experienced With:

Consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is the power of content to stimulate individuals' ability and desire to process and respond during a defined time period, measured by the length, direction (positive vs. negative)

and magnitude of their active responses, and periods of sustained response as captured by an on-screen slider scaled from 0-100.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Citations are on the validity of mouse and trackpad for attention measurement. There are many ways to measure attention. One of the techniques that CIMM cites is content/context detection, i.e., assessment of creative elements, and this is the underpinning of [ReSync] Attention Metrics. Link to references here.

ORGANIZATION'S ATTENTION OFFERING(S):

Chilmark Digital documents the grabbing power of content: percent of sample who were attentive; average time of first attentive behavior; active vs. sustained response, positive and negative; magnitude of active responses and net attentive impressions (weighted active responses). All are provided for the entire stimulus and configurable time segments, for desired targets as well as total.

- Active response (positive and negative): move to a higher or lower point on the scale (0-100).
- Sustained response (positive and negative): maintenance of a previous higher or lower response.
- Magnitude: positive or negative distance moved.
- Net attentive impressions: active moves weighted by magnitude.

Measurement or Prediction of Attention:

Both measurement and prediction.

Measurement of Types of Content:

Ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio.

Attention Measures of Creatives: Control of Variables

Media content context, media content context, device context, brand penetration, demographics, psychographics, prior exposure to same creative, any client supplied closed end variable. This enables Chilmark Digital to look at the attention metrics according to any behavioral combination or any behavioral/psychographic combination.

Attention Measures of Media Context: Control of Variables

Attention value of creative, device context, brand penetration, demographics, psychographics, prior exposure to same creative.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction:

Chilmark Digital's on-screen methodology comports with trackpad and mouse methodology vetted by academic and research sources. Data collection respondents receive links to content enabled with the [ReSync] technology, accessible on all devices and browsers, which can be deployed with either a controlled sample or in the wild. No external devices or software are needed. As respondents view and/or listen they move an *on-screen slider*, which captures the individual's scaled reactions by the millisecond and enables greater definition for short forms. The slider is the translation of the individual respondent's reaction to the stimulus. The number of data points drawn for analysis is variable, at the individual project level. At the end of the stimulus review, Chilmark Digital plays back to each respondent clips of their high and low slider points and action point and *query* them regarding their responses. All data, including open-end comments, are synced to stimulus time. The uniqueness of the slider is that it collects data on a micro-second basis (in comparison to typical sliders that collect on a second basis). This enables a very fine granular translation of individuals' responses.

Data construction: After the survey is completed, Chilmark Digital uses a set of algorithms to *deconstruct* data from the slider results and additional qualitative data to develop very specific attention metrics. The algorithms construct records of individuals' attentiveness based on their slider moves, as categorized by type of response in the previous question. From these data Chilmark Digital develops the Flow of Attentive Impressions™, i.e., total number of active attentive moves or total active attentive time, both positive and negative, weighted by the magnitude of those responses. This measure does not include sustained response values.

Methods to Measure/Predict Attention:

Survey based attentiveness question by media vehicles, survey based ad recall (product category cue), survey based ad recall (unaided), survey based ad liking, survey based post-only persuasion, survey based on showing ad in context with slider bar to indicate second-by-second attention, second-by-second self-report (i.e., slider), nonscrolling/nonmovement of cursor.

Means to Measure/Predict Attention:

Forced exposure, forced exposure to platform but choice of specific content (simulated natural exposure), natural exposure "in the wild."

Eye Tracking Measurements:

None.

Positive and Negative Attention:

Chilmark Digital differentiates between attention directed towards an ad (positive attention) and attention focused on skipping or avoiding the ad (one form of negative attention).

Their algorithms construct records of individuals' attentiveness based on their slider moves and categorize it as active or sustained response, each having negative and positive modes; active responses are further defined by their magnitude. For analysis, the stimulus is divided into time segments, which is a client variable. All measurements and calculations are for both total time and by time segment and can be displayed for target groups as well as total sample as clients specify. This enables correlation of attention metrics to outcomes by desired breaks. New time series are generated for each move by each individual within a defined time bloc, identifying each point as an "up," "down" or "hold" based on whether the value of the current time interval is greater than, less than or equal to the previous one. The time bloc currently in use is one-second, but they test for varying time segments. The rationale is that stimuli, both commercials and programs have a certain rhythm, depending on the desired outcome. Whoever designs the creative has different objectives for different points of time. This method thus allows Chilmark Digital to look at the entire segment but also to break it up to specific time units. All calculations are then aggregated based on target specifications by the user. The resulting positive and negative attention metrics are displayed in reports as described in their offering mentioned above.

METHODS TO PREDICT ATTENTION:

Chilmark Digital uses duration of exposure, context norms and ad unit norms to predict attention. They also use other norms such as Value of Net Attentive Impressions overall and by custom time segments, rate of change of the flow of Net Attentive Impressions within and across custom time segments, measure of positive and negative attention overall and within and across custom time segments.

Calibration Method by Which Algorithm was Developed to Predict Attention:

While Chilmark Digital currently does not have enough data to predict attention on a broad scale, they do have the calculations to do so. Their goal is to build a database large enough to enable that. They plan to take a multi-phase approach to generating predictive attention metrics.

The basic structure of [ReSync] allows Chilmark Digital to correlate by time code and then analyze results of multiple forms of quantitative and qualitative data. Their existing algorithms permit them to divide the stimulus into time segments of varying lengths, customizable at the user level.

The first step in calibrating Chilmark Digital's measures is developing a "Net Flow of Attentive Impressions," overall and by time segment. This net flow curve is derived from using net (positive minus negative) timed responses in conjunction with Net Intensity or degree of engagement. The algorithms can generate these curve(s) for any single or combination of demographic and behavioral variables. This flow provides both a numeric and visual picture of how the underlying stimulus affects attention.

Chilmark Digital has now extended their measurements to include the calculus underlying the rate of change of the Net Flow of Attentive Impressions. This calculus maps the pattern of Attentive Impressions over the duration of a stimulus and allows them to pin-point, by exact time codes, the occurrence and nature of changes in attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Chilmark Digital does not see viewability as inherently a part of attention, engagement or emotion. Viewability is an attribute assigned to content, based on the impact of external factors on the opportunity to be seen. It does not measure attention or engagement. The ability of the content itself to engage people and engender an emotional response is quite different and apart, and, they believe, paramount. Attention, emotion and engagement are human responses. And attention is a prerequisite for evoking emotion and influencing behavior. Measuring content on these performance indicators demands understanding the relationships among them and applying metrics that reflect them.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative is very important in driving attention to ads. Media type, specific content context, targeting and brand effect are important. Device is somewhat unimportant.

Attention and Emotion:

Self-reports are used for reporting happiness, surprise, disgust and laughter. Respondents report their sentiment—attitudes, opinions, emotions—at the time of specific reactions to viewing/listening to the stimuli. They report the full range of emotion that the stimulus evokes exactly as respondents express them.

Reporting Additional Information:

Likes, view completion rate, open end verbatims linked to attention graphs, sex/age breakouts, respondent is regular user of platform measured (if forced exposure), attention to the contexts themselves. All demographic and behavioral characteristics used in the [ReSync] survey, as well as other variables the client wishes to upload, are available to cut the attention metrics in a manner that parallels analysis of other slider output.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions, awareness, brand preference change, brand consideration change.

Evidence that Method is Predictive of Lower Sales Funnel Outcomes:

Brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Currently Chilmark Digital does not use machine learning and/or AI. However, the company is planning on melding ML output with their mix of quantitative, qualitative and attention metrics to train LLM for predictive analysis.

Commercial Arrangements:

Custom/bespoke, syndicated, industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Validation studies on sample size under 200 were conducted through random control trial and correlation. Specifically, first study was on 110, second study on 153, third study on 145 and fourth study on 242. On each of the studies, they developed the attention metrics after the fact to match between the results. In each case their attention metric predicted what the ad would do.

Organization's Utilization of Third-Party Data:

Demographic data, streaming server data, other metadata, sales data and consumer segments.

Organization's Utilization of Human Subjects:

Chilmark Digital uses human subjects in the following ways: qualitative, online survey, online panels (if online panels are used, the client supplies them).

Delivery of Results to Clients:

Results are reported within 24 hours in the form of scores, reports, indices to norms, self-serve user interface. If a client wants recommendations, consultations or custom algorithms, Chilmark Digital can produce them. Depending on the client, there are also post recommendation and implementation follow ups that provide proof of behavior optimization.

Organization's Share of Data Through Third-Party Workflow Systems:

Chilmark Digital does not offer their data through third-party workflow systems.

*Chilmark Digital submitted validation studies, methodology paper and a client list.

DOUBLEVERIFY*

ORGANIZATION'S PROFILE:

DoubleVerify (DV), founded in 2008, is a publicly owned, free-standing company that operates in the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe, Africa and the rest of Asia.

Attention was not a part of the original purpose and focus of the company at its founding. DV was founded as a verification company with the mission to build better industry validation. Today, they authenticate media quality and power performance. They are driven by a singular purpose—to build a stronger, safer and more secure digital advertising ecosystem that gives global advertisers confidence in their digital investments.

There are 250-999 employees in the unit focused on attention measurement. Of these employees, 25-49 are researchers working on attention, all of whom hold qualitative skills. Most hold traditional quantitative skills, many are data science and Python/R coders, while some have stat package skill sets. None are neuroscientists or psychologists.

DoubleVerify also uses external advisors and consultants for statistical, analysis and corporate/product strategy services.

ORGANIZATION'S MISSION OF SERVICE:

DV's mission is to develop independent media quality and performance solutions that drive better outcomes for advertisers. As a result, brands can leverage DV Authentic Attention® across their campaign workflow to optimize campaign performance and increase efficiency. They believe that attention data is positioned to become the new standard for measuring performance and are taking steps to help the industry move towards transacting on scalable attention measurement. As part of this mission, they recently introduced a free version of their attention solution, the DV Authentic Attention® Snapshot, which provides all clients with high-level attention insights. They have also rapidly expanded into the performance optimization space with the debut of two attention optimization solutions. The industry-leading DV Algorithmic Optimizer generates optimization algorithms customized to drive advertiser KPIs in real-time via best-in-class AI technology and the DV Universal Attention Segment, empowers brands and agencies to optimize campaign performance at scale pre-bid by eliminating inventory characterized by low attention.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning & strategy, programmatic optimization and campaign post hoc measurement.

Media Types Organization Operates in:

Connected television, digital, programmatic, digital content, games and apps.

Brand Types Organization is Experienced With:

Automotive, CPG, education, entertainment, financial services, health & pharma, media & sports, retail & restaurants, technology, telecommunications, travel.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention, according to DV, is a multifaceted construct that should be measured via several different data signals. DV has found that attention can be broken down into exposure (an ad's entire **presentation**, including viewable time and share of screen) and engagement (measurement of user **interaction**—key user-initiated events that occur while the ad creative is displayed including user touches, screen orientation and more). DV measures attention (DV Authentic Attention®) with over 50 unique data signals in real-time, at the impression level, that are then aggregated into actionable indices (Exposure Index + Engagement Index). Their attention indices are normalized to 100, based on a 28-day rolling window of over 65 billion global DV impressions.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

DV has conducted extensive research in performance, leveraging over 15 years of media experience and expansive global data scale to identify a wide array of signals that serve as critical proxies for user attention. They have had many conversations with industry leaders across many agencies and brands to identify the essential components of attention measurement. DV has validated that DV Authentic Attention® metrics directly correlate with business outcomes through several case studies before and after launch. Specifically, ad exposure relates to branding KPIs such as brand awareness or favorability and user engagement correlates with direct response KPIs such as conversions. Mondelez International used DV Authentic Attention® and verified results via Kantar Millward Brown to identify high-exposure impressions on the campaign. This campaign correlated with a nine-percentage point increase in brand favorability, an 8-point lift in consideration overall and a 5-point rise in purchase intent among the brand's primary target audience. Vodafone Germany found that high engagement ads—those with an Engagement Index of 100 or greater—drove over 2.5x higher qualified traffic and sales conversion compared to low engagement ads.

DV is constantly performing ongoing research to make enhancements to their solution. They are also evaluating other datasets and partnerships to broaden the scope of their offering. Case study #1; Case study #2; Case study #3.

ORGANIZATION'S ATTENTION OFFERING(S):

DV Authentic Attention® is an MRC-accredited solution built on a foundation of quality, is privacy friendly and does not rely on cookies and provides impression-level data. The actionable DV Attention Index™ helps measure campaign effectiveness, refine media planning and optimize performance. The solution has six sub-indices that link to the DV Attention Index™, providing deeper insight into performance drivers. Data is accessed in a near real-time dashboard and can be filtered by many campaign dimensions. Attention benchmarks are available across 11 global industries. DV Authentic Attention® measurement also fuels DV's Attention Auto-Optimization Solutions—the Universal Attention Segment and the DV Algorithmic Optimizer. DV recently

announced an agreement to acquire Scibids, a global leader in AI-powered campaign optimization. The acquisition expands DV's product leadership in real-time, campaign optimizations—and lets the company combine its trusted media quality and performance data that includes viewability, contextual and attention signals, with Scibids' proven AI technology and real-time optimization algorithms. This first-of-its-kind joint offering lets DV span the media transaction end-to-end, from activation to measurement and provides advertisers real-time campaign optimization, without the use of third-party cookies. Importantly, the acquisition progresses DV from the realm of proxy for performance to actual ad KPI achievement and tangible business outcome—fully in line with advertiser goals.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Ads.

Measurement/Prediction of Types of Formats:

TV/video, display/static and games.

Attention Measures of Creatives: Control of Variables:

Media type context, device context, ad size context and ad duration.

Attention Measures of Media Context: Control of Variables

Device context, media type context, ad size context and ad duration.

MEASUREMENT OF ATTENTION:

Methods:

1. Measure real consumer reaction: Eye tracking, panel-based measurement for specific channels.
2. Digital KPI proxy for consumer reaction: Exposure and engagement.

Methods to Measure/Predict Attention:

Eye tracking, tuning duration/dwell time, tune during full play of video, nonscrolling/nonmovement of cursor, clickthrough and website visits. Overall, KPIs include exposure, engagement, prominence, intensity, user presence and ad interaction. Consist of viewable share of screen, average viewable time, quartile completion, screen orientation, mute/unmute, volume adjustments, mouse hover, ad clicked, ad size increase/decrease, ad skipped, ad abandoned, device scroll, device mouse movement, device key press, device tab to foreground, device tab to background, video quartile audibility, video quartile viewability, video quartile intensity and more.

Means to Measure/Predict Attention:

Natural exposure “in the wild” and panels.

Eye Tracking Measurements:

Tools: Camera in TV viewing area.

Methods: Eye on-screen duration and user presence.

Positive and Negative Attention:

DV does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding an ad (one form of negative attention). If eyes are closed, this is registered as a signal of inattention.

METHODS TO PREDICT ATTENTION:

Machine learning.

ORGANIZATION’S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

DV has found that engagement is an essential component of attention and can be defined as user interaction with an ad or device. Before optimizing towards attention, it is necessary to have strong viewability to create a foundation of media quality. DV research has shown that optimizing toward viewability alone will not guarantee higher attention levels. DV Authentic Attention® is an agnostic data solution. DV does not currently evaluate emotion in relation to attention but is constantly evaluating other technologies and may include this type of analysis in the future.

Organization’s Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type and device are all very important in driving attention to ads. In addition, specific content context and targeting are important, while brand effect is somewhat unimportant.

Attention and Emotion:

DV does not report on emotion.

Reporting Additional Information:

DV also reports on voluntary playback, clickthrough, skip and view completion rate.

Prediction/Forecast of Additional Measures:

Beyond attention, DV has extensive media quality solutions. Some predictions about viewability, brand safety and context are made in this space.

Evidence that Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, clickthrough, completion of viewing a video ad, brand

recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust and on-site actions.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

DV's attention optimization solutions leverage best-in-class machine learning and algorithmic bidding technology to help brands optimize toward top-performing inventory while maintaining cost efficiency and scale. They also leverage advanced machine learning to score impressions that cannot be measured directly due to device limitations or characteristics of the ad unit. Instead, to measure these ads, they use a machine learning model based on DV's own data set—tens of billions of accredited estimated impressions per month.

Data AI/ML Models Based/Trained on:

AI/ML models are based on DV's owned media quality and attention data, consisting of over 100 billion global impressions monthly. The dataset includes impressions measured by DV directly based on an IAB-accredited method. Other data sets include campaign cost data and DSP log-level data.

Commercial Arrangements:

Custom/bespoke, syndicated and CPM based pricing, custom rates are available on a client-to-client basis.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on 5,001-10,000 and over 10,000 through random control trial, holdout group, multitouch attribution, multiple regression analysis, correlation and A/B testing.

DV's panel partner for CTV measurement has a panel based on 5K households that is representative of the U.S. population. Many of their case studies are performed at the impression-level and correlate attention levels to conversions. These case studies are built on actual campaign delivery, consisting of millions of impressions (varies slightly from client to client).

Organization's Utilization of Third-Party Data:

DV accesses or utilizes the following types of third-party data: attention data for television sets, ad occurrence data, smart TV data, streaming server data, content coding data and other metadata.

Organization's Utilization of Human Subjects:

DV uses human subjects in eye tracking panel via partner.

Delivery of Results to Clients:

DV Authentic Attention® measurement offers tag-based reporting in a comprehensive dashboard that is updated in near real-time. Reporting can also be accessed via a customizable Report Builder

platform that is aggregated to the placement level. A wide range of dimensions and metrics are available to achieve a holistic view of performance across sites, devices, media properties, etc. and can be scheduled to an email address, SFTP, Amazon s3 bucket, Microsoft Azure Blob or Google Cloud Storage. Additionally, DVs data API gives customers an additional way to access all of the same data points within Report Builder through a seamless connection. DV also has the ability to create custom, offline reports that can be scheduled to be delivered hourly, daily, weekly or monthly based on a client's needs.

Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API, custom algorithm, custom insights presentations, quarterly business reviews and ad hoc analyses.

Organization's Share of Data Through Third-Party Workflow Systems:

TVision: DV and TVision have partnered to combine DV's scalable ad exposure data, including viewable time and screen share, with TVision's viewer presence and eyes on-screen ad attention signals, delivering the most holistic attention measurement solution for advertisers looking to gauge their performance on CTV at scale.

The combined offering will enable advertisers to measure media performance on CTV to justify premium budget allocations, validate campaign effectiveness and improve digital investment returns. Furthermore, by extending DV's attention measurement to CTV, clients will be able to analyze campaign performance holistically across open web inventories, formats and devices at scale in order to maximize business outcomes and KPIs. No other attention solution can provide the breadth and depth of coverage needed to deliver broad based pre-and post campaign optimization for advertisers.

Scibids: The Scibids acquisition expands DV's product leadership in real-time, campaign optimizations—and lets the company combine its trusted media quality and performance data that includes viewability, contextual and attention signals, with Scibids' proven AI technology and real-time optimization algorithms. This first-of-its-kind joint offering lets DV span the media transaction end-to-end, from activation to measurement, and provides advertisers real-time campaign optimization, without the use of third-party cookies. Importantly, the acquisition progresses DV from the realm of proxy for performance to actual ad KPI achievement and tangible business outcome—fully in line with advertiser goals.

* DoubleVerify submitted validation studies, technical appendix/methodology description, technical paper and glossary.

DYNATA*

ORGANIZATION'S PROFILE:

Dynata's Creative Testing Division (formerly Ameritest), founded in 1989, is privately-owned, part of a larger corporate structure, that operates in the U.S., India, Europe and rest of Asia.

Attention was part of the original purpose and focus of the company at its founding.

There are 10-24 employees in the unit focused on attention measurement. Of these employees, 0-9 are researchers working on attention, all of whom hold traditional quantitative skills. Some hold data science and qualitative skills, are Python/R coders and hold stat packages skill sets. None are neuroscientists or psychologists. The Creative Testing team also has access to extensive skills and experience of the broader Dynata organization.

ORGANIZATION'S MISSION OF SERVICE:

Dynata's Creative Testing Division seeks to help their clients produce the best advertising possible in order to support their short-term and long-term brand-building and business goals.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measure-ment):

Media/media planning.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, print, out of home, digital display.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage, consumer services and telecommunications.

ORGANIZATION'S DEFINITION OF ATTENTION:

An ad's ability to breakthrough a cluttered environment and get noticed in a way that sticks in memory.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

https://www.warc.com/content/paywall/article/ad-response-tests-show-how-attention-connects-to-memory/en-GB/90231?

https://www.warc.com/content/paywall/article/does-day-after-recall-testing-produce-vanilla-advertising/en-GB/79081?

https://thearf-org-unified-admin.s3.amazonaws.com/Copytesting,%20Pretesting/Copytesting.2004.Kastenholz.Young.Dubitsky.pdf

ORGANIZATION'S ATTENTION OFFERING(S):

Dynata's Creative Testing Full and Lite versions across all media include an attention measurement as a KPI, plus ad-level and moment-by-moment diagnostics to understand why or why not an ad gets noticed.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Ads.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static and OOH.

Attention Measures of Creatives: Control of Variables:

Media type context, media content context, demographics, psychographics.

Attention Measures of Media Context: Control of Variables

None.

MEASUREMENT OF ATTENTION:

Methods:

Measure Real Consumer Reaction: Show a test ad in a clutter of other ads and/or content (depending on media). After clutter exposure, they ask which ads, if any, did they find interesting. The percent of respondents who refer to the test ad in any way is the attention score. (Note: for digital banner they show logos and test ad images and ask recognition of the images. This is their measure of attention for digital display ads).

Methods to Measure/Predict Attention:

Survey-based ad brand recognition (show logos including brands not shown), survey based interested recall (differs from ad recall because participants are asked which ads did they find interesting rather than which ads did they remember). Moment by moment measurement of scenes and imagery that viewers remember after seeing the ad. The moments that are remembered after exposure to the ad are the moments viewers will remember in the long term.

Means to Measure/Predict Attention:

Forced exposure.

Positive and Negative Attention:

Dynata does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Viewability is necessary for an ad to be able to garner attention, but it is not attention in and of itself. Engagement is a function of an ad that has grabbed attention. In linear TV, ads that get noticed and grab attention tend to keep viewer engagement or build in engagement from beginning to end. In social media or online environments, it is critical that attention-getting ads are able to maintain engagement long enough to communicate the brand and key messaging. Ads that garner attention can work by delivering emotionally compelling or engaging stories or visuals. But ads that deliver new information in an interesting or unique way, not necessarily by generating emotion, also have the potential to draw attention.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, targeting and brand effect are very important in driving attention to ads. Media type and specific content context are important. Device is somewhat unimportant.

Attention and Emotion:

Dynata reports on emotion through self-reports using a 5 pt scale from Very Positive to Very Negative Feelings.

Reporting Additional Information:

Dynata also reports on like and sex/age breakouts.

Prediction/Forecast of Additional Measures:

Other quantitative metric related to sales/conversions, brand consideration change, category-specific motivation, brand linkage (a brand's tie to the ad), shift in goodwill/brand affinity.

Evidence that Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

None.

Commercial Arrangements:

Custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on 1,001-5,000, 5,001-10,000 and over 10,000 through multiple regression analysis and correlation. Specifically, N=22,125—177 CPG ads over 18 months; N=1,800—12 CDR ads over 1 year; N=180,000—441 QSR ads over 6 1/2 years; N=9,450—63 Toy & Game ads over 5 years; N=2,100—14 telecom ads over 2 years; N=1,500 2-phase pre/post study 9 COVID-themed ads.

Organization's Utilization of Third-Party Data:

None.

Organization's Utilization of Human Subjects:

Dynata uses human subjects in the following ways: online survey and online panels.

Delivery of Results to Clients:

Results are typically delivered two weeks after receiving the test stimuli or authorization. Results are delivered through scores, recommendations, reports, consultation and indices to norms.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

* Dynata submitted a technical appendix/methodology description.

ELEMENT HUMAN

ORGANIZATION'S PROFILE:

Element Human, founded in 2013, is a privately-owned, free-standing global platform that has been used in 89 countries so far, including in the U.S., Canada, Australia/New Zealand and Europe.

Attention was part of the original purpose and focus of the company at its founding.

There are 10-24 employees in the unit focused on attention measurement. Of these employees, 0-9 are researchers working on attention, many of whom are Python/R coders, psychologists and hold data science, traditional quantitative and stat packages skill sets. Some hold qualitative skills. None are neuroscientists.

Element Human also uses external advisors and consultants for marketing, technical, statistical, analysis, corporate/product strategy and machine learning services. They also have neuroscience advisors.

ORGANIZATION'S MISSION OF SERVICE:

Element Human is developing the human data layer of the internet. They capture and process data on human reactions and responses to content beyond traditional techniques such as surveys. Their system combines eye tracking, facial coding, psychological techniques, survey data and machine learning to get a comprehensive and accurate assessment of how audiences respond to content and predictions of how it will perform in the real world.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media, campaign post hoc measurement and predictors of performance.

Media Types Organization Operates in:

Digital programmatic, digital content, social media and video.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Element Human considers attention as eyes on content, namely, visual orientation to the object of interest, expressed either as a percentage of those tested, or as average time spent (seconds) on the fixation across the test group.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Several documents introduced and formalized over the next three months and expected to come

out later this year.

ORGANIZATION'S ATTENTION OFFERING(S):

Element Human offers three measures of attention:

Dwell time: capturing the amount of time a social post is viewed within a feed. This is expressed in seconds (i.e., 10.6 seconds) and as a percentage of total time spent scrolling (i.e., 12%). Dwell time is judged based on whether the post is "in-view" as the user scrolls on a device.

Attention is measured using an eyes on-screen methodology and reports the percentage of total respondents with eyes on-screen at every second of duration, as well as an average across the whole duration.

Impact: emotional and implicit memory response to content.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, display/static, carousel, TikTok, live streaming.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, demographics and psychographics.

Attention Measures of Media Context: Control of Variables

Attention values of creative.

MEASUREMENT OF ATTENTION:

Methods:

1. Measure real consumer reaction: Webcam eye tracking and facial coding.
2. Digital KPI proxy for consumer reaction: Time on-screen.
3. Other: Social interaction.

Methods to Measure/Predict Attention:

Eye tracking, facial coding, survey-based attentiveness question by media vehicles, survey-based ad recall (product category cue), survey based ad recall (unaided), survey based ad liking, survey based post-only persuasion, survey based on showing ad in context with slider bar to indicate second by second attention, tuning duration/dwell time, implicit uplift, video completion rates.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure).

Eye Tracking Measurements:

Tools:

Forward camera on smartphone and camera on laptop/desktop computer.

Methods:

Eye on-screen duration.

Positive and Negative Attention:

Element Human differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention) through facial coding.

If eyes are closed this will be read as inattention.

METHODS TO PREDICT ATTENTION

Element Human uses alignment between ad and person to predict attention. Specifically, their attention model predicts where people are looking at the screen.

Element Human machine learns predictors of content performance based on real world audience engagement. Machine learning is also used to predict where the eye is looking based on webcam captured eye-movements as part of the overall facial features. They also capture >200 facial features that may contribute to different "attention" KPIs with their clients.

In terms of audience experience: audiences provide consent to activate their webcam. Element Human then calibrates with a moving dot system to get accuracy within 16mm on any device. The prediction calibrates against the screen size of the device. Notably, the sample audience is skewed towards mobile where accuracy is the lowest and made for a good test of the system.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

All part of the same neuroscience workflow:
Reach>View>Attention>Emotion>Memory>Thought>Behavior. Each stage provides a weight relative to the prior.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative is very important in driving attention to ads. Specific content context and brand effect are important while media type and device are somewhat unimportant. Targeting is not viewed as important in driving attention to ads.

Attention and Emotion:

Element Human reports on the following emotions using facial signals: happiness, surprise, disgust, confusion, laughter and over 50 facial expressions that roll up.

Reporting Additional Information:

Element Human also reports on open end verbatims linked to attention graphs, sex/age breakouts, other demographics such as social media patterns and psychographics, if respondent is regular user of platform measured (if forced exposure) and attention to contexts themselves.

Prediction/Forecast of Additional Measures:

Other quantitative metrics related to sales/conversions, awareness, dwell time, brand preference change, brand consideration change, first brand mention (saliency).

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through completion of viewing video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Element Human has a rich database which is their core IP and algorithm—over 256 data points are collected at every frame at 30 frames a second. Their ML combines this data with the client's success metrics and additional data from surveys (measurement and effectiveness section). This is compared to an exposed group. They, then, assess through ML which elements are the most predictive leading indicators of performance.

Commercial Arrangements:

Custom/bespoke and SaaS licensing.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 respondents through machine learning with performance data. This is ongoing since each test contributes to the predictive power. So far 125,000 people have been tested with each individual test averaging 100-150 people.

Organization's Utilization of Third-Party Data:

Element Human does not access or utilize any third-party data.

Organization's Utilization of Human Subjects:

Element Human uses human subjects in the following ways: online survey, online panels and biometrics.

Delivery of Results to Clients:

Results are normally delivered within 48 hours after receiving the test stimuli or authorization. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API and custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

Element Human does not offer data through third-party workflow systems.

EMOTIVA

ORGANIZATION'S PROFILE:

Emotiva was founded in 2017 and is a privately-owned, free-standing company operating in Europe and parts of Asia.

Attention was not part of the original purpose and focus of the company at its founding.

There are 0-9 employees focused on attention measurement, all of whom are data science researchers, adept at Python/R coding/stat packages and computer vision.

The company also utilizes external resources for marketing, technical and coding.

ORGANIZATION'S MISSION OF SERVICE:

Emotiva's mission is to revolutionize the field of deep-tech AI by measuring and recognizing attentive and human emotional states using advanced computer vision and machine learning algorithms, ultimately unlocking new possibilities for positive impact in society.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative effectiveness, advertising pre-test and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning optimization.

Media Types Organization Operates in:

Linear television, digital content, social media, streaming audio, print.

Brand Types Organization is Experienced With:

TV broadcaster, pharma, telco, automotive, entertainment, finance, insurance, retail, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is a cognitive state that provides meaningful information about people's mental availability in the context of increasing media overcrowding. Attention is limited and not given. It is something to be earned and, more importantly, maintained. Attention metrics and measurement techniques assess various aspects of attention to help advertisers and marketers understand the effectiveness of their advertising campaigns and optimize their messages and creative content for maximum impact and engagement.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Some examples of case studies mixing attention and emotional data:

- https://emotiva.it/en/case-studies-super-bowl-2022-2/
- https://emotiva.it/en/case-study-super-bowl-2023/
- https://emotiva.it/en/pepperoni-generative-ai/
- https://emotiva.it/en/christmas-ads

ORGANIZATION'S ATTENTION OFFERING(S):

Emotiva's product is EmPower, a SaaS platform for the integrated measurement of audience attention and emotional responses to a stimulus. The attention metrics calculate average total attention versus content duration and the attention span (which calculates how many seconds people are attentive before the first moment of distraction).

Measurement or Prediction of Attention:

Measurement.

Measurement of Types of Content:

Ads, packaging and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static.

Attention Measures of Creatives: Control of Variables

Media content context, demographics, emotions.

Attention Measures of Media Context: Control of Variables

Attention value of creative, demographics, prior exposure to same creative, attention span of creative.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction, using webcam to calculate the head coordinates. This helps to understand the general level of attention and whether emotional engagement supports attention, and helps optimize the media plan for the right target and predict social media interaction.

Methods to Measure/Predict Attention:

Facial coding, survey-based ad recall (product category cue), survey-based ad liking, tuning duration/dwell time, tune during full play of video, head pose.

Means to Measure/Predict Attention:

Forced exposure, natural exposure "in the wild."

Eye Tracking Measurements:

None.

Positive and Negative Attention:

Emotiva differentiates between positive and negative emotions that are associated with attention. It provides insight into whether the moment of attention generates emotions and of what valence, thus defining positive or negative attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

There is a close link between attention and emotion. Emotiva has identified a correlation between engagement and the speed of attention loss in their studies of more than 25,000 respondents. Emotiva builds on the assumption that attention is a monotonously decreasing signal. As such, once engagement increases, a slowing of the fall or even reversal of the decline in attention can be detected.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Media type and specific content context are very important in driving attention to ads. Creative, device and targeting are important.

Attention and Emotion:

Facial signals are used for reporting happiness, surprise, disgust, laughter, anger, sadness, boredom and fear. While cultural differences are a factor, how these emotions are expressed is similar.

Reporting Additional Information:

Sex/age breakouts and respondent is regular user of platform measured (if forced exposure).

Prediction/Forecast of Additional Measures:

Dwell time, interaction on social media, proper target segmentation for media optimization.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Sales effect, clickthrough, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

For attentional analysis, Emotiva computes a precise estimate of head pose from individual images. This is done with a single AI model without key points computing from the face. The model

composes eye information from action units calculated with head pose during a time window to estimate the level of attention.

Commercial Arrangements:

As a service, custom/bespoke, industry cooperative, standard.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Multiple regression analysis with sample size over 10,000.

Organization's Utilization of Third-Party Data:

None.

Organization's Utilization of Human Subjects:

Online panels.

Delivery of Results to Clients:

Results are reported within a maximum of 48 hours in the form of a dashboard with scores, recommendations, consultation, indices to norms, self-serve user interface and/or custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

EYE SQUARE*

ORGANIZATION'S PROFILE:

Eye Square, founded in 1999, is a privately-owned, free-standing company, that operates in the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe, Africa and rest of Asia.

Attention was part of the original purpose and focus of the company at its founding.

There are 100-249 employees in a unit focused on attention measurement. Of these employees, 50-99 are researchers working on attention, most of whom hold traditional quantitative skills, are psychologists and have stat package skill sets. Many hold data science and qualitative skills, some are Python/R coders and neuroscientists.

Eye Square also uses external advisors and consultants for marketing, technical and coding services.

ORGANIZATION'S MISSION OF SERVICE:

To provide reliable and valid eye tracking data that helps to optimize creative media platforms and brands. Eye tracking is used with other biometrics, survey ratings, interviews and reaction time-based implicit testing methods to provide a holistic view of the human experience of customers. Eye Square's product suite includes ad hoc and tracking studies and reflects the most critical consumer touchpoints: brand and media experience, shopper experience and user experience.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning and campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, connected television, digital content, AVOD/FAST, SVOD, social media, streaming audio, search, print and out of home.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is the measurable perception of a specific area of interest at a given point in time, as measured by hardware eye tracking devices or algorithms based on camera videos. Eye Square's analysis algorithms classify viewing into saccades and fixations. Fixations can be regarded as the most granular elements of the attention stream. They analyze gaze durations, reach, fixation intensity and sequences. Meaningful attention refers to the attention + X paradigm, in which they analyze more profound attention and attention linked to higher-order cognitive processes.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Rothensee, M., & Reiter, P. (2019). Neuromarketing. In C. Kleinand & U. Ettinger, (Eds.), *Eye movement research: An introduction to its scientific foundations and applications* (pp. 819–855). Springer International Publishing.

ORGANIZATION'S ATTENTION OFFERING(S):

Eye Square offers full-service consumer research products, such as ad testing, media platform testing, brand research, user experience and ecommerce testing. Attention is used as a diagnostic tool to enrich all their full-service offerings. They analyze static ads and pack shots in video ads to determine which elements attract attention. Furthermore, eye tracking is crucial in understanding multiscreen media behavior in media ethnography research in consumers' homes. Finally, Eye Square offers technical services for other market research industry vendors to enhance their quantitative and qualitative offerings.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, print, display/static, search.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration, demographics, psychographics and prior exposure to same creative.

Attention Measures of Media Context: Control of Variables

Attention values of creative, device context, brand penetration, demographics, psychographics and prior exposure to same creative.

MEASUREMENT OF ATTENTION:

Methods:

1. Measure real consumer reaction: consumer reaction, eye tracking using hardware or webcam, and mobile phones.
2. Digital KPI proxy for consumer reaction: playback duration of tested ads, ad visibility.

Methods to Measure/Predict Attention:

Eye tracking, facial coding, survey based attentiveness question by media vehicles, survey based ad recall (product category cue), survey based ad recall (unaided), survey based ad brand

recognition (show logos including brands not shown), survey based ad liking, survey based post-only persuasion, survey based on showing ad in context with slider bar to indicate second by second attention, ethnography, other biometrics and proxies including, GSR, tuning duration/dwell time, tune during full play of video, nonscrolling/nonmovement of cursor, clickthrough, search within two minutes of exposure, website visit and store traffic.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure in laboratory and natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

Forward camera on smartphone, camera on laptop/desktop computer, eye tracking glasses, remote eye trackers.

Methods:

Eye on-screen duration, number and duration of fixations.

Positive and Negative Attention:

Eye Square differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention) through emotional reaction and gaze intensity. Also, based on survey post exposure.

If eyes are closed, this will be read as inattention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Viewability is a proxy for attention with a moderate correlation between the two, as attention is a good predictor of engagement with the brand. Meaningful attention is when attention and emotion come together, this being the most valuable prediction of engagement. Each factor receives a specific scoring. When attention and emotion receive high scoring, this is predictive of engagement.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative and media type are very important in driving attention to ads. Specific content context and brand effect are important, device and targeting are somewhat unimportant.

Attention and Emotion:

Eye Square reports on the following emotions using facial signals and self-reports: happiness, surprise, disgust, anger, fear and sadness.

Reporting Additional Information:

Eye Square also reports on voluntary playback, like, clickthrough, skip, view completion rate, open end verbatims linked to attention graphs, sex/age breakouts, demographics such as education and income, respondent is regular user of platform measured (if forced exposure) and attention to contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions and awareness.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, website search, clickthrough, completion of video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust and ad2cart.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Eye Square does not use ML/AI.

Commercial Arrangements:

Custom/bespoke and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on 60-1,000 through random control trials, multiple regression analysis and correlation.

Organization's Utilization of Third-Party Data:

Eye Square does not access or utilize any third-party data.

Organization's Utilization of Human Subjects:

Eye Square uses human subjects in the following ways: qualitative, online survey, in-depth interview, online panels, biometric and face-to-face survey.

Delivery of Results to Clients:

Results are normally delivered within one week after receiving the test stimuli or authorization. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface and API.

Organization's Share of Data Through Third-Party Workflow Systems:

Eye Square does not offer their data through third-party workflow systems.

*Submitted technical appendix/methodology description and technical paper.

IMMERSION NEUROSCIENCE*

ORGANIZATION'S PROFILE:

Immersion Neuroscience, founded in 2017, is a privately-owned, free-standing company that operates in the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe, Africa and the rest of Asia.

Attention was part of the original purpose and focus of the company at its founding.

There are 10-24 employees in the unit focused on attention measurement, all of whom are researchers working on attention. Many of these researchers hold data science, qualitative, traditional quantitative and stat package skill sets. Many of these researchers are Python/R coders, neuroscientists or psychologists.

ORGANIZATION'S MISSION OF SERVICE:

Immersion is the world's first neuroscience as a service platform that allows anyone to measure what people's brains love in real-time, anyplace people are doing interesting things. They do this by applying algorithms in the cloud to data they pull from smartwatches to measure neurologic Immersion, the brain's valuation system for messages and experiences. Immersion was purpose-built to accurately and consistently predict outcomes, with predictive accuracy across a variety of experiences consistently better than 90%.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning and campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, search, games, apps, print, out of home, AR/VR/metaverse and live experiences.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, restaurants, retail, travel and food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Conscious attention is due to activity in the medial prefrontal cortex of the brain that is primarily associated with dopamine binding.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Validation study and technical paper attached below.

Additional literature includes:

- https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0260589
- https://www.frontiersin.org/articles/10.3389/fnbeh.2021.787905/full
- https://neuroeconomicstudies.org/wp-content/uploads/2022/03/Neurological-Correlates-Allow-Us-to-Predict-Human-Behavior-_-The-Scientist-Magazine®.pdf

ORGANIZATION'S ATTENTION OFFERING(S):

Decades of published scientific research show that attention is a poor predictor of outcomes. Immersion captures both attention and emotional resonance and these two components together capture how compelling content and experiences are to people. For this reason, neurologic Immersion convolves both attention and emotional resonance mathematically in a manner optimized to accurately predict outcomes. When content is sufficiently immersive, it motivates people to take actions, including buying, sharing and recalling information. High immersion experiences are saved in the brain in a very particular way that increases the ease of recall and thus the ROI of content.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/Video, audio, print, display/static, games, AR/VR/metaverse, search, live experiences/meetings/training.

Attention Measures of Creatives: Control of Variables:

Demographics and psychographics. Immersion is a software platform so their subscribers choose the controls, whereas they only collect demographics.

Attention Measures of Media Context: Control of Variables:

Demographics. Immersion is a SaaS product so it is up to their subscribers the kinds of data they collect to complement Immersion data.

MEASUREMENT OF ATTENTION:

Methods:

Neurologic measurement of attention and emotional resonance.

Methods to Measure/Predict Attention:

Brain measurements and oxytocin prediction based upon biometric algorithm.

Brain activity is measured from the cranial nerves.

Means to Measure/Predict Attention:

Forced exposure, forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure in laboratory and natural exposure "in the wild."

Positive and Negative Attention:

Immersion does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Immersions' published research shows that to predict behavior (individual and market), attention is only the necessary condition. The sufficient condition is measuring emotional resonance. The neurologic measure Immersion convolves attention and emotional resonance built to do a single thing: predict outcomes. So, attention alone is not enough, people have to sufficiently care about the message or experience, i.e. be emotionally engaged, or they are unlikely to take action.

See Lin, P-Y., Grewal, N. S., Morin, C., Johnson, W. D., & Zak, P. J. (2013). Oxytocin increases the influence of public service advertisements. *PLOS ONE, 8*(2) for a model of how attention and emotional resonance interact.

Previously attached published research shows that Immersion predicts how long people watch content and increased viewing time increases observable outcomes.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative and targeting are very important in driving attention to ads. Specific content context and brand effect are important whereas media type and device are only somewhat important.

Attention and Emotion:

Emotion is measured from the effect of oxytocin on the cranial nerves. Immersion measures continuous emotional resonance, i.e., the degree to which the stimulus is emotionally valuable to participants.

Reporting Additional Information:

Immersion also reports on sex/age breakouts, location, attitudes. Mostly connected by subscribers to the Immersion platform.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions, awareness and first brand mention (saliency). The neurologic Immersion of the experience strongly predicts sales bumps, information recall, YouTube views/streams, enjoyment and other aggregate metrics.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, completion of viewing video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Immersion data is collected at 1Hz and are therefore statistically rich measures of neurologic value. ML is used by subscribers or Immersion staff to estimate predictive models of outcomes using Immersion data. These models further refine the algorithms that Immersion offers to its subscribers.

Data AI/ML Models Based/Trained on:

Models are trained on neurophysiologic Immersion and outcomes data that their subscribers collect.

Commercial Arrangements:

SaaS.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 through random control trial, multiple regression analysis, correlation and machine learning. Immersion has 20 years of published scientific research and six years of client use measuring over 50,000 brain observations.

Organization's Utilization of Third-Party Data:

Immersion does not utilize any third-party data.

Organization's Utilization of Human Subjects:

Immersion uses human subjects in the following ways: online survey, neuro and distributed neuroscience measures of stimuli people can complete at home with a smartwatch and Immersion Mobile App.

Delivery of Results to Clients:

Results, available in real time, are delivered through scores, recommendations, reports, indices to norms, self-serve user interface, API and custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

Immersion builds APIs to share data through third-party workflow systems.

*Immersion submitted the following validation studies: link#1, link #2 and technical paper.

INTEGRAL AD SCIENCE

ORGANIZATION'S PROFILE:

Integral Ad Science, founded in 2009, is publicly owned and part of a larger corporate structure that operates in the U.S., Canada, Australia/New Zealand, India, Latin America, Europe and the rest of Asia.

Attention was not a part of the original purpose and focus of the company at its founding. The original purpose of the company was brand safety, suitability, fraud and IVT.

There are 100-150 employees in a unit focused on attention measurement. Of these employees, 10-24 are researchers working on attention, all of whom hold qualitative skills and are Python/R coders. Most hold data science skill sets. Many have traditional quantitative and stat package skill sets. None are neuroscientists or psychologists.

ORGANIZATION'S MISSION OF SERVICE:

Integral Ad Science's mission is to help their customers by using attention measurement to simplify campaign evaluation, understand the impact of their media and additional insights to help them optimize their campaigns.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Media Types Organization Operates in:

Digital programmatic.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, restaurants, retail, travel, food/beverage. Integral Ad Science also works with all types of verticals.

ORGANIZATION'S DEFINITION OF ATTENTION:

Integral Ad Science's definition of attention is a combination of human inclination and media signals that, when used together, improve campaign effectiveness. Integral Ad Science determined three signals that can predict if an impression is likely to lead to an outcome: visibility, situation and interaction.

- Visibility signals measure the validity of the impressions being served.

- Situation signals describe the environment in which impressions are served.
- Interaction signals are indicators of consumer activity in the presence of ads.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

None provided.

ORGANIZATION'S ATTENTION OFFERING(S):

Integral Ad Science is planning to release attention reporting and dashboard in 2023.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Ads.

Measurement/Prediction of Types of Formats:

Display banner/video open web only formats.

Attention Measures of Creatives: Control of Variables

None.

Attention Measures of Media Context: Control of Variables

Device context.

MEASUREMENT OF ATTENTION:

Methods

1. Digital KPI proxy for consumer reaction: These are the KPI's clients generally use, typically these are conversions.

Methods to Measure/Predict Attention:

Tuning duration/dwell time, clickthrough, website visit and online sales.

Means to Measure/Predict Attention:

Natural exposure "in the wild."

Eye Tracking Measurements:

Integral Ad Science is currently incorporating an eye tracking component into the IAS Quality Attention model by getting data from Lumen. This component will be included by 2023.

Positive and Negative Attention:

Integral Ad Science differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

METHODS TO PREDICT ATTENTION:

Integral Ad Science uses viewability, duration of exposure, placement on page norms, ad density and ad interaction, such as volume up/down, pause/unpause, click to play ads, etc., to predict attention.

Calibration Method by Which Algorithm was Developed to Predict Attention:

Integral Ad Science uses a variety of signals obtained as both a part of their core products and services (viewability, suitability, traffic type) and other signals captured by their tags that are organized into three categories:

- Visibility: the quality of the impressions.
- Situation: elements of the environment the impression is served in.
- Interaction: user actions that are taken when the impression is served.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

They all seem to contribute to attention.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context, device, targeting and brand effect are all very important in driving attention to ads.

Attention and Emotion:

Integral Ad Science does not report on emotion.

Reporting Additional Information:

Integral Ad Science also reports on voluntary playback, clickthrough and view completion rate.

Prediction/Forecast of Additional Measures:

Integral Ad Science does not predict or forecast anything other than attention.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through website visit, clickthrough and completion of viewing video ad.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Integral Ad Science uses a propensity model that considers three categories (visibility, situation and interaction) to predict attention scores.

Data AI/ML Models Based/Trained on:

Integral Ad Science ML is trained on IAS first-party data, where they have the predicting signals and campaign performance data.

Commercial Arrangements:

Direct to customers/advertisers.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

The study was conducted on over 10,000. However, the validation and calibration studies that were performed have not been shared.

Organization's Utilization of Third-Party Data:

Integral Ad Science utilizes Sincera's Ad Density and Lumen's eye tracking data.

Organization's Utilization of Human Subjects:

Integral Ad Science includes an eye tracking component.

Delivery of Results to Clients:

Question does not apply since this is still in progress. Once the timeline has been decided results will be delivered through scores, recommendations, reports and consultation.

Organization's Share of Data Through Third-Party Workflow Systems:

Integral Ad Science currently works with Sincera to receive Ad density data. They are also in the process of integration with Lumen to receive eye tracking based prediction data.

IPSOS*

ORGANIZATION'S PROFILE:

Founded in France in 1975, Ipsos has been publicly listed on the Euronext Paris since July 1, 1999. Ipsos is one of the largest market research and polling companies globally, operating in 90 markets and employing nearly 20,000 people. Ipsos has over 75 business solutions, based on primary data from surveys, social media monitoring and qualitative or observational techniques.

Attention was not part of the original purpose and focus of the company at its founding. Rather, original purpose was to provide clients with the best information to make confident business decisions to grow their sales and market share.

There are 1,000-2,499 employees in the unit focused on attention measurement. Of these employees, 0-9 are researchers working on attention, all of whom hold traditional quantitative skill sets. Some hold data science, qualitative, Python/R coding and stat packages skill sets. Some are neuroscientists. None are psychologists.

ORGANIZATION'S MISSION OF SERVICE:

Creative|Spark is Ipsos's flagship creative assessment service, deployed in over 40 countries globally. The mission of the service is to help brands harness creativity to spark brand growth. This is done by measuring a unique combination of Thoughts, Feelings and Emotions to evaluate, diagnose and optimize creative to get to the most effective business outcomes.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, SVOD, social media, terrestrial radio, streaming audio, search, print and out of home.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, restaurants, retail, travel and food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is a process that acts as a mental spotlight to allocate cognitive resources in the mind at the expense of other activity or stimulus. For something to attract attention, cognitive resources need to be taken from something else as they are finite. Attention can be captured either via Bottom Up and automatic processes without deliberative thinking or Top Down with considered thinking. It is frequently observed that attention is captured Bottom up, with visual and audio cues familiar to the person acting as signals of loss or reward. The outcome of high quality attention is

if an experience is encoded and stored in the mind. There are occasions where cognitive resources can be allocated to attend to an experience, but it is not encoded, which is why Ipsos focuses on measuring the outcome rather than the process to achieve the outcome.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

NA.

ORGANIZATION'S ATTENTION OFFERING(S):

Ipsos's core measure of the outcome of attention is Brand Attention. They use survey measures to get evidence from peoples' minds that the ad was encoded and stored in memory. And, importantly, if these memories are linked to the brand. Ipsos does this by showing people de-branded images of the test ad, previously shown in a distracted exposure experience amongst other ads and video content, to raise cognitive load. Branding is measured by asking people unaided to type the name of the advertised brand, to prove the encoded memories are linked to the brand. Ipsos also include as standard, web cam measurement and focus on immediate emotional responses, which they have empirically shown to have a relationship to Brand Attention. As part of the web cam measurement, they refer to a measure that quantifies the volume of people looking at the screen at a given moment. And they are experimenting with this type of measure to utilize for diagnostic purposes.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Ads.

Measurement/Prediction of Types of Formats:

TV/video, audio, print and display/static.

Attention Measures of Creatives: Control of Variables

Media type context, device context, brand penetration and demographics.

Attention Measures of Media Context: Control of Variables

None.

MEASUREMENT OF ATTENTION:

Methods

Ipsos measures real consumer reaction through survey responses.

Methods to Measure/Predict Attention:

Facial coding, survey-based ad recall (unaided), survey-based ad brand recognition (show logos including brands not shown) and tuning duration/dwell time.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure).

Eye Tracking Measurements:

None

Positive and Negative Attention:

Ipsos does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

METHODS TO PREDICT ATTENTION:

Ipsos does not predict attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Ipsos has empirically observed relationships between the outcome of attention and Brand Attention (the degree to which the ad is encoded in the mind and linked to the brand) as follows:

1. Emotions, positive emotional arcs that grow over time have a relationship with Brand Attention – https://arf-research-dox.s3.amazonaws.com/Supplementary+Materials/Ipsos/the_impressions_also_count.pdf
2. In-view play time percentage, to varying degrees by platform – https://arf-research-dox.s3.amazonaws.com/Supplementary+Materials/Ipsos/2022_02_11_Digital_Advertising_Rodgers_Ipsos.pdf

None of these relationships are strong enough to suggest that they can replace the outcome of Brand Attention, which is why Ipsos thinks attention needs a holistic measurement of immediate web cam + survey to measure effects and diagnose and optimise, as needed.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative is very important in driving attention to ads. Media type and brand effect are important, whereas specific content context, device and targeting are somewhat unimportant.

Attention and Emotion:

Facial signals and self-reports are used for reporting happiness, surprise, disgust, confusion, sadness, contempt and fear.

Reporting Additional Information:

Ipsos also reports on like, skip, sex/age breakouts and if respondent is regular user of platform measured (if forced exposure).

Prediction/Forecast of Additional Measures:

Sales lift increase, brand preference change, brand consideration change and long-term equity impact.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

None.

Commercial Arrangements:

Custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 through market mix model to sales lift.

Organization's Utilization of Third-Party Data:

Ipsos accesses or utilizes facial coding.

Organization's Utilization of Human Subjects:

Ipsos uses human subjects in the following ways: qualitative, online survey, online panels, neuro, biometric and face-to-face survey.

Delivery of Results to Clients:

Results are typically delivered within 48 hours after receiving the test stimuli or authorization. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface and API.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

* Ipsos submitted the following validation studies: Sales Validation for Creative Spark and Creative Spark Client Method Metrics.

KANTAR*

ORGANIZATION'S PROFILE:

Kantar was founded in 1992 and is privately owned, part of a larger corporate structure company operating in the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe, Africa and the rest of Asia, totaling over 90 markets.

Attention was not part of the original purpose and focus of the company at its founding. The original purpose of the company was brand consulting, data analytics, advertising effectiveness, media measurement, consumer and shopper behavior and public opinion. Kantar's advertising effectiveness roots extend back even further; Millward Brown (now fully integrated in Kantar) was founded in 1973.

There are 2,500+ employees focused on attention measurement. Of these employees, 1,000-2,499 are researchers and adept at traditional quantitative research. Many of the researchers are data scientists or qualitative, some have Python/R coding/stat package skills and some are neuroscientists and/or psychologists.

The company also utilizes external resources for marketing, technical, coding and/or corporate/product strategy.

ORGANIZATION'S MISSION OF SERVICE:

Kantar is a marketing data and analytics business that combines the most meaningful attitudinal and behavioral data with deep expertise and advanced analytics to uncover how people think and act. They help clients understand what has happened and why and how to shape the marketing strategies that shape their future. Their extensively validated creative solutions help develop and optimize content to demand attention, create meaningful impressions and generate sales. Their media effectiveness solutions help clients understand the art and science of media success with a complete picture of campaign effectiveness across channels.

Current Type of Attention Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Future Type of Attention Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning, campaign post hoc measurement are offered by Kantar but currently not part of their attention offerings. That said, they are planned to be part of their attention offerings in the future.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, print, out of home.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, restaurants, retail, travel, food/beverage and all other sectors.

ORGANIZATION'S DEFINITION OF ATTENTION:

Having reviewed academic literature, Kantar does not believe there is a single, widely accepted scientific definition of attention. However, they find this definition from Knudsen at Stanford helpful. Four processes are fundamental to attention: 1) working memory, 2) top-down sensitivity control, 3) automatic bottom-up filtering for salient stimuli, 4) competitive selection. More pragmatically, they believe capturing attention is about putting the right creative, in the right place, in front of the right person. Their attention measurement focuses primarily on creative attention in specific contexts.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Knudsen, E. I. (2007). Fundamental components of attention. *Annual Review of Neuroscience, 30*, 57-78.

ORGANIZATION'S ATTENTION OFFERING(S):

Attention measurement has been baked into Kantar creative testing solutions for many years. They have observed human attention for over 50,000 ads and captured survey responses about advertising attitudes for over 250,000 ads. Kantar's technical attention capabilities include facial coding and eye tracking (both observed and predicted), as well as in-context measurement of attention for all major digital advertising formats. They are experts at integrating attention into a comprehensive communications response framework.

Measurement or Prediction of Attention:

Both measurement and prediction.

Measurement of Types of Content:

Ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration, demographics, prior exposure to same creative.

Attention Measures of Media Context: Control of Variables

Attention value of creative, device context.

MEASUREMENT OF ATTENTION:

Methods

Kantar measures real consumer reactions using facial coding, eye tracking and more often, webcam gaze estimation and attitudinal survey-based measures and evaluations. Kantar also measures in-context digital behavior. They diagnose skip data by integrating facial coding measures, thus providing rich data about what one is feeling when skipping an ad.

Methods to Measure/Predict Attention:

Webcam gaze estimation, facial coding, survey-based attentiveness question by media vehicles, survey-based ad recall (product category cue), survey-based ad recall (unaided), survey-based ad brand recognition (show logos including brands not shown), survey-based ad liking.

Means to Measure/Predict Attention:

Forced exposure, forced exposure to platform but choice of specific content (simulated natural exposure).

Eye Tracking Measurements:

Tools:

Forward camera on smartphone, camera on laptop/desktop computer.

Methods:

Eyes on-screen duration.

Positive and Negative Attention:

For positive attention, Kantar measures time-paying attention and depth of attention. For negative attention, Kantar measures when people skip (behavioral), look away or show signs of distraction. Kantar also captures facial coding valence to understand when viewers are engaging positively or negatively on a second-by-second basis and expressiveness to see when they react with any emotion. Eyes on-screen and not being distracted is considered the passive attention measure; facial expressiveness is the active attention measure.

METHODS TO PREDICT ATTENTION:

Kantar uses the following to predict attention: colors used in ad, type face size in ad, human faces, animals, objects (could be vehicles, footballs, phones, laptops, etc., the category list is huge). They also detect emotions exhibited in the faces by intensity. In all of the above, it's not just the detection of these features, but statistics and other features around those that are generated—e.g., how much time did the face occupy the screen space, how much screen space, how does it vary

across the length of the ad, dialogue or not, etc. Additionally, Kantar uses Link survey-based norms at a market level to provide understanding of responses across markets worldwide. Alignment between ad and context is used to some extent (they have different algorithms by context, but they don't use an explicit "fit to context" input). Alignment between ad and person is also used (their predictions are for "category users" and they adjust for age and gender in their calculations).

Calibration Method by Which Algorithm was Developed to Predict Attention:

Kantar's Link AI prediction algorithm has been calibrated against thousands of ads tested using Kantar's Link survey-based tests for TV and digital video ads. Both TV and digital tests include claimed attentiveness to the ads. The digital video tests also include an observed behavioral component (i.e., do participants skip after a while).

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

There is a hierarchy considered: viewability > passive attention > engagement > memory > action. Viewability is first, as no visual attention is possible to something not in view. Passive attention is next as active attention is impossible without sensory input. Engagement is necessary to create meaning from the content—which is then necessary for impact on the memory structures of the brand—which is needed to shape action at a later date. Emotion is both a cue to engagement and memory as one attends to and remembers emotional stimuli, and positive feelings create a positive context for later brand decision-making.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative is very important. Media type, specific content context, targeting and brand effect are considered important. Device is considered somewhat unimportant.

Attention and Emotion:

Facial signals and self-reports are used for reporting happiness, surprise, disgust, sentimentality, confusion, sadness and focus (brow furrow), along with many other signals.

Reporting Additional Information:

Voluntary playback, like, clickthrough, skip, view completion rate, open end verbatims linked to attention graphs, sex/age breakouts, custom demographics, respondent is regular user of platform measured (if forced exposure).

Prediction/Forecast of Additional Measures:

Sales lift increase, awareness, brand preference change, brand consideration change, first brand mention (saliency).

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Sales effect, completion of viewing video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Kantar uses AI within their facial coding measurement approach (in partnership with Affectiva). They use predictive eye tracking to diagnose likely areas of focus within an ad (in partnership with Neurons). Kantar also uses AI to predict overall ad effectiveness including likelihood to skip for digital ads (proprietary Kantar Link AI for Digital algorithm).

Commercial Arrangements:

Custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Multiple regression analysis and correlation was used on over 10,000 sample size.

Organization's Utilization of Third-Party Data:

Kantar uses demographic data, ad occurrence data and sales data from third-party data.

Organization's Utilization of Human Subjects:

Kantar uses human subjects for the following: qualitative, online survey, in-depth interview, online panels, neuro, biometric, face-to-face survey, telephone survey, mailed survey.

Delivery of Results to Clients:

Results are typically reported within 24 hours in the form of scores, recommendations, reports, consultation, indices to norms, self-serve user interface and/or custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

* Validation studies were submitted.

LUMEN*

ORGANIZATION'S PROFILE:

Lumen, founded in 2013, is a privately-owned, free-standing company that operates in the U.S., Canada, Australia/New Zealand, India, Latin America, Europe, Africa and rest of Asia.

Attention was part of the original purpose and focus of the company at its founding.

There are 50-99 employees in the unit focused on attention measurement. Of these employees, 10-24 are researchers working on attention, many of whom hold traditional quantitative skill sets and are psychologists. Some have data science, qualitative and stat package skill sets. Some are Python/R coders or similar, or are neuroscientists.

ORGANIZATION'S MISSION OF SERVICE:

Lumen exists to optimize attention for outcomes.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning and campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, games, apps, print, out of home and AR/VR metaverse.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage, publishing, media owners.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is the capacity to select certain behaviors within a dynamic environment. In advertising, attention is the process of selection for action. Visual attention—eyes are like a spotlight; audio attention—ears are like a filter.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

The definition of attention as "selection for action" comes from Wayne Wu, *Attention* (2013). His thinking is led by the following theorists:

- Richard Gregory: Perceptions as hypotheses (1980)
- Michael Posner: Orienting of attention (1980)
- Karl Friston: Perceptions as hypotheses, saccades as experiments (2012)

- Nilli Lavie: Load theory (2014)
- Jakob Howhy: The predictive mind (2013).
- Lisa Feldman Barrett: How emotions are made (2017).
- M. Merleau-Ponty: *The phenomenology of perception* (1968).

ORGANIZATION'S ATTENTION OFFERING(S):

Lumen helps brands plan, buy, measure and optimize attention:

- Plan: attention factors for use within media planning tools.
- Buy: attention algorithms within DSPs and attention—informed PMPs.
- Measure: an event pixel that records viewability data from live campaigns, estimates attention and links this data to outcomes metrics such as performance and brand lift studies.
- Optimize: tools for creative testing, that enable the creation of brand-specific predictive models of attention.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static, games, AR/VR/metaverse and out of home.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context and demographics.

Attention Measures of Media Context: Control of Variables

Attention values of creative and device context.

MEASUREMENT OF ATTENTION:

Methods

1. Measure real consumer reaction: Passive eye tracking panels and controlled tests.
2. Digital KPI proxy for consumer reaction: Predictive models of attention based on viewability signals. The models are calibrated with reference to attention data from Lumen's panels and controlled tests.

Methods to Measure/Predict Attention:

Eye tracking.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure in laboratory and natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

Forward camera on smartphone, camera on laptop/desktop computer, camera in TV viewing area and cameras within cinemas.

Methods:

Eye on-screen duration, number and duration of fixations. It is important to understand the nature of gaze, fixations and saccades. In measuring gaze points (and grouping these to create fixations), saccades are also automatically "measured."

Positive and Negative Attention:

Lumen does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

If eyes are closed, it will be read as inattention.

METHODS TO PREDICT ATTENTION:

Lumen uses viewability (how many pixels on screen, % pixels in view, % of page real estate taken up by ad), duration of exposure, ad unit norms, placement on page norms and other norms, such as device (mobile/desktop/CTV), and publisher to predict attention.

Calibration Method by Which Algorithm was Developed to Predict Attention:

The Lumen attention prediction model is based on data obtained from Lumen's passive eye tracking panels in the U.S. and U.K. (1,000 people in each panel).

Nationally representative panelists are recruited to download Lumen's software to either their desktop computers or their mobile phones. This software does two things:

- Records the activity on the device—sites visited and detailed viewability data on each of the ads served on those sites. The viewability data is collected at 100ms (i.e., 10 x per second), which gives a detailed understanding of the "lifetime" of the ad—when a single pixel becomes visible, how long the video plays for and what proportion of the total length this constitutes, when (and if) the ad attains "technical viewability" to MRC standards. This level of detail is very important in being able to accurately predict attention to advertising subsequently.
- Visual attention data. The software operates at between 11 and 37 Hz, meaning that Lumen can pick up changes in visual attention faster than 10x a second and so, associate any changes in attention with any changes in the "lifetime" of the ads captured.

Both sets of data are uploaded to the cloud, and the attention data is associated with each ad over its "lifetime" on-screen.

Over the last five years, Lumen has had over 3,000 individuals pass through the panels and have collected over 2m data points. They collect more data each day.

It is this human visual attention data that is used to calibrate Lumen's predictive model of attention. Based on a combination of viewability data signals, the model predicts how likely a person is to look at an ad for every 10th of a second that it is on screen and then aggregates these probabilities to give a final prediction for the "lifetime" of an ad as a whole. It also makes a prediction for how long the ad is looked at in total.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING):

Ads need to be viewable to be seen—though not necessarily viewable by MRC standards. Sometimes, advertisements that are not "technically" viewable (i.e., 50% of pixels on screen for 1-2+ seconds) still achieve attention. Increased visual attention usually correlates to expanded recall and shifts in future behavior, but not consistently or strictly linearly. "Engagement" and "emotion" are ill-defined terms. There may be a connection between viewability/attention, but it depends on how one defines engagement/emotion.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type and device are all very important in driving attention to ads. Specific content context, targeting and brand effect are important.

Attention and Emotion:

Lumen does not report emotion.

Reporting Additional Information:

Lumen also reports on voluntary playback, likes, clickthrough, skip, view completion rate, open end verbatims linked to attention graphs and sex/age breakouts, respondent is a regular user of the platform measured (if forced exposure) and attention to the contexts themselves.

Prediction/Forecast of Additional Measures:

Dwell time, brand preference change and ad recall.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, clickthrough, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Lumen uses AI in two places: (1) constructing gaze from webcam inputs and (2) training predictive attention models. Constructing gaze consists of using ground-truth gaze data as a training set for generating models that predict gaze from webcam inputs considering body position, device motion and orientation, and other factors. Training the predictive models consists of a neural-networking process that consumes gaze and browser/app environment data and produces models that predict gaze from exclusively environmental data.

Data AI/ML Models Based/Trained on:

The core data set training Lumen's models is the gaze data derived from the "passive panel." This produces a ground truth of how users attend to ads in the wild. All the data is first-party, and no data is brought in from external vendors. This is important as it allows Lumen to control and understand the measurement modality and resulting error rates and bias. The "passive data" is augmented by additional laboratory data where necessary.

Commercial Arrangements:

Custom/bespoke, syndicated and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

A study was conducted on under 200 and 1,001-5,000 through random control trial, holdout group, synthetic control group, multiple regression analysis and correlation.

Creative attention tests: recommended sample size 150+ passive attention panels, c1,000 per market.

Organization's Utilization of Third-Party Data:

Lumen accesses or utilizes the following types of third-party data: attention data for television sets, ad occurrence data, sales data and carbon emissions estimates.

Organization's Utilization of Human Subjects:

Lumen uses human subjects in the following ways: online survey, online panels and biometric.

Delivery of Results to Clients:

Results are normally delivered within 24 hours after receiving the test stimuli or authorization. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API, custom algorithm and activations via digital private marketplaces (PMPs) and segments.

Organization's Share of Data Through Third-Party Workflow Systems:

Lumen shares data through DSPs: The Trade Desk, Google DV360, Teads and Quantcast.

Format owners: Teads, Adnami, Seedtag, SeenThis, Picnic, WeTransfer, Hybrid Theory, Azerion, GumGum, Digital Turbine, Anzu, Bidstack and Frameplay.

SSPs: The Media Grid (and therefore, all the SSPs they service).

Viewability companies: IAS.

Other: Scope3.

*Lumen submitted technical appendix/methodology description.

MEDIAPROBE*

ORGANIZATION'S PROFILE:

Mediaprobe, founded in 2016, is a privately-owned, free-standing company that operates in the U.S. and Europe.

Attention was part of the original purpose and focus of the company at its founding.

There are 16 people in the company who work on "attention" in a broad sense. They are distributed into two teams: first, client facing/customer success/insights—this is a 10 person team with degrees in psychology, all of whom with traditional quant skills; second, the data and science team who does fundamental research work on attention/emotion and may also be called in for more ad hoc research projects. This is a team of six with advanced degrees in neuroscience and/or data engineering/machine learning.

Mediaprobe also uses external advisors and consultants for marketing and corporate/product strategy services.

ORGANIZATION'S MISSION OF SERVICE:

Mediaprobe provides data on the physiological activation of consumers as they are exposed to media. They operate panels of consumers who have physiological sensors that capture electrodermal activity and heart rate in their homes. The signals are synchronized with the media content panelists are exposed to and are processed in an automated platform to deliver second-by-second (and aggregated) impact metrics. Mediaprobe provides impact scores on every element of the broadcast (content and commercial) across demographics, via a dedicated platform. They mix these with declarative data, such as dial ratings or survey responses.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Media Types Organization Operates in:

Linear television, addressable television, connected television, AVOD/FAST, SVOD, terrestrial radio, streaming audio.

Brand Types Organization is Experienced With:

Entertainment.

ORGANIZATION'S DEFINITION OF ATTENTION:

Mediaprobe uses the aggregated, coherent increase in the phasic component of the electrodermal signal time locked to media events as a proxy for attention. They believe this is a valuable signal since it has some properties that make it valuable as a measure of impression quality:

- It is clearly associated with the perceived arousal in media (they see this across academic publications and their own extensive dataset).
- It has a carry over property, meaning that the score of a given ad is partially explained by the score of its context, which is a necessary property if the intention is to value the context in which ads are inserted.
- It is multi-modal, meaning that the same metric can be used for video and audio.
- It is related to (top-of-the-funnel) outcomes such as ad recall.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Since attention is a construct, Mediaprobe uses GSR as proxy for attention to video. This metric has been shown to be a reliable indicator of perceived arousal in video stimuli. They have done meta-analysis around the psychophysiological correlates of emotion, which clearly shows the linear association between GSR and perceived emotion. The open publication can be found here: https://psyarxiv.com/kmpq5/

Mediaprobe bases the use of this metric in the strong association between GSR and emotional arousal, and the correlation between emotional arousal and attention to the stimuli which elicit responses (see Pessoa, 2015—*The handbook of emotion* (MIT)). Accordingly, GSR can be a good candidate metric for operationalizing attention.

ORGANIZATION'S ATTENTION OFFERING(S):

Mediaprobe offers a metric, denominated EIS (Emotional Impact Score) that translates the impact (as determined by the phasic amplitude of the electrodermal response) of each element of the broadcast. The client accesses the second-by-second impact on a dedicated dashboard and this data is tagged (on a client-by-client basis) with the elements of the broadcast, as well as any other meta-data aggregated to the event. For advertisers, this allows an estimation of the impact of each content on the emotional response elicited by advertising, as well as estimating the overall impact of each ad. As audiences become more fragmented and the reach of individual channels diminishes, it's becoming more and more important for media owners and brands to determine the true value of their content, inventory and investments. Mediaprobe's proprietary sensor, mobile app and platform assess how content affects people psychologically, as well as how engaged they are. Mediaprobe goes beyond eye tracking and audience ratings to provide actionable second-by-second measurement to create more engaging content to sell ads, increase commercial efficacy and amplify brands.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video and audio.

Attention Measures of Creatives: Control of Variables

Media type context, media content context and demographics.

Attention Measures of Media Context: Control of Variables

Attention values of creative, brand penetration and demographics.

MEASUREMENT OF ATTENTION:

Methods

Measure real consumer reaction.

Methods to Measure/Predict Attention:

Survey based ad recall (product category cue), survey based ad recall (unaided), second by second self-report (e.g., slider), electrocardiogram, galvanic skin response and other biometrics. Mediaprobe measures EKG but does not use this in production.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure), and natural exposure "in the wild."

Eye Tracking Measurements:

Mediaprobe does not use eye tracking measurements.

Positive and Negative Attention:

Mediaprobe does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Mediaprobe considers that attention, emotional arousal and engagement can be overlapped conceptually and from an operational viewpoint (all somewhat related to arousal and operationalized via GSR). The emotional impact score of an ad is a mediator between the

emotional impact score of the content and the likelihood of viewer's remembering the ad. If the content is more impactful, it will lead to a more impactful ad, which in turn will lead to a higher probability of recalling the ad.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative and specific content context are very important in driving attention to ads, and media type, device, targeting and brand effect are all important.

Attention and Emotion:

Mediaprobe reports on emotional arousal using self-reports and GSR.

Reporting Additional Information:

Mediaprobe also reports on like, sex/age breakouts, other demographics per clients request, respondent is regular user of platform measured (if forced exposure) and attention to contexts themselves.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness and completion of listening to audio ad.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

At this point, Mediaprobe does not offer any ML/AI-modeled measure of attention. However, they are doing extensive work on modeling the attentional patterns to different types of TV programming and how that determines the emotional response to advertising.

Commercial Arrangements:

Custom/bespoke and syndicated.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

The studies were conducted on under 200, 200-599 and 600-1,000 through multiple regression analysis and correlation. The average sample size of a Mediaprobe session (measuring one telecast) is 100 panelists. They have run hundreds of sessions. Mediaprobe has an active panel of 1,900 (growing) panelists in the U.S.

Organization's Utilization of Third-Party Data:

Mediaprobe does not access or utilize any third-party data.

Organization's Utilization of Human Subjects:

Mediaprobe uses human subjects in the following ways: online survey, online panels and biometric.

Delivery of Results to Clients:

Results are typically delivered within 24 hours after receiving the test stimuli or authorization. Results are delivered through scores, reports, indices to norms, self-serve user interface and API.

Organization's Share of Data Through Third-Party Workflow Systems:

Mediaprobe does not share data through third-party workflow systems.

*Mediaprobe submitted validation studies, methodology description and client list.

MEDIASCIENCE*

ORGANIZATION'S PROFILE:

MediaScience was founded in 2008 and is a privately-owned, free-standing company operating in the U.S., Canada, Australia/New Zealand and Europe. They will operate elsewhere on demand.

Attention was part of the original purpose and focus of the company at its founding.

There are 25-49 employees focused on attention measurement. Of these employees, 10-24 are researchers, all of whom are media/advertising researchers. Most of these researchers are adept at traditional quantitative research, many are neuroscientists and/or psychologists and skilled with stat packages. Some of the researchers are data scientists, some have qualitative research and/or Python/R coding skills.

The company also utilizes external resources for statistical, analysis and/or industry application support.

ORGANIZATION'S MISSION OF SERVICE:

MediaScience provides best-in-class measures for attention. Although these measures do not always scale, they provide the best measures for accurate and reliable measurement of attention across its various applications. Their mission in this space is to help elevate industry discourse on attention, helping bring it more in line with positions consistent with the scientific literature rather than around vendor product offerings. They also work with publishers and brands to help provide validation of their approaches to attention measurement and evaluative research on attention effects for content and ads. MediaScience is also developing scalable solutions for measuring for attention using heart rate through fitness tracking wrist devices. MediaScience recently conducted a relative large pilot (testing over 50 program sessions with n>4,000) but is still working to improve the measure's signal-to-noise ratio.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning, campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, search, games, apps, print, out of home, AR/VR/metaverse, mobile.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, restaurants, retail, travel, food/beverage, sports, motion pictures.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is the automatic or controlled focusing of limited cognitive resources on external or internal stimuli. It is best understood as a threshold above which processing of such stimuli occurs. In practical terms, this means that attention is best understood as a state reflecting the absence of inattention (i.e., below the attention threshold). In layman's terms, inattention is a reflection of not noticing something. It is important to recognize that while "inattention" is a stable and measurable construct, "attention" is not. While there is primarily one type of "inattention," there are, in fact, many different types of "attention," each of which work in entirely different ways. This is a key reason why focusing on inattention rather than attention makes most sense. It is also important to understand where attention is oriented. When not oriented to the brand, such attention constitutes distraction (an area which MediaScience is currently conducting foundational research on).

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Link to literature here. Note that MediaScience regularly subjects its research to peer review and frequently features in academic journals. In fact, MediaScience CEO, Dr. Duane Varan, was recently ranked seventh globally in terms of the number of top tier publications in the advertising discipline (a ranking he shares with the Ehrenberg-Bass Institute's Dr. Byron Sharp).

ORGANIZATION'S ATTENTION OFFERING(S):

MediaScience provides custom research specifically tailored to their client's needs. This includes:

- Validation research—testing the validity and reliability of attention measures against best-in-class measures of attention.
- Content effects (including contextual transfer effects) associated with program content.
- Ad/format effects—evaluating ad campaigns and new ad formats relative to their propensity to attract attention.
- Platform effects—measuring for attention effects across both video and audio (and VR) across TV, CTV, desktop, tablets, mobile, print and other platforms.
- Situational effects—such as co-viewing, media multitasking and a variety of situation variables moderating attention.
- New scalable solutions using fitness trackers are currently in development.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static, games, AR/VR/metaverse, search, mobile.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration, demographics, psychographics, prior exposure to same creative and brand integrations.

Attention Measures of Media Context: Control of Variables

Attention value of creative, device context, brand penetration, demographics, psychographics, prior exposure to same creative and contextual transfer.

MEASUREMENT OF ATTENTION:

Methods

MediaScience measures real consumer reaction using a variety of methods dependent on the client's needs. Among these, EEG, galvanic skin response, heart rate, blink duration, response latency, facial expression analysis, survey, tactile response and eye tracking.

Methods to Measure/Predict Attention:

Eye tracking, facial coding, survey based attentiveness question by media vehicles, survey based ad recall (product category cue), survey based ad recall (unaided), survey based ad brand recognition (show logos including brands not shown), survey based ad liking, survey based post-only persuasion, survey based on showing ad in context with slider bar to indicate second by second attention, second by second self-report (e.g., slider), ethnography, brain measurements, electrocardiogram, electromyography, heart rate, galvanic skin response, facial expression analysis, blink rate/duration, response latency, tactile response, tuning duration/dwell time, tune during full play of video, nonscrolling/nonmovement of cursor, clickthrough, search within two minutes of exposure, website visit.

Means to Measure/Predict Attention:

Forced exposure, forced exposure to platform but choice of specific content (simulated natural exposure), natural exposure in laboratory, natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

MediaScience employs various proper eye tracking systems including infrared and goggle-based systems for TV, desktop, mobile, print and portable (i.e., stores).

Methods:

Eyes on-screen duration, number and duration of fixations, inferences of attention/interest from saccadic eye movements and analysis of areas of interest.

Positive and Negative Attention:

EEG hemispheric differences, facial expression analysis, dial testing, self-report. Blink duration is found to be related to attention to ads.

METHODS TO PREDICT ATTENTION:

MediaScience does not predict attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

There is a sequence to be considered. Viewability refers to the opportunity to see an ad. But just because the ad is visible (or heard) doesn't mean that people are paying attention to it. Attention is the automatic or controlled focusing of our limited cognitive resources to the ad. Essentially, this refers to whether the ad, when viewable, is actually noticed. Emotion is a device used to get attention and further engage a person when watching an ad. Engagement is the cognitive processing of the ad—essentially working to digest and understand its message. Distraction (or lack thereof) is the extent to which attention is oriented to the brand. Each of these are different stages in the overall processing of the ad.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative is very important; media type, specific content context, device and brand effect are important in driving attention to ads.

Attention and Emotion:

EEG, facial signals, galvanic skin response and self-reports are used for reporting happiness, surprise, disgust, confusion, laughter.

Reporting Additional Information:

Voluntary playback, like, clickthrough, skip, view completion rate, sex/age breakouts, respondent is regular user of platform measured (if forced exposure), alignment score between ad and context based on human content coding, attention to the contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions, awareness, dwell time, clickthrough, brand preference change, brand consideration change, first brand mention (saliency), ad likability, brand recognition, ad memory, message comprehension, response latency.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Sales effect, correlation with gold-standard EEG, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust. A *Journal of Advertising Research* article reports that MediaScience's measures are more reliable in predicting sales (based on single source data) than traditional survey measures.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

MediaScience has developed AI-based software for post-session analysis of viewer blinking behavior. It does not use AI tools, however, to predict attention.

Commercial Arrangements:

Custom/bespoke and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Random control trial, multiple regression analysis and correlation were used on under 200, 600-1,000 and 1,001-5,000 sample sizes.

MediaScience published a study exploring the relationship between heart rate and sales impact with a sample of over 1,200 subjects. Another study was published comparing almost all measures of attention from the published literature in the media/advertising context with a sample of over 800 subjects. Additionally, MediaScience conducted numerous studies with samples of less than 200 subjects. Notably, these are neuro studies—so the sample sizes are considered large for this type of research.

Organization's Utilization of Third-Party Data:

MediaScience does not utilize third-party data.

Organization's Utilization of Human Subjects:

MediaScience uses human subjects through neuro, biometric, face-to-face surveys, telephone surveys, mailed surveys, qualitative, online surveys, in-depth interviews and online panels.

Delivery of Results to Clients:

Results are reported within six weeks in the form of scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API and/or custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

MediaScience does not share data through third-party workflow systems.

*MediaScience submitted the following documents: validation studies #1, #2, #3 and technical papers #1, #2.

MESH EXPERIENCE*

ORGANIZATION'S PROFILE:

MESH Experience was founded in 2006 and is a privately-owned, free-standing company operating in the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe and the rest of Asia.

Attention was not part of the original purpose and focus of the company at its founding. The original purpose of the company was to help marketers make better investment decisions through understanding the whole customer experience (everything from the TV ad to the experience in store or seeing someone consuming the product).

There are 10-24 researchers focused on attention measurement. All of the researchers are adept at traditional quantitative research, many of them have qualitative research, Python/R coding, stat package skills and/or are psychologists. Some of the researchers have data science skills.

The company also utilizes external resources for technical and academic support.

ORGANIZATION'S MISSION OF SERVICE:

In a world where marketing is transforming with a plethora of ways people interact with brands, measurement has become the burning platform. Share of Voice is "antiquated" (CMO Hisense). MESH Experience's mission is to bring a suite of enduring Experience Metrics (whether people move from TV to TikTok or mail to the metaverse, the notion of experiences is lasting), including Share of Experience, Experience Noticeability and Experience Quality, to help create and measure experiences that grow brands, people and society.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning, campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, search, games, apps, print, out of home, AR/VR/metaverse, every action that someone has with a brand—routinely capture 100+ touchpoints.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, restaurants, retail, travel, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

MESH Experience captures Experience Noticeability. These experiences are the paid, owned, earned, shared, retail (any brand interaction) that a participant records in a mobile diary. In order to record the experience, the participant must have paid some level of attention.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Harvard Business Review article on the Real-time Experience Tracking methodology, *Journal of Retailing*, award-winning case studies—these articles have analytics case studies using the data—they contain more than simply attention.

ORGANIZATION'S ATTENTION OFFERING(S):

MESH Experience works with clients like Delta Air Lines, LG Electronics and Fidelity International and has captured Experience Noticeability for over 15 years. Experience Metrics help to explain the outcome metrics and enable marketers to know where to focus their investment. The data is captured using a mobile diary platform. This method includes participants' reported experiences based on the premise that to report on an experience one must have paid attention to an object/feature/brand.

In 2023 MESH Experience is pivoting to launch a subscription product to clients to access valuable Experience Metrics in a cost-effective, tech-enabled way. These will include Share of Experience (correlated with Market Share), Experience Noticeability and Quality Experience (since it has been shown that a positive experience has three times more effect than a neutral one).

Measurement or Prediction of Attention:

Measurement.

Measurement of Types of Content:

Ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static, games, AR/VR/metaverse, search, every format or brand interaction.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration, demographics, psychographics, prior exposure to same creative and benchmarks.

Attention Measures of Media Context: Control of Variables

Attention value of creative, device context, brand penetration, demographics, psychographics, prior exposure to same creative and benchmarks.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction. Participants report their experiences in a mobile diary platform and report how engaging, persuasive and relevant each brand interaction is as well as describing

the experience and why it made them feel the way it did.

Methods to Measure/Predict Attention:

Participants are recording their experiences in real-time, in the real world through a mobile diary platform.

Means to Measure/Predict Attention:

Natural exposure "in the wild."

Eye Tracking Measurements:

MESH Experience does not use eye tracking measurements.

METHODS TO PREDICT ATTENTION:

MESH Experience does not predict attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Attention relates to whether someone noticed. Good viewability is likely to increase attention. MESH Experience has validated that for advertising, experiences need to be positive (before relevant or persuasive) but for owned experiences, relevance is most important. Engagement therefore likely increases attention with advertising. Certain emotions are more powerful than others in increasing attention.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context and targeting are considered very important; device and brand effect are considered important in driving attention to ads.

Attention and Emotion:

Self-reports and use of AI to evaluate comments. Reporting happiness, surprise, disgust, confusion, laughter, how did the experience make you feel—very negative to very positive.

Reporting Additional Information:

Voluntary playback, like, sex/age breakouts, customers/non, diversity, alignment score between ad and context based on AI semiotic analysis, attention to the contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions, awareness, brand preference change, brand consideration change, first brand mention (saliency), market share growth.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Sales effect, website visit, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

MESH Experience does not use machine learning and/or AI to model attention but does use AI in other parts of the methodology.

Commercial Arrangements:

Custom/bespoke, syndicated and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Multiple regression analysis and correlation. MESH Experience studies who has and who has not noticed the experience—metrics and validation were created in collaboration with Professor Hugh Wilson and Professor Emma Macdonald with whom MESH Experience has worked for 10+ years and received government grants and awards for U.K. innovation.

Organization's Utilization of Third-Party Data:

None.

Organization's Utilization of Human Subjects:

Diary platform, qualitative, online survey, online panels.

Delivery of Results to Clients:

Reported on ongoing basis as attention may change due to wear-in or wear-out. Reported by scores, recommendations, reports, consultation, indices to norms and self-serve user interface.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

*MESH Experience submitted validation studies, technical appendix/methodology description and technical paper.

NIQ-BASES*

ORGANIZATION'S PROFILE:

The neuroscience business of NielsenIQ (NIQ) was founded in 2005. In 2020, it was merged into the BASES division of NIQ. It operates in the U.S., Canada, Australia, India, U.K., France, Germany, Italy, Spain, Mexico and Brazil. It is actively expanding more broadly in Asia.

Attention is one of several measures derived from EEG brain data and was part of the original purpose and focus of the company at its founding.

Roughly 50 employees are focused on neurological measurement (of which attention measurement is a part). Of the 50, about half are researchers, most of whom have backgrounds in quantitative survey research, data science, Python/R coding and stats. A half dozen of the researchers are neuroscientists.

The company also utilizes an external resource from UC Berkeley for scientific consulting.

ORGANIZATION'S MISSION OF SERVICE:

The neurological testing services of NIQ-BASES are primarily used to evaluate and optimize marketing materials before their deployment. The most common marketing stimuli tested are advertising (video/static/audio), point of sale materials (packaging, planograms, e-comm layouts) and product sensory testing.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative pre-testing.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

No future plans to offer media or post hoc campaign measurement.

Media Types Organization Operates in:

Linear television, connected television, digital content, terrestrial radio, streaming audio, apps, print and out of home.

Brand Types Organization is Experienced With:

Automotive, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Neuroscience tells us that attention is a set of biological and psychological processes that allow for mental prioritization of information above the background. Attention is not a uniform construct, comprising many specific phenomena, including sustained attention, orienting, tonic or phasic

arousal, top-down vs. bottom-up attention, conscious awareness vs. non-conscious attentional grab, etc. In combination, all these processes ensure that mental resources are focused on relevant and salient information. Attention is often necessary but not sufficient to motivate behavior. A comprehensive analysis of how consumers engage with information would be incomplete without considering emotion and memory in conjunction with attention.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

- https://www.annualreviews.org/doi/abs/10.1146/annurev.neuro.30.051606.094256
- https://psycnet.apa.org/record/1972-02073-001
- https://www.frontiersin.org/articles/10.3389/fncom.2020.00029/full
- https://www.pnas.org/doi/10.1073/pnas.1902286116
- https://journals.sagepub.com/doi/abs/10.1177/1534582303002002003
- https://www.sciencedirect.com/science/article/abs/pii/S1364661305003025
- https://www.sciencedirect.com/science/article/pii/S0896627318306305

ORGANIZATION'S ATTENTION OFFERING(S):

NIQ-BASES uses a two-pronged simultaneous approach to measuring attention. First, sustained attention and moment-to-moment shifts in attentional focus are measured via EEG through a combination of a power decrease in the alpha frequency band with concomitant fronto-central power increases in the beta frequency band. Second, NIQ-BASES employs eye tracking to understand stimulus elements that prompt these attentional shifts. Although eye tracking is used to explain attentional indices observed from the brain, NIQ-BASES is careful not to equate eye tracking with attention as consumers can have attentional lapses even when they are looking at a stimulus or, inversely, consumers can attend to information they are not directly looking at.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Ads and other marketing material.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static, programming.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, demographics.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction through direct brain measurement (EEG).

Methods to Measure/Predict Attention:

Eye tracking and brain measurement.

Means to Measure/Predict Attention:

Forced exposure.

Eye Tracking Measurements:

Tools:

Camera on laptop/desktop computer, camera in TV viewing area (not webcam, uses Tobii trackers).

Methods:

Eyes on-screen duration, number and duration of fixations, inferences of attention/interest from saccadic eye movements, aggregate heat map.

Positive and Negative Attention:

NIQ-BASES finds that negative and positive attention cannot be discerned through eye tracking. One may fixate on something due to interest, due to confusion or due to daydreaming. NIQ-BASES uses attention as measured by EEG and differentiate positive and negative attention by referencing other brain signals like memory activation and emotional motivation. If EEG attention is high, but memory activation and emotion are low, it signals confusion. If EEG attention is high and memory and emotion are also high, that signals a very positive attention. When attention is low, but emotion and memory are high, it signals "low attention processing" or "flow" in which the brain doesn't need to work hard to take in what's being communicated.

METHODS TO PREDICT ATTENTION:

NIQ-BASES does not predict attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

NIQ-BASES uses a forced-exposure pre-testing technique, so there is no data on viewability. They measure attention to ads and the emotional response to those ads through EEG. Within the brain, these are two separate systems. Accordingly, NIQ-BASES sees almost no correlation between brain measures of attention and emotion. In their experience, attention can be either good or bad. Sometimes the brain focuses attention on something because it is interesting (good). Other times, the brain focuses attention on something because it is confusing or hard to understand. Many marketers think "Attention = Good." Brain data says this is not true. Attention can be good or bad. By itself, you cannot tell the difference. It is only by referring to other metrics that you can tell if it is good attention or bad attention.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context, device are considered very important; targeting and brand effect are considered important in driving attention to ads.

Attention and Emotion:

NIQ-BASES uses EEG to measure emotions such as approach vs. avoidance. They abandoned facial signals due to a poor correlation with sales data.

Reporting Additional Information:

None.

Prediction/Forecast of Additional Measures:

Other quantitative metrics are related to sales/conversions.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

NIQ-BASES has found that EEG attention is predictive of channel switching and Twitter tweets when watching TV programs and have found that EEG attention by itself is not strongly correlated with sales.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

None.

Commercial Arrangements:

Custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

NIQ-BASES conducted a tightly controlled experiment where respondents were pre-recruited to watch an episode of a TV program they normally watch. NIQ-BASES looked at how EEG measures correlated with both channel switching data from Nielsen Media and Twitter comments during those programs (from Twitter).

Organization's Utilization of Third-Party Data:

Sales data, Nielsen Media data, Twitter data and awareness tracking data.

Organization's Utilization of Human Subjects:

Online surveys and neuro. In-home panel N=500 in U.S. equipped with EEG, eye tracking and PCs.

Delivery of Results to Clients:

Results are normally delivered within two weeks through scores, recommendations, reports, consultation, database comparisons and custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

*NIQ-BASES submitted a technical paper.

OMNICOM MEDIA GROUP

ORGANIZATION'S PROFILE:

Omnicom Media Group (OMG), founded in 1986, operates in the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe, Africa and rest of Asia.

Attention was not part of the original purpose and focus of the company at its founding. It is only part of OMG's offering.

There are 10-25 employees in a unit focused on attention measurement. Most of these researchers working on attention hold data science skills. Some hold qualitative and traditional quantitative skills. Some are Python/R coders, psychologists and hold stat package skill sets. None are neuroscientists.

OMG also uses external advisors and consultants for technical, statistical, project management, coding and analysis services.

ORGANIZATION'S MISSION OF SERVICE:

OMG's approach is built around defining an attention requirement for a given campaign, brief or creative and then aligning the different attention metrics to that requirement.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, streaming audio, apps, out of home and influencer attention.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

OMG takes a wide and inclusive view of attention as a proxy measurement of different positive outcomes across engagement, visual gaze and time on screen, etc.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

OMG is gathering materials to share.

ORGANIZATION'S ATTENTION OFFERING(S):

OMG is using attention data from various vendors to calculate the required attention needed to change specific campaign KPIs. The requirement is tailored to the opportunities across different KPIs and how those interact across the client's unique goals and their brand, company and industry. The attention required is then incorporated into the planning and buying phase with attention specific reach curves, optimized across channels.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Ads.

Measurement/Prediction of Types of Formats:

TV/video, audio, print, display/static and cinema.

Attention Measures of Creatives: Control of Variables

In development.

Attention Measures of Media Context: Control of Variables

Attention values of creative, demographics and prior exposure to same creative.

MEASUREMENT OF ATTENTION:

Methods:

1. Measure real consumer reaction: gaze tracking, facial emotion analysis, EEG, etc.
2. Digital KPI proxy for consumer reaction: through time on-screen, scroll speed, etc.

Methods to Measure/Predict Attention:

Eye tracking, facial coding, survey-based ad recall (product category cue), survey-based ad recall (unaided), survey-based ad brand recognition (show logos including brands not shown), galvanic skin response, tuning duration/dwell time, tune during full play of video, clickthrough and other biometrics.

Means to Measure/Predict Attention:

All the measurements of attention may be included in a model which then predicts attention. The means to measure attention range from passively measuring attention through panels to forced exposure, forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure in laboratory and natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

Forward camera on smartphone, camera on laptop/desktop computer, camera in TV viewing area, via measurement partners.

Methods:

Eye on-screen duration, number and duration of fixations.

Positive and Negative Attention:

OMG differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ads (one form of negative attention). OMG only measures positive attention.

If eyes are closed, treatment depends on the partner with whom the measurement is conducted.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Attention requirements are built on top of viewability, i.e., there cannot be meaningful attention without viewability. Different levels of attention then enable different forms of engagement and emotional response. These relationships differ by channel; for example, an emotional response is unlikely in search, but very possible in cinema. This is partly because cinema can deliver extended duration of attention with high engagement.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Media type is very important in driving attention to ads. Creative, specific content context and brand effect are important; device and targeting are somewhat unimportant in driving attention to ads.

Attention and Emotion:

OMG does not report on emotion.

Reporting Additional Information:

OMG also reports on other demographics.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, website search, clickthrough, completion of viewing video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

OMG is not an attention measurement company and thus relies upon those companies to provide the measurement of attention. Some of which may be panel measurements, AI/ML predicted attention or some combination of the two.

Commercial Arrangements:

Custom/bespoke, syndicated and industry cooperation.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Studies conducted on 200-599; 600-1,000; 1,001-5,000; 5,001-10,000 through random control trial. This depends on the partner with whom the study is conducted.

Organization's Utilization of Third-Party Data:

OMG accesses or utilizes the following types of third-party data: attention data for television sets, demographic data, ad occurrence data, set top box data, smart TV data, streaming server data, VOD server data, content coding data, other metadata and consumers segments.

Organization's Utilization of Human Subjects:

OMG uses human subjects in online panels.

Delivery of Results to Clients:

Delivery of results depends on the partner with whom the measurement is done. Results are delivered through scores, recommendations, reports, consultation, indices to norms and custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

OMG does not offer their data through third party workflow systems.

PLAYGROUND XYZ*

ORGANIZATION'S PROFILE:

Playground XYZ, founded in 2015, is a privately owned part of a larger corporate structure that operates in the U.S., Canada, Australia/New Zealand, Latin America, Europe, rest of Asia, England, Scotland, Wales and Ireland. Their technology is scalable globally, so they can work with clients in any region. For the next 12 months, their sales efforts will be focused on clients based in these regions, but they can also run their products outside of them.

Attention was part of the original purpose and focus of the company at its founding.

There are 50-99 employees in the unit focused on attention measurement and/or optimization. Between 10 and 24 of these employees are researchers working on attention, all of whom have stat package skill sets. Most of whom hold data science, traditional quantitative skills and are Python/R coders or similar. Some are qualitative, neuroscientists and psychologists.

ORGANIZATION'S MISSION OF SERVICE:

To provide a global, scalable attention measurement and optimization platform to increase the effectiveness of brand advertising.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning, campaign post hoc measurement and live, real-time campaign measurement.

Media Types Organization Operates in:

Digital programmatic, social media and YouTube.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel and food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention Time: The duration, in seconds, that the consumer directly looks at an advertisement.

Key Academic or Journal References and/or Organization's Research That Supports This Definition:

Whether quoting literature from psychology, neuroscience or advertising, there is a consensus that attention is required for successful advertising. Playground XYZ acknowledges that attention is a broad topic and encompasses numerous factors. However, their approach, and therefore their definition, promotes the importance of visual attention concerning consumer behavior. Visual attention is strongly related to consumer behavior.

References:

Bhatnagar, R., & Orquin, J. L. (2022). A meta-analysis on the effect of visual attention on choice. *Journal of Experimental Psychology: General, 151*(10), 2265–2283.

Playground XYZ's first whitepaper adds to the literature that supports visual attention as an insight into consumer/brand relationships—case studies.

ORGANIZATION'S ATTENTION OFFERING(S):

The Attention Intelligence Platform (AIP) combines eye tracking and AI. This allows them to offer their clients a predictive attention model to be used at scale. Their product offering centers around the attention measurement and optimization of live advertising campaigns.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, display/static, social and rich media.

Attention Measures of Creatives: Control of Variables

Media type context, media content context and device context.

Attention Measures of Media Context: Control of Variables

Device context.

MEASUREMENT OF ATTENTION:

1. Measure real consumer reaction: The Playground XYZ attention measurement process involves four essential steps. First, they collect data through eye tracking panels. They employ digital workers who agree to allow them to capture facial images while they read media. Those facial images are fed through an on-device, machine-learning based, eye tracking algorithm that identifies the gaze fixation points every 100ms (or less) of the session. Next, they overlay those gaze fixation points with data about the ad position on their screen to determine the gaze duration for each ad to which the digital worker is exposed. The gaze duration measurement becomes the target variable for their attention model. Finally, they collect additional data points during the eye tracking session to power the attention model. These additional data points form the current 40 features the model uses and fall into two categories: environmental and behavioral.

   The environmental variables describe the page and other factors of how the panelist consumes the media. Examples include the platform it is being viewed on (mobile, desktop),

the type/size of the ad (banner, mrec, image, carousel, video, etc.), time of day of the browsing session, content types and more.

The behavioral data is collected through a continuous event stream that captures the panelists' interaction with the page (called above the "geometry of motion"). Examples include panelist scrolling, clicking and navigation behavior, how they move through the page over time and more. This underlying event stream is aggregated to create behavioral features that describe the entire session. Playground XYZ collects 40 features/data points from these two categories. Each adds incrementally to the model's accuracy, and a tremendous amount of engineering effort goes into extracting these features. Their feature importance models show that no single feature represents more than 20% of the weight of the predictive model.

2. Digital KPI proxy for consumer reaction: Building an attention model from the eye tracking data. All the features (environmental and behavioral) are collated into one record per ad exposure that they use to train a model that predicts the observed gaze duration from the eye tracking study. The machine learning algorithms they use are ensembles of tree models. This means they generate large numbers of independent tree structures and then combine these trees to produce their final prediction. This machine learning technique has a well-documented history of providing state-of-the-art performance on datasets with the properties of their attention data (nondeterministic target variable and heterogeneous input data). They regularly retrain their models as they collect new panel data, onboard new ad formats and develop new features. As such, the internal structure of the model changes over time. They manage that change by performing thorough evaluations of the model's performance.

3. Evaluating & Refining the Model for Business Critical Performance: Critical to developing the attention model is Playground XYZ's method to evaluate its performance. The evaluation method informs their decisions about adding and removing features and changes they can make to improve performance. They use the following critical criteria to evaluate their models: Evaluating fresh hold-out data (data the model did not use in training), ensuring they have a clean separation of high and low attention impressions, ensuring they obtain unbiased estimates of mean attention for specific ad formats and platforms. The first criterion is best practice in predictive modeling. It means they obtain metrics reflecting actual performance on new data when evaluating. The second two criteria relate to how their clients will use their models. Their clients need to know whether they can effectively identify a block of high or low-performing inventory and report meaningful attention metrics for reliable campaigns and creatives. They use two methods to evaluate and compare models for these criteria: 1) Mean Attention Decile Plots which illustrate the extent to which the model has ranked the impressions by attention, and 2) ad format + platform breakdowns. They analyze the performance of their test data by breaking it into ad format and platform-specific groups. They then look at the decile plots again, which demonstrates that they can make the same discrimination on specific types of campaigns. For example, their average attention time predictions for an MREC has a mean accuracy of 94% based on the hold-out data set from their latest analysis. 3) Playground XYZ deploys that model into a tag-based measurement solution. To use the attention model at scale for measuring attention across campaigns, they developed an Attention Measurement Tag (AMT) that collects the same behavioral and context data as in the eye tracking panel from step 1. This tag is attached to a campaign,

and that will return a raw event stream of user behavior to their logging systems. The data collected is then aggregated in the same way used for model development, so they have an identically structured set of features that they feed into the model. The aggregated event data is then scored with the attention model to produce reports and visualizations presented to users through the Attention Intelligence platform. The upshot of this entire process is that the Attention Intelligence Platform can accurately measure attention time and impression level. This helps to understand the nuanced differences of features like channel, etc., but also, importantly, different creative executions, targeting strategies, URLs and much more. This provides the agency with a much deeper and more exciting set of data on which to build their attention products.

Methods to Measure/Predict Attention:

Eye tracking.

Means to Measure/Predict Attention:

Natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

Forward camera on a smartphone, camera on laptop/desktop computer and camera on tablet.

Methods:

Eye on-screen duration, number and duration of fixations.

Positive and Negative Attention:

Playground XYZ does not differentiate between attention directed toward an ad (positive attention) and attention focused on skipping/avoiding an ad (one form of negative attention).

If eyes are closed this will be read as inattention.

METHODS TO PREDICT ATTENTION:

While Playground XYZ is in the market of building models in order to predict attention, all modeling is based on **real, human-based, attention data** (collected via eye tracking). To-date, they have collected eye tracking data for over 50,000 individuals in order to understand attention. It is this data that they use as the ground truth to validate the predictions made by their models.

Playground XYZ uses approximately 40 unique signals to predict attention. These signals are categorized as either environmental or behavioral. Environmental signals include, but are not limited to, viewability, duration of exposure, context norms, ad unit norms and placement on page norms, while behavioral signals include scrolling speed, ad position in viewport as well as video interactions such as play/pauses and mute/unmute.

Calibration Method by Which Algorithm was Developed to Predict Attention:

Playground XYZ has an explicit two-step process to create their predictive models: Firstly, they collect large volumes of eye tracking data along with all the signals mentioned above (both environmental and behavioral signals). In the second stage, they build a model to predict the attention measured by their eye tracking panels. In this way, their attention predictions are calibrated by the machine learning model being exposed to both raw eye tracking as well as the predictive signals. They use the same eye tracking methodology across platforms and media types to ensure their attention measurement models are calibrated across all environments. They follow explicit machine learning best practices to strictly evaluate model performance using data the model wasn't trained on.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Viewability is merely the presence of an advertisement within the viewport (i.e., the ability of something to be seen), while attention is the process of focus being directed towards the ad. Attention is the driver of subsequent engagement (i.e., without attention, an ad cannot be engaged with), and emotion heightens attentional processing.

Organization's Perspective on the Importance of Elements That Drive Attention to Ads:

The general pattern of importance is as follows (from most important to least important): Creative > Device > Media Type > Context/Targeting.

Attention and Emotion:

Playground XYZ does not report on emotion.

Reporting Additional Information:

Playground XYZ also reports on voluntary playbacks, like, clickthrough, skip, view completion rate, open end verbatims linked to attention graphs, alignment score between ad and context based on human content-coding, alignment score between ad and context based on AI semantic analysis and attention to contexts themselves.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, clickthrough, completion of viewing video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Playground XYZ uses machine learning. To measure attention, time eye tracking data has been

recorded from over 50,000 consumers across mobile, tablet and desktop devices. ML and AI methodologies are subsequently implemented to process the raw eye tracking data and predict attention times.

Data AI/ML Models Based/Trained on:

Playground XYZ collects data using digital panels in which users consume media using their devices while their eyes are tracked. Playground XYZ developed the application for this process, and this allowed them to run international panels and collect data about various ad formats across a range of digital channels. The result is a ground truth data set of attention measurement for different ad formats in natural media environments.

Commercial Arrangements:

Usage-based pricing of their products on a Cost Per Thousand of ad impressions (CPM) or Data as a Service Subscription.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Playground XYZ runs numerous validation/calibration studies. Depending on the commissioned study, Playground XYZ utilizes a combination of random control trials and synthetic control groups. When studies are conducted with clients, they recommend the use of large-scale randomized control trials.

Their in-house brand studies with exposure/non-exposure and follow up survey are generally ~300 people per study (150 control/150 exposed). When they do studies with clients using the attention measurement tag these generally utilize samples >10,000.

Organization's Utilization of Third-Party Data:

Playground XYZ accesses or utilizes third-party data through Scope 3 emissions data.

Organization's Utilization of Human Subjects:

Playground XYZ uses human subjects in the following ways: qualitative, online survey, online panels and eye tracking.

Delivery of Results to Clients:

Once a campaign is live, results are delivered to clients in real-time. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API and impression level. In addition, log level data can be shared on request.

Organization's Share of Data Through Third-Party Workflow Systems:

Playground XYZ shares data through Display & Video 360 (DV360), CM360, MediaMath, Xandr, Yahoo!, Amobee, The Trade Desk, Pubmatic, Flashtalking, Adobe, GumGum and Quantcast.

*Playground XYZ submitted validation studies, technical appendix/methodology description, technical paper and client list.

REALEYES*

ORGANIZATION'S PROFILE:

Realeyes was founded in 2010 and is a privately-owned, free standing company operating in over 80 countries including the U.S., Canada, Australia/New Zealand, China, India, Latin America, Europe, Africa and the rest of Asia.

Attention and emotion were the original purpose and focus of the company at its founding.

There are 50-99 employees focused on attention measurement and 25-49 of whom are technical, including data scientists adept at traditional quantitative research, (i.e., Python/R, stat packages), as well as professionals in computer engineering, data engineering and product management. Many are neuroscientists and psychologists, and some have qualitative research skills.

The company also uses external resources for marketing, panel exchanges and annotation services for AI training.

ORGANIZATION'S MISSION OF SERVICE:

Realeyes' PreView platform delivers quality, simplicity and value to advertisers seeking to understand and improve performance through visual attention metrics. PreView reveals the ability of a creative asset to: (1) break through and capture attention within any live digital media environment; (2) drive reactions, including sustained attention and emotional response; (3) impact brand equity, including brand recognition and ad recall. PreView is built on the most advanced facial coding technology and machine learning. That includes 20 patents and 19 pending in attention and emotion AI, including U.S. patent 10,194,213 for its "computer-implemented system and method for determining attentiveness of users."

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Measurement for creative and media/media planning.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Campaign live and post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, streaming audio, apps.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage, nonprofits.

ORGANIZATION'S DEFINITION OF ATTENTION:

Awareness to a stimulus while ignoring other stimuli.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Realeyes' definitions and methodologies are influenced by its technical and academic advisory board members: Jeffrey Cohen, University of Pittsburgh and Carnegie Mellon University, Realeyes academic advisory board member.

Maja Pantic, Professor of Affective and Behavioural Computing at Imperial College London, and at the University of Twente; Data Science at Meta, Realeyes academic advisory board member.

Also, for benefit of this ARF validation initiative, Realeyes points to the recent master thesis on attention metrics, by Kenan Buhic.

ORGANIZATION'S ATTENTION OFFERING(S):

PreView: Task-based visual attention measurement. Attention to visual stimuli is measured by detecting when viewers have their eyes on-screen while a stimulus of interest is presented to them. This allows their measurement to report how much concentrated awareness is spent towards the stimulus in view (attention), and how much is diverted to stimuli in the viewer's environment (distraction). In addition, they also measure facial expressions when attention is on, allowing them to probe into increased states of cognitive investment into the visual stimuli to which viewers are exposed.

Realeyes Experience Platform for Marketing: Realeyes' core computer vision tech is now available via SDK for integration into any app, enabling live-in-the-wild attention and emotional reaction detection. The technology enables continuous passive measurement with optimized battery consumption and data privacy controls.

Measurement or Prediction of Attention:

Measurement of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, display/static, AR/VR/metaverse. Audio is not primary, but sound on/off and sound a/b testing with video is very common.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration, demographics, psychographics.

Attention Measures of Media Context: Control of Variables

Attention value of creative, device context, brand penetration, demographics, psychographics.

MEASUREMENT OF ATTENTION:

Methods

1. Measure real consumer reaction: eyes on-screen visual attention and emotional reactions via computer vision technology
2. Digital KPI proxy for consumer reaction: primary eyes on-screen metrics are complemented by environment/media contextual interaction metrics, achieved through a close integration partnership with Eye Square.

Methods to Measure/Predict Attention:

Facial coding, survey-based attentiveness questions by media vehicles, survey-based ad recall (product category cue), survey-based ad recall (unaided), survey-based ad brand recognition (show logos including brands not shown), survey-based ad liking, tuning duration/dwell time, tune during full play of video, nonscrolling/nonmovement of cursor, website visit, online sales, offline sales; validate and fortify metrics with as much business outcome data as possible.

Means to Measure/Predict Attention:

Forced exposure, forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure "in the wild."

Eye Tracking Measurements:

Tools:

Forward camera on smartphone/tablet/laptop/desktop computer—tracking eyes on-screen attention and emotion reactions via computer vision tech (not mapping eye movements).

Methods:

Facial coding; eye on-screen duration, number and duration of fixations.

Positive and Negative Attention:

Realeyes quantifies attention duration when eyes are on-screen and the ad considered is in-view. At first, this signal comprises both positive and negative attention. The two signals are then separated into positive and negative attention by subtracting the seconds that led to an exit event as follows. When an impression can be set out-of-view by the viewer, Realeyes counts the seconds of attention directly leading to a skip, scroll or swipe as negative attention. When an impression is in forced view and a skip is made in the second when the ad can be exited, the entire forced view time counts as negative attention. This differentiation is made for video ads. Please note that at any second, Realeyes also quantifies if viewers are distracted, i.e. if they do not have eyes on-screen when the ad is playing. Therefore, combining negative attention and distraction gives a deeper insight into the efficiency of viewable seconds at yielding attention. Eyes closed reads as inattention, however, this does not apply to blinks.

METHODS TO PREDICT ATTENTION:

Realeyes does not predict attention. (Creative attention predictions tools coming in 2024).

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Viewability of stimuli (or equivalent for audio or other stimuli) is necessary for attention to those stimuli. Viewability is important, though it is subject to gaming and perverse incentives. Attention is also considered an outcome by many as a stage in customer behavior funnels or buyer journeys. At Realeyes, visual attentiveness is a form of engagement, and Realeyes fortifies its understanding of attention with emotional reactions.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media (type and specific content context), audience and device are considered very important; brand equity also is considered important in driving attention to ads.

Attention and Emotion:

Realeyes uses facial signals to detect these emotions: happiness, surprise, disgust, confusion, laughter and contempt.

Reporting Additional Information:

Voluntary playback, like, clickthrough, skip, view completion rate, sex/age breakouts, respondent is regular user of platform measured (if forced exposure), alignment score between ad and context based on human context coding/AI semantic analysis/AI semiotic analysis, attention to the contexts themselves.

Prediction/Forecast of Additional Measures:

Reported interest in the ad seen.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Sales effect, website visit, clickthrough, completion of viewing video ad, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand trust and social engagements.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Realeyes uses deep neural networks that it developed and trained with state-of-the-art computer vision techniques. These models achieve near-instantaneous recognition of human presence, face presence, head pose angles, eyes on-screen visual attention and facial expressions. These neural networks can run in the cloud or directly on-device, and are used to measure attention and facial reactions within any digital context on any device with a front-facing camera. Realeyes' core

attention and emotion AI also is available via SDK for integration into any digital application or service, outside of advertising. Facial expressions include signs of happiness, confusion, disgust, surprise, contempt, fear and empathy. Realeyes' core computer vision tech was validated by Google's Advanced Measurement Team. Realeyes also uses tech to remove duplicate, fraudulent and mislabeled panel participants (which can impact up to 50% of sample participants from even the most elite panel providers).

Commercial Arrangements:

Standard unit pricing, subscription and custom/bespoke.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Random control trial, holdout group, multiple regression analysis and correlation studies have all been used, with sample sizes ranging from over 1,000 to over 10,000.

Realeyes conducts thousands of task-based studies every year and has several dozen validations. One prominent study is with Mars Inc., which was an ARF AUDIENCExSCIENCE winning entry in 2023. Their creative attention data were found to achieve 75% accuracy in projecting sales outcomes. Those creative attention data in practice drove up to 18% sales lift in 19 markets in one year, with $30 million in ad optimizations. Another prominent validation of the attention data involves a major environmental study with Meta and Bill Harvey, where the team found that different attention qualities, inherent with different mobile platform environments, yield different levels of brand recognition and ad recall. Working with Teads, Realeyes learned that at a 5% increase in creative attention data can result in 40% increase in brand lift. Working with a large consumer tech company and retailer, Realeyes learned that creative attention could predict 80% of the retailer's on-site shopping conversions.

Organization's Utilization of Third-Party Data:

Realeyes uses third-party data for demographics, sales data, consumer segments and other metadata.

Organization's Utilization of Human Subjects:

Realeyes uses online surveys and panels, biometric and neuro data, and computer/device interaction data, in both forced-exposure data collection and live-"in the wild" measurement.

Delivery of Results to Clients:

Results are normally delivered within 48 hours through scores, recommendations, reports, indices to norms, self-serve user interface and API.

Organization's Share of Data Through Third-Party Workflow Systems:

Realeyes has an API of which various research companies have used for their core attention and facial coding tech for task-based studies, including: IPSOS, MarketCast, MetrixLab, NRG, Triangulum and more. Realeyes is beginning to license data to other attention metrics providers (many inevitably in this validation review) as ground truth—so they can fortify their metrics with high-fidelity human attention data. Realeyes has announced partnerships with TVision and

Adelaide. Mars Inc. built its own attention product on top of the Realeyes measurement system, which it syndicates from corporate to all regional businesses and brands. Realeyes also has several data licensing relationships with large tech platforms and other companies in VR/AR and computer vision.

*Realeyes submitted the following documents: validation studies, technical appendix/methodology description, technical paper #1, technical paper #2.

Case studies: https://www.realeyesit.com/resources/case-studies/

RMT*

ORGANIZATION'S PROFILE:

RMT (Research Measurement Technologies), founded in 2014, is a privately-owned, free-standing science and technology development company, that operates in the U.S. and Canada. It is planning to expand further into all other markets.

Attention was a small part of the original purpose and focus of the company at its founding, being only an interim measure of advertising success. RMT's purpose is to increase advertising effectiveness, as primarily measured by increases in incremental sales per dollar invested, with brand equity measures of high secondary importance. RMT's main use cases to achieve these increases are optimizing context effects, motivational resonance between the specific ad and the specific individual reached and advertising communication strategy and execution guided by motivational insight into target segments.

There is one employee in the unit focused on attention measurement. This employee is a researcher working on attention, primarily for the purpose of creating a "cocktail" of sales-predictive measures which can be used in media selection, and includes attention, RMT context, RMT motivation resonance and any other sales-predictive measures (e.g., EKG, CSR, etc.) which can be taken "in the wild." This researcher holds data science, qualitative, traditional quantitative and psychological skill sets.

RMT also uses external advisors and consultants for science, software, marketing, technical, statistical and corporate/product strategy services.

ORGANIZATION'S MISSION OF SERVICE:

RMT exists to provide a taxonomy of empirically derived and validated psychological content codes which can be applied not only to content but also to people. When an ad is aligned (based on these codes) with a person, that person is more likely to notice it, give it attention, receive communication, be persuaded and/or buy the advertised product. This effect is increased when the ad and context are also aligned based on these codes.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative development, media/media planning, specific media vehicle selection, specific addressable audience target selection. (Campaign post hoc measurement is always supplied via highest quality third-party research companies and/or ARF).

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

1. Partnership announced in July 2023 with Amplified Intelligence by which programmatic buys will be enhanced by the combination of the Amplified Intelligence attention technology and the RMT/Semasio full funnel predictive technology.

2. Training of advanced AIs to increase sensitivity to human feelings.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, digital content, AVOD/FAST, SVOD, social media, terrestrial radio, streaming audio, games, apps, print, out of home, AR/VR/metaverse, direct mail.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage, beer, wine and spirits, hospitality, home and garden, pharmaceutical, ecommerce, telecommunications, energy.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention is the degree of focus by a person on specific stimuli. RMT understands that before there is conscious attention, there is noticing ("apperception") and that noticing is controlled by subconscious motivations (also called "goals" in the literature). Attention is not a sufficient condition for advertising success but in most cases, it is a necessary precondition (Gallup & Robinson found that ad recall levels of non-viewers present in the room with a TV commercial equal 25% of ad recall among those who self-categorize as viewers).

Key Academic or Journal References and/or Organization's Research That Support This Definition:

- Wayne Wu, *Attention: New Problems in Philosophy*
- https://www.rmt.solutions/arf-on-contexts/

ORGANIZATION'S ATTENTION OFFERING(S):

RMT's product suite consists mainly of (1) with AI partner Semasio, 300 million U.S. and 16 million Canadian IDs categorized by their 15 RMT Motivations, so that people can be targeted by ads based on knowing the RMT classifiers in the ad, and (2) media vehicles coded by their 265 DriverTags (which cluster into 86 Need States and 15 Motivations) so that ads (similarly classified by RMT) can optimize their media selection including the context alignment factor. Both of the main RMT products are designed to maximize all valid measures of advertising effectiveness, not solely attention. However, attention is the current industry focus, and for example, clean attention measures of creative vs. context require controlling for the alignment effect, for which RMT is ideally suited.

Measurement or Prediction of Attention:

Prediction of attention, as well as all other funnel measures including incremental sales and brand equity metrics.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, display/static, walled gardens (Facebook/Instagram, Twitter, YouTube, Snap, Reddit, TikTok, LinkedIn), apps, games, AR/VR/metaverse, cinema, print and digital out of home.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, psychographics, prior exposure to same creative have been used in third-party studies of RMT's increase of business outcomes including those related to attention (ad recall, brand awareness, first brand mention, etc.).

Attention Measures of Media Context: Control of Variables

Measurement of the context ability to amplify the ad is always specific to the single specific ad under study.

MEASUREMENT OF ATTENTION:

RMT is not in the business of measuring attention.

METHODS TO PREDICT ATTENTION:

RMT predicts all funnel measures and is most focused on predicting incremental sales increase. Two types of RMT measures have been validated to predict sales and other funnel metrics: (1) the resonance score between an ad and a context; (2) the resonance score between an ad and a person (ID). The third parties involved include the ARF Cognition Council, Nielsen NCS, Simmons, Neustar and 605.

Calibration Method by Which Algorithm was Developed to Predict Attention:

RMT considers its platform capable of predicting attention because it has been proven to predict sales, persuasion, brand perceptions, brand awareness and other outcome measures. The most complete predictive model based on RMT is the one based on the NCS study (sales), where the datapoints have been reduced to a sigmoid curve whose equation is known and published. The same could be done with attention but awaits a consolidation of what attention operationally means via the ARF Attention Initiative.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Viewability is a filtration (based on device level data) of Opportunity To See (OTS) in ad exposure level of the ARF Model; attention is the next level up in the ARF Model. Emotion occurs when a stimulus either positively or negatively reinforces a motivation, which can occur at any time after noticing occurs within the attention level of the ARF Model. Engagement is a term that has too many meanings. RMT considers that engagement occurs along with positive attention and is positively correlated with various device measures including cursor hovering, clickthrough, search, etc.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context, device, targeting and brand effect are all important in driving attention to ads.

Attention and Emotion:

Approximately 75 of the 265 RMT DriverTags are emotions/moods.

Reporting Additional Information:

RMT reports on the alignment score between a specific ad and specific contexts based on human content coding utilizing an empirically derived and third-party validated content coding taxonomy. RMT also reports on the alignment score between a specific ad and specific reachable privacy protected IDs based upon AI semantic and semiotic analysis.

Prediction/Forecast of Additional Measures:

Sales lift increase, other quantitative metric related to sales/conversions, awareness, brand preference change, brand consideration change, first brand mention (saliency), rating lift increase.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Sales effect, website visit, website search, clickthrough, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception, brand adoption and brand trust.

- https://www.rmt.solutions/sales-lift/
- https://www.rmt.solutions/branding-lift/
- https://www.rmt.solutions/media-village-report-of-neustar-validation/
- https://www.rmt.solutions/integration/
- https://www.mediavillage.com/article/arf-cognition-council-analysis-finds-rmt-creative-codes-explain-48-of-sales/
- https://www.rmt.solutions/brand-adoption-lift/

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

RMT used machine learning (ML) to empirically derive its taxonomy from every word in the English language, distilling the words that drive loyal viewership to television series down to the 265 DriverTags. RMT, through partner Semasio, uses AI to apply the rollup of these DriverTags to the 15 RMT Motivations in real-time to all ad-supported URLs and IDs in U.S. and Canada.

Commercial Arrangements:

Custom/bespoke and now also syndicated in Canada as an optional dataset within Vividata self-serve system.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

All RMT validation studies were performed by high-quality third-party research companies and involved intab sample sizes between 10,000 and 400,000. Methods used include random control trial, holdout group, synthetic control group and multiple regression analysis.

Organization's Utilization of Third-Party Data:

RMT uses high-quality third-party data for validations. Partner Semasio data used in advanced targeting are first-party data through the partnership.

Organization's Utilization of Human Subjects:

RMT does not use human subjects. RMT does use human content coders who achieve 89% coder replicability and the third-party validated results in reliably driving double digit sales and branding lifts.

Delivery of Results to Clients:

Context resonance and Motivation target results are normally delivered within 48 hours after receipt of link to the specific ad. Results are delivered through scores, recommendations, reports, consultation, indices to norms and in the case of Vividata, self-serve user interface.

Organization's Share of Data Through Third-Party Workflow Systems:

RMT Semasio targeting is integrated with Adelphic, Adform, Adobe Advertising Cloud, Adobe Audience Manager, Amazon, Adsquare, AdsWizz, Amobee, Dynata, Emerse, Google DV360, Kargo, LiveRamp, Lotame, Magnite, MediaMath, Neustar, Omnicom OMNI, PubMatic, Reset Digital, Salesforce, Sonobi, The Trade Desk, Throtle, Verizon Media/Yahoo and Xandr. RMT is also integrated with Vividata.

*RMT provided validation studies: #1, #2, #3, #4, #5, technical appendix/methodology description and a client list.

THE RATIONAL HEART*

ORGANIZATION'S PROFILE:

The Rational Heart (TRH), founded in 2019, is a privately held emotional measurement-focused company. They capture attention in the process of measuring emotions. TRH operates in the U.S., Canada, India, Europe and the rest of Asia. They plan to operate in another region depending on the client's needs.

Attention was not part of the original purpose and focus of the company at its founding. The original purpose was to develop and deploy a new method to measure emotional response.

There are 0–9 researchers in the unit focused on attention measurement, all of whom hold qualitative and traditional quantitative skills. Most have data science skills. Some have skill sets in stat packages.

The Rational Heart also uses external advisors and consultants for marketing, technical, statistical and coding services.

ORGANIZATION'S MISSION OF SERVICE:

The Rational Heart seeks to integrate emotion into marketing research's measurement and insights world, thereby improving the accuracy and predictive power of those research efforts. TRH incorporates advanced measurement and modeling techniques to assess this emotional response from respondent memory. They provide emotional measures that are consistent, actionable and affordable.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning and campaign post hoc measurement.

Media Types Organization Operates in:

The Rational Heart can operate on any given media type. Their approach relies on "emotional memory." So, for example, if one wants to determine the extent to which a given creative execution performs in addressable TV, games or print, one will expose respondents to the creative in that media platform and then use the TRH's measurement tool to see what emotions are generated from the exposure.

Brand Types Organization is experienced with:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, food/beverage, advertising, copytesting, market research/market intelligence, trade/business organization, pharmaceuticals, contract research organizations (CROs), non-profit/charitable organizations.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention reflects the degree to which any one emotion is felt relative to the other 140+ human emotions for a given stimulus object, event or condition. That is, emotional change reflects the impact of attention on consumer memory. TRH is not focused on measuring or modeling "attention" as it comes to a specific piece of creativity being seen in a media environment. Instead, they are focused on understanding emotional response as it is stored and associated in memory with the stimulus/brand.

At The Rational Heart, they do not measure attention directly. Instead, they measure the degree to which that attention is having the impact that publishers want it to have, which is to generate an emotional response to whatever stimulus is put before an audience. In the TRH view, attention is a necessary, but not automatically sufficient driver of action. An audience may have seen and attended to an ad, but if that ad did not also create an emotional memory, it will not have the desired impact. As such, TRH believes that their method should be a companion tool to most, if not all, of attention-based research efforts.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral cortex*, *10*(3), 295-307.

Binet, L., & Field, P. (2012). Advertising effectiveness: The long and short of it. London: IPA DataMine.

Ellis, C. (2019, January 30). *Why emotion plays a critical role in decision making*. The Drum.

Powers, T., Advincula, D., Austin, M. S., Graiko, S., & Snyder, J. (2012). Digital and social media in the purchase decision process: A special report from the Advertising Research Foundation. *Journal of Advertising Research*, *52*(4), 479-489.

ORGANIZATION'S ATTENTION OFFERING(S):

The Rational Heart does not measure/model "attention" viz. creativity being seen in a media environment; they look to measure the impact of attention on emotional memory. Their offerings focus on the emotional resonance of brands or stimuli rather than an attention metric. That is, they measure the effectiveness of attention in generating emotional response. TRH assesses that humans feel 6 to 10 emotions at a time when considering a stimulus, and they evaluate emotions with respect to their strength and intensity. In this manner, they provide an emotional profile for each stimulus, helping clients understand the emotional impact of the stimulus, such as the brand, product, experience or consumer decision-making process. They examine if there was an emotional impact that occurred for the brand because one saw a creative and check to see if the creative shifted the emotional valence of the brand.

Measurement or Prediction of Attention:

Measurement of attention through emotional response.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, audio, print. To date, they have measured emotional response in various formats. However, their method does not specifically measure an individual media type. Instead, they aim to measure the emotional impact of the creative.

Attention Measures of Creatives: Control of Variables

Historically, The Rational Heart has not controlled these effects. However, they believe there is no reason why these adjustments cannot be provided.

Attention Measures of Media Context: Control of Variables

Historically, The Rational Heart has not controlled these effects. However, they believe there is no reason why these adjustments cannot be provided.

MEASUREMENT OF ATTENTION:

Methods:

The Rational Heart both measures and models the emotional response of survey respondents.

Methods to Measure/Predict Attention:

The Rational Heart utilizes a combination of psycho-evolutionary theory, behavioral economics and Bayesian statistics to measure the strength and intensity of emotional response. This measurement, in turn, reflects attention through emotional response.

Means to Measure/Predict Attention:

Forced exposure.

Eye Tracking Measurements

The Rational Heart does not use eye tracking.

Positive and Negative Attention:

The Rational Heart does not differentiate between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

METHODS TO PREDICT ATTENTION:

The Rational Heart does not predict attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Since TRH is focused on dynamic response measurement, they measure the strength and intensity of feelings, reflecting attention by impacting respondent memory.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, targeting and brand effect are all very important in driving attention to ads. Media type and specific content context are important, while the device is somewhat unimportant.

Attention and Emotion:

The Rational Heart reports on emotion using the following methods. In approximately three minutes of survey time, using a combination of psycho-evolutionary theory, behavioral economics and Bayesian statistics, they measure or model over 140 different basic, complex and reciprocal emotions, as well as a handful of higher-order emotions. Also note: TRH captures and reports emotional memory, not "in-the-moment" emotion, such as neuro or facial emotional response.

TRH measures and models roughly 140 distinct emotions, including emotion strength and intensity.

Reporting Additional Information:

The Rational Heart reports on demographics but this depends on the survey experience and needed breaks on a custom basis.

Prediction/Forecast of Additional Measures:

Emotional response.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

The Rational Heart can read emotional responses among respondents that are in different phases of the sales funnel and understand the brand's emotional resonance among these groups. Additionally, they can model through driver analysis which emotions are drivers of specific outcomes/behaviors.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

The Rational Heart does not use machine learning or AI to model attention.

Commercial Arrangements:

Custom/bespoke. The Rational Heart works with research vendors and end clients to provide an in-depth measurement of emotional response.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Studies are conducted on 200-599 and 600-1,000 through random control trial, multiple regression analysis and correlation.

Organization's Utilization of Third-Party Data:

The Rational Heart does not access or utilize any type of third-party data.

Organization's Utilization of Human Subjects:

The Rational Heart uses human subjects in online surveys.

Delivery of Results to Clients:

This question does not apply since The Rational Heart works through custom/bespoke measurement. Their timelines are not based on standardized outputs/dashboards.

The Rational Heart delivers results through scores, recommendations, reports, consultation, self-serve user interface and custom algorithms.

Organization's Share of Data Through Third-Party Workflow Systems:

The Rational Heart does not share data through third party workflow systems.

*TRH submitted a technical appendix/methodology description.

TOBII

ORGANIZATION'S PROFILE:

Founded in 2001, Nasdaq Stockholm listed since 2015, with over 600 employees (1/3 of whom are R&D), Tobii is a world leader in eye tracking and attention computing.

More than 20 years ago, Tobii delivered the world's first remote eye tracker. Since then, they've been on a mission to build technology that understands human attention and intent—what they call attention computing.

ORGANIZATION'S MISSION OF SERVICE:

Tobii introduces two areas of attention: *Tobii ATTEX* (passive, always on and local) and *Tobii Enterprise* (active insights and creative testing products), each of which offers a unique range of attention solution services and insights, all based on panel-based attention data.

Tobii ATTEX is an attention data exchange designed to aggregate high-quality metrics collected through always on, local passive panelists equipped with Tobii's attention computing solutions horizontally across the ecosystem. Through an API, *Tobii ATTEX* delivers the data to help design innovative and scalable products to disrupt how media is bought, optimized and evaluated. Use cases would include but are not limited to: creation of bespoke attention algorithms, a CPM bidding, curated attention marketplaces, attention insights and/or custom client outcome solutions. This passively collected data is measured over time, to take into consideration long term behavior, changes to websites, seasonality, etc...

Tobii Enterprise offers behavioral insight services and solutions via active studies—meaning the users have been told what to view and when. It is a snapshot of attention in a given period of time, for a specific audience and product.

Tobii's world leading eye tracking allows their customers to see how their product is viewed from the perspective of the consumer. Test and compare packaging design alternatives or assess how it performs against a competitor lives at the heart of *Tobii Enterprise*.

In both instances, Tobii decodes head and eye movements, translating microscopic gestures into accurate gaze signals and generating insights to reveal what captures a person's attention and interpret intent.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Tobii Enterprise supports A/B creative testing as an active study via Sticky by Tobii.

Tobii ATTEX supports campaign tracking using their ground truth panel data + prediction on historical data.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Tobii is evaluating the opportunity to extend their platform support for passive data collection, in addition to richer data on the creative.

Media Types Organization Operates in:

Tobii ATTEX is a tag-less attention measurement solution. They track across digital programmatic, digital content and apps, including walled gardens. Specifically, desktop, tablet and mobile are Tobii's current core.

Additionally, *Tobii Enterprise* has gaming integrations via Twitch, VR/AR applications.

Brand Types Organization is Experienced With:

Tobii ATTEX is an attention data exchange that measures data horizontally across the eco-system, including the following: automotive, insurance, clothing and fashion, real estate, consumer electronics/technology, restaurants, CPG, retail, entertainment, travel, finance, food/beverage, health and wellness.

ORGANIZATION'S DEFINITION OF ATTENTION:

Attention should be measured as a ground truth. Tobii does not define ad attention or what length of fixation time is needed—they leave that to the media researchers and industry organizations to define. Instead, Tobii ensures that there is correct underlying fixation data available.

Tobii ATTEX uses world leading eye tracking technology to measure fixations and saccades (a rapid movement of the eye between fixation points) and fixation time on ads. They output all fixation info via their APIs.

Fixations = characterized by the action of concentrating the eyes directly on something, trigger a cognitive process within the brain.

Saccades = a saccade is a rapid, conjugate, eye movement that shifts the center of gaze from one part of the visual field to another. Saccades are mainly used for orienting gaze towards an object of interest.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

None provided at this time.

ORGANIZATION'S ATTENTION OFFERING(S):

Tobii offers two distinctively different services: *Tobii Enterprise*, active research studies & insights products, and *Tobii ATTEX*, **The Attention Data Exchange.**

Tobii ATTEX provides ground truth attention data horizontally across the ecosystem, for the enablement of their clients to build their own AI driven algorithms, custom measurement and targeting solutions, attention CPMs, attention curated marketplaces and custom data enhanced attention products and insights.

Tobii ATTEX is the passive always on and local panel which provides highest quality data segments on a granular level (demo, hostname, fixation and fixation time, ad type/size, brand, location, time, placement ID) over time. Passive panels are not told what to view, but they are aware that *Tobii*

ATTEX are measuring what they view. *Tobii ATTEX* see that over time the user behavior begins to level out and normal viewing patterns return. Hence the need for an always on approach for quality predictive models to be built on—always on measurement takes into consideration changing environment (website layout changes, new ad tech players, macro trends, brand perceptions that changes, campaigns that perform differently, etc.) because without this, there is only a snapshot of behavior frozen in time, not ground truth.

Innovation enablement is key for Tobii's customer to deliver for clients.

Measurement or Prediction of Attention:

Measurement of ground truth attention using eye trackers.

Measurement of Types of Content:

Tobii ATTEX measurements include display, social, search, pre-roll, outstream and native on desktop, mobile and tablet.

Measurement/Prediction of Types of Formats:

Display, video, native, pre-roll, outstream and native ad formats with the addition of OCR on the creative in desktop, mobile and tablet.

Attention Measures of Creatives: Control of Variables:

Tobii Enterprise does A/B testing on creative packages for advertisers to determine the highest attention creative and/or messaging for a campaign's particular outcome goal. Eye trackers and heat mapping are used to determine highest attention areas. Eye tracking enables assessment if key attributes are effectively communicated and measures other things like findability, brand recognition, shelf positioning and visual appeal. This can be done in isolation, against the client's alternatives or in direct comparison with their competitors' designs. Tobii's wearable eye tracker empowers their clients with quality behavioral data in any environment, whatever they're studying. Powerful first-person insights, in any context.

Attention Measures of Media Context: Control of Variables:

Per impression *Tobii ATTEX* measures, for example: ad format, channel, brand, host name, ad size, placement ID, fixation, fixation time, demographic, in screen, ad clutter, print screens, gaze points.

MEASUREMENT OF ATTENTION:

Methods:

Tobii ATTEX passively measures real-time, always on and local consumer reaction, based on local panel attention data.

Methods to Measure/Predict Attention:

Eye tracking.

Means to Measure/Predict Attention:

Tobii ATTEX measures attention without any dependencies on tag integrations, allowing

measurement of every single ad panel members are exposed to. This gives *Tobii ATTEX* a broader, more robust attention data set, as well as historical data to pull from.

Eye Tracking Measurements:

Tools:

Tobii uses both hardware and software eye tracking technology.

Their passive (always on) collection works on the majority percentage of the population, inclusive of all eye colors, shape and prescription glasses.

Accuracy is maintained even if user moves relative to device, if ambient light changes or months have passed since calibration.

Methods:

Desktop: *Tobii ATTEX* uses the webcam plus eye tracking hardware. For contextual data collection Tobii's panellists download their ATTEX chrome extension to record passively what they look at across the full internet (including walled gardens) to find the ground truth in audience attention behaviors.

Mobile: *Tobii ATTEX* uses the webcam for eye tracking and collect the contextual data via their ATTEX app, using accessibility services and VPN.

Tobii ATTEX also takes print screens on the ad on both desktop and mobile devices to further verify the attention data points and reconfirm the brand.

Positive and Negative Attention:

Tobii ATTEX chooses not to define attention, they rather focus on the highest quality measurement of attention data by fixation, gaze and creative. This data allows their customers to measure positive or negative attention as they define it, by their clients or industry. This data also enables creating any other attention metric which suits Tobii's customers' overall strategy and needs.

METHODS TO PREDICT ATTENTION:

Tobii ATTEX main focus is the attention data exchange, to collect ground truth data globally from passive, always on, panels (rather than predictions). However, in cases where users do not send eye tracking data (e.g., if low battery on mobile and/or eye tracking is turned off) Tobii predicts the users' attention based on historical data. This prediction model is trained on 62M historical impressions with measured attention and uses data from ATTEX software on actual panelists, but without eye tracking data (for instance to conserve battery power on mobile phones). This provides real browsing behavior and contextual data as input, while leveraging AI to predict individual gaze fixations.

Calibration Method by Which Algorithm was Developed to Predict Attention:

Tobii ATTEX evaluates the trained AI model on test data (ground truth). They use standard metrics in their evaluation (precision, recall, F1 score).

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Tobii considers it essential to understand the different types of eye movements and their purpose while developing attention measurement solutions. To this point it's important to understand the different types of eye movements and how they can provide insights into different aspects of cognitive processes. For instance, saccades can reveal information about the decision-making process, while fixation duration may indicate mental effort.

Ultimately fixation is needed to take the initial step in cognitive processing—this is the period when eyes essentially stop scanning a visual scene and remain relatively still. Fixations allow holding a stationary object of interest on the fovea for a detailed visual information intake.

See Tobii's explanations on eye movements and how they relate to attention computing HERE.

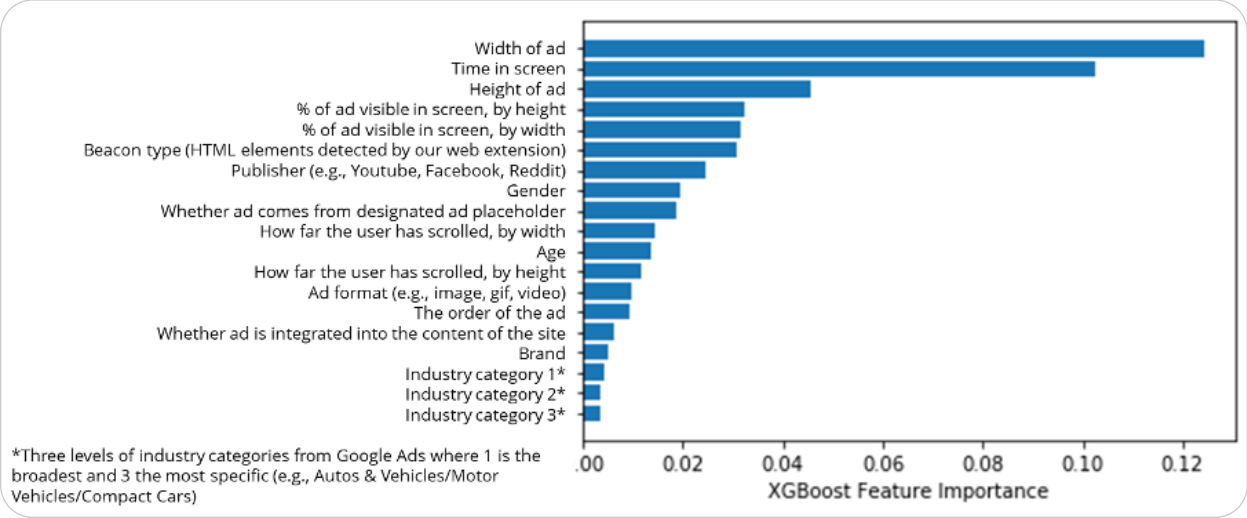
ORGANIZATION'S PERSPECTIVE ON IMPORTANCE OF ELEMENTS THAT DRIVE ATTENTION TO ADS:

Among variables that drive attention, alongside the amount of time a consumer has available to spend viewing, content is key.

Controlled elements such as ad size, ad type, ad format, page layout, ad clutter, time in screen, % in screen, in addition to the more uncontrolled variables such as gender, age, location, time of day, seasonality, context and choice all play a significant role in driving attention.

With the continually changing variables of the user, data collection and measurement must also be able to adjust for, and collect data that is always on and local. With all the variables at play, having static non changing data collection doesn't account for the changes in user consumption patterns, location, changes to site design—over time, doesn't provide the full picture for ground truth nor predictive modelling. Having always on data measures the full lifetime of data and allows for true quality attention metrics and insights.

See image below for drivers of attention from a chosen set of variables on desktop in Sweden.



Attention and Emotion:

Tobii does not currently report on emotion from their passive panel.

Reporting Additional Information:

Tobii ATTEX also measures real-time passive fixations, fixation duration, gaze, demo, contextual, brand and deliver it via API and/or any method of choice.

Prediction of Additional Measures:

Other quantitative metric related to conversions, dwell time/fixation duration, clickthrough, brand consideration.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Tobii ATTEX's passive and always on panel data can be used at both top of funnel as well as lower sales funnel to drive outcomes. An example would be global automotive company Toyota who saw a 77% boost in click conversion rate upon running a successful attention optimization campaign using Tobii attention data; harnessing the power of their online eye tracking panel, including data on which placement IDs have historically received high attention.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Tobii ATTEX would use AI to model prediction on user level when ground truth data is not available. They would use historical data in times such as when mobile device is on low power or user has disengaged the eye tracker or blocked webcam—any variable which precludes Tobii from measuring the user or they question the data quality. In these situations, they would refer to their historical data to predict attention. In these cases, they are still collecting contextual data as well.

On impressions level, AI is used by Tobii's customers via their attention optimization algorithms.

Commercial Arrangements:

Custom/bespoke and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Tobii ATTEX passive, always on panel tracking currently has upwards of 62M impressions to date with 200% YOY growth of their current panel. Tobii has collected data from closer to 10,000 individuals in total.

Tobii ATTEX can build panels in any market of interest to their clients. Current markets include United Kingdom, Sweden, Norway and Denmark. Panel recruitment ongoing in France and coming to United States.

Organization's Utilization of Third-Party Data:

Tobii ATTEX does not access or utilize third-party data.

Organization's Utilization of Human Subjects:

Tobii ATTEX uses human subjects in online panels. Their attention data exchange collects data from passive panels, *Tobii Enterprise* bases their insights on active panels and studies.

Delivery of Results to Clients:

Tobii ATTEX from the attention data exchange data is accessible via API and/or their customers' preferred method of accessing the data.

Tobii Enterprise (active data collection): research, case studies and insights via reports.

Organization's Share of Data Through Third-Party Workflow Systems:

Tobii does not share data through third-party workflow systems.

TVISION*

ORGANIZATION'S PROFILE:

TVision, founded in 2014, is a privately-owned, free-standing company that operates in the U.S., Europe and parts of Asia. The company has no plans of operation in other regions yet.

Attention was part of the original purpose and focus of the company at its founding.

There are 50-99 employees in the unit focused on attention measurement. Of these employees, 0-9 of are researchers working on attention, all of whom have qualitative, traditional quantitative and SQL skill sets. Most hold data science skills and are Python/R coders. Some have stat package skills. None are neuroscientists or psychologists.

TVision uses external advisor/consultants for marketing, technical and corporate/product strategy services.

ORGANIZATION'S MISSION OF SERVICE:

To drive a universal measurement standard for the future of video.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative, media/media planning and campaign post hoc measurement.

Media Types Organization Operates in:

Linear television, addressable television, connected television, digital programmatic, AVOD/FAST, SVOD and apps.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real-estate, restaurants, retail, travel and food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

A viewer must be in the room with their eyes on the TV screen. TVision's technology enables a person-level measure of attention at a second-by-second granularity for ads and programs. This measurement is done in-room and thus, is representative of natural viewing environments.

Key Academic or Journal References and/or Organization's Research That Support This Definition:

TVision uses an adaptation of the MRC Viewability Guidelines found here.

TVision's definitions are also validated in the academic paper "How Viewer Tuning, Presence, and Attention Respond to Ad Content and Predict Brand Search Lift," by researchers at the University of Delaware, Cornell and UC San Diego.

ORGANIZATION'S ATTENTION OFFERING(S):

TVision provides detailed attention metrics for media buyers, sellers and data partners. Their second-by-second, person-level data is available through their SaaS platform and direct data feeds. Their technology measures whether somebody is actively watching the TV or not. Attention metrics include percent attention, attention time, attention to duration index, attention to viewable index and creative breakthrough scores. TVision also provides co-viewing metrics: the percentage of time when someone was watching a program/ad with someone else. TVision's attention data can be used for media planning, campaign measurement and optimization, innovative monitoring, competitive benchmarks, digital activation, ad sales research, inventory scoring and aCPM (attentive CPM) value determinations.

Measurement or Prediction of Attention:

Both measurement and prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, brand penetration, demographics, prior exposure to same creative and second of exposure, time period, ad length, pod placement, average frequency, share of impressions, second-by-second of attention.

Attention Measures of Media Context: Control of Variables

Attention values of creative, device context, brand penetration, demographics, prior exposure to same creative and second of exposure, time period, ad length, pod placement, average frequency, share of impressions, second-by-second of attention.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction: TVision has a panel of over 5,000 homes/15,000 individuals across the U.S. They also have a panel in the U.K. and Japan. Panelists install TVision technology alongside their television sets, enabling TVision to passively measure their viewing behavior. A TVision sensor combined with ACR is used to determine the content on the primary TV in the living room (for both linear TV and CTV). TVision uses computer vision to determine if/which panelist is in the room and if their attention is directed to the TV. Given the passive nature of TVision's measurement technology, data is anonymously collected at a person-level, second-by-second, 24/7 and reported back to TVision. For linear TV, TVision follows the schedule when ads are broadcast, cross-referencing this information to identify ad attention. For CTV, since there is no schedule when ads are broadcast, TVision matches their ACR library data to pinpoint the time within the ad.

All data is collected at a time-stamp level, so when overlaying how a viewer is paying attention or to which ad, it is possible to align all data to the exact second.

TVision can identify how many people are in the home, and specifically in the room, and whether these are guests or the primary household's occupants. They can identify co-viewing, as well as each individual's attention, and whether the attention is higher or lower for each specific ad. Their technology does not measure animals, only humans.

Methods to Measure/Predict Attention:

Facial coding and other biometrics. TVision's technology involves using computer vision to understand when individuals are in the room, recognize individuals and determine whether each individual is paying attention or not and what their duration of attention is. With their technology, TVision can assess whether the creative is engaging and keeping people's eyes on-screen or if they're looking away more because the ad is not engaging or relevant.

Means to Measure/Predict Attention:

Natural exposure "in the wild."

Eye Tracking Measurements

TVision does not use eye tracking measurements.

Positive and Negative Attention:

TVision differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

Their technology can measure person-level attention at a second-by-second granularity. As a result, they can determine when exactly individuals are paying attention to ads or programs and when they begin to look away. If a person is present but not looking at the screen, this would count as inattention.

METHODS TO PREDICT ATTENTION:

TVision's technology enables actual observed attention measurement that allows their customers to evaluate whether or not viewers had eyes on-screen attention. This data is used to evaluate media placements and creative effectiveness. TVision's data is provided as a look back post viewership event. For media planning, many of their customers use their historical attention data to predict which apps or linear networks may achieve the highest attention for their campaigns. For example, a brand that has a target market of M18-25 can look at historical attention data across the entire CTV and linear ecosystem and use that to uncover apps/networks that historically achieve high attention for that demographic segment and use that data as a predictor of future behavior for their go-forward media planning.

Calibration Method by Which Algorithm was Developed to Predict Attention:

TVision's technology allows for direct measurement of attention by evaluating whether a viewer had their eyes on-screen when an ad or program was playing. They do not rely on proxy measures such as completion rates to determine attention.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Viewability on TV should mean the same thing as in digital—that the ad was physically viewable by a natural person. Since TV is a passive environment, viewability should not just measure whether the ad was displayed on the screen. For someone to be attentive to an ad or program, they must first be present in the room. Therefore, being viewable is a precursor to being focused. Engagement can be an overarching descriptor that can be applied to viewability and attention. TVision's data has been used to correlate concentration to outcome data, such as web searches, in-store visits, sales, etc., to measure engagement.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Media type and specific content context are all very important in driving attention to ads. Creative, targeting and brand effect are important. The device is somewhat unimportant.

Attention and Emotion:

TVision does not report on emotion.

Reporting Additional Information:

TVision also reports on view completion rate, sex/age breakouts, other demographics such as education, income, political status, geography, alignment score between ad and context based on human content coding and attention to the contexts themselves.

Prediction/Forecast of Additional Measures:

Sales lift increase, dwell time, presence in room, co-viewing rates, share of time, incremental reach, attentive apps for CTV activation.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website search, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness. TVision is currently doing a study to determine the correlation between attention and sales outcomes. They also have case studies showing attention's impact on in-store visits, cost-per-customer acquisition, TV tune-in, account signups, aCPM and the correlation between creative pre-testing and real-world engagement.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

TVision does not use ML/AI.

Commercial Arrangements:

Custom/bespoke, syndicated, industry cooperative. TVision also partners with other measurement companies to provide TV attention data and person-level TV viewing data for audience projections.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on over 10,000 through multiple regression analysis and correlation.

Organization's Utilization of Third-Party Data:

TVision accesses or utilizes the following types of third-party data: ad occurrence data, content, coding data and program occurrence data.

They evaluate the behavior of their panel for all analyses.

Organization's Utilization of Human Subjects:

TVision uses human subjects in their own in-home TV panel.

Delivery of Results to Clients:

Measurement data is available within less than 24 hours of passive viewing occurring in the panel. Results are delivered through scores, recommendations, reports, consultation, indices to norms, self-serve user interface. TVision also provides observed metrics such as attentive time, attention %, etc. They don't use an API but can deliver data via cloud services.

Organization's Share of Data Through Third-Party Workflow Systems:

TVision shares attention data through LiveRamp, Cadent, Teads, Lumen, Viant, Adelaide, The Trade Desk, Oracle, Origin, Ebiquity, SensorTower, DoubleVerify.

*TVision provided the following supplementary materials: validation studies, technical appendix/methodology description and an academic paper. Client list was also provided.

VIOMBA*

ORGANIZATION'S PROFILE:

Viomba, founded in 2014, is a privately-owned, free-standing company, that operates in the U.S. and Europe. Viomba is planning to expand further into markets within Canada, Australia/New Zealand, Latin America, rest of Asia and the U.K.

Attention was part of the original purpose and focus of the company at its founding.

There are 10-24 employees in the unit focused on holistic attention measurement and connected AI based activation algorithms for industry-first agencies, publishers and other Martech operators. Of these employees, 0-9 are researchers working on attention, all of whom hold data science, traditional quantitative, Python/R coding and stat packages skill sets. Most are full stack developers. Some hold qualitative skill sets. None are neuroscientists or psychologists.

Viomba also uses external advisors and consultants for marketing and corporate/product strategy.

In the territories of the U.S. and Canada, Viomba is currently ramping up its North America specific holistic attention data, nat.rep audience exposure panel and connected market reports for further industry-first data partnerships with Luth Research.

ORGANIZATION'S MISSION OF SERVICE:

Viomba's mission is to be #1 Holistic Attention Data & Tech provider for the results demanding industry-first professionals. Viomba attention analytics, data and connected SaaS tools are all about providing holistically actionable attention activation for the ambitious digital marketing, market research and media publishing professionals.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative measurement, Media Publisher Pixel Pulse, media agency campaign planning, real time attention reporting and campaign post hoc measurement.

Media Types Organization Operates in:

(RTB and deal) digital programmatic, addresable television, connected television, digital content, AVOD/FAST, SVOD, social media, publisher attention analytics, website UI specific visual flow analytics.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, restaurants, retail, travel, food/beverage and medical.

ORGANIZATION'S DEFINITION OF ATTENTION:

Viomba empowers publishers, agencies and brands to boost their digital advertising with

holistically actionable attention analytics—which means that Viomba combines three digital ad attention signal segments into one holistically actionable attention algorithm: 1. Environmental signals (including technical visibility metrics, situation metrics and behavioral metrics); 2. Commercial signals (including creative metrics, domain metrics, ad buy metrics such as CPM & header bidding); 3. AI predicted Visual Engagement Signals (including seen%, engaged view time (ms), memory impact, gaze return rate, aCPM, aCPH).

Key Academic or Journal References and/or Organization's Research That Support This Definition:

There are hundreds of human visual sense, covert and overt attention etc., human visual object detection focused scientific studies to list which have been made by the global science community during the past decades alone—with numerous different focus areas and methods. The strong visual science community consensus has been reached on how our visual sense subliminally saccades 2-4 times every second and how it fixates and cognitively detects visual objects through around 180-200 milliseconds fixation. Viomba's methodology considers 200 ms lasting gaze fixation on a technically viewable ad element inside a visible viewport area as a visually "seen" ad since the visual sense detected and processed data has then reached our human brain to create initial memory impact. In other cases, 100 ms can be already considered as visually seen element, but Viomba leans on the safely "brain" landed visually seen average of 200 ms. See here for a review of the widely peer-reviewed scientific basics about Viomba's evolutionary evolved visual sense data processing.

ORGANIZATION'S ATTENTION OFFERING(S):

Viomba's industry-first holistic attention data and tech solutions are available for:

1. Display and rich media campaigns: attention ad buy and custom bidding algorithms with real time reporting.
2. Media publishers: Viomba Pixel Pulse offers detailed attention analytics from each domain specific ad impression and campaign.
3. Market research studies: organic nat.rep. audience exposure reports for ad recall, brand lift and competitor analyses.
4. Facebook campaign measurement and visual attention exposure metering.
5. High-Attention formats (e.g., Adnami): top- and interscrollers, horse shoe formats, etc.
6. Video analytics: audience focus and exposure analytics per each detected graphic element visually viewable on the video.

Measurement or Prediction of Attention:

Both measurement and AI prediction of attention.

Measurement of Types of Content:

Both ads and media contexts.

Measurement/Prediction of Types of Formats:

TV/video, display/static, Facebook ads.

Attention Measures of Creatives: Control of Variables

Media type context, media content context, device context, demographics, prior exposure to same creative, ad format and visual object specific seen (%) and viewtime (ms) vs. local benchmark.

Attention Measures of Media Context: Control of Variables

Attention values of creative, device context, demographics, prior exposure to same creative, line item/ad placement, level attention scoring of each domain vs. market specific benchmark.

MEASUREMENT OF ATTENTION:

Methods:

Measure real consumer reaction: Minimum of 200 ms (overt) gaze fixation on an ad = seen ad.

Methods to Measure/Predict Attention:

1P multi-market eye tracking panels to create +250k weekly "in the wild" empirical training samples from thousands of media domains for premium AI prediction.

Means to Measure/Predict Attention:

Natural exposure "in the wild."

Eye Tracking Measurements

Tools:

Tobii 5 eye tracking device (not a webcam) connected to Viomba browser exten-sion.

Methods:

Eye on screen duration, number and duration of fixations, inferences of attention/interest from saccadic eye movements.

Positive and Negative Attention:

Viomba differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

While Viomba's methodology focuses primarily on determining whether an ad is subliminally visually detected and seen during the overt attention physical act and if so, for how long the ad will receive visual engagement and/or visual viewtime, they consider all visual engagement with an ad element in live media as a positive attention while unseen ads are generating negative attention. While focusing primarily on visual sense focused attention analytics, Viomba is not considering surrounding media and contextual sentiments of the content or media domain itself—this is left to other metering and analytic operators.

When generating measurement samples with real eye trackers, a visual object can only be visually detected and fixated during saccades when eyes are open and firmly fixated on the ad element technically viewable in media domain.

METHODS TO PREDICT ATTENTION:

Viomba uses the following to predict attention: viewability, duration of exposure, ad unit norms, placement on page norms, colors used in ads, type face size in ad, human face or other specific images used in ad—Viomba's ConvNet AI identifies and analyses all key elements in the ad creative to predict its aggregated Seenability in live media per device type. Additionally, Viomba uses alignment between ad and context and alignment between ad and person.

Calibration Method by Which Algorithm was Developed to Predict Attention:

Viomba develops and calibrates their attention algorithm and connected predictions for a holistic attention analytics by using collected data from their "in the wild" media browsing panelists, equipped with high-accuracy Tobii 5 eye trackers and their proprietary browser extension.

Viomba's browser extension works with these eye trackers to collect carefully isolated, accurately precise measurement samples across multiple viewport sizes, generating for about 250,000 weekly empirical samples from thousands of live websites across the world. And the data collection has been going on consistently for eight years already.

For algorithm development, Viomba employs a Convolutional Neural Network (ConvNet) for processing eye tracking data, focusing on ad and media patterns. The model, trained with accurately precise eye-tracking data, is regularly updated to capture essential visual attention features.

For calibration, the algorithm is fine-tuned using empirical data and cross-validation methods. It's also continuously improved with new data, ensuring adaptability. Controlled experiments and benchmarks help validate the algorithm's accuracy, complemented by retrospective campaign analyses and correlation studies for robust attention measurement.

The algorithm training using Viomba's own ConvNet models and meticulous calibration and validation processes against both empirical and controlled holistic attention data sets (involving rich set of both system and biometric attention indices) allows Viomba to develop a robust, accurate and continuously evolving tool for predicting visual attention in diverse media contexts.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

In Viomba's methodology, these terms are viewed as follows:

Viewability refers to an ad elements technical impression been served inside a viewport potentially to be visually detected by a user. IAB standard of 50% technically viewable for minimum of one second and with larger formats 30% for one second are commonly used industry standards, yet much smaller area can already be visually detected by human vision, and it can create a clear memory impact and effect on a consumer.

Attention is a wide term which can mean many things in metering, focusing often purely on technical attention indices to emulate potential "human contact." In other methods attention can also include visual sense based visual attention metering. In Viomba's terminology holistic attention include both these areas.

Engagement—when an object is initially visually 200 ms detected and the user continues to engage with the object for a longer period after which Viomba can report the total visual engagement time in milliseconds and seconds.

Even though *emotion* is not reported by Viomba methodology (since reliably peer-reviewed scientific study results clearly show that human emotions cannot be reliably analyzed from facial expressions alone; rather, facial expressions usually imitate the other person's emotions more than our own). Nonetheless, the term "emotion" in advertising commonly refers to the emotional reactions and responses which media impressed images and/or text arouse within the exposed user (which have to be studied through qualitative analytics rather than Viomba type quantitative analytics). Viomba's U.S. panelist and business partner Luth Research has deployed Viomba SDK across its nat.rep panel to enable strong audience exposure data feed across the U.S. consumer segments and media landscape with Viomba attention connected lift, ad recall, etc., qualitative studies.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Ad creative is very important in driving attention to ads. Media type, specific content context, device, targeting and brand effect are all also important to measure and understand along the ad creative's visual attention impact.

Attention and Emotion:

Viomba does not report on emotion.

Reporting Additional Information:

Viomba also reports on voluntary playback, clickthrough, skip, view completion rate and aggregated sex/age breakouts.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, clickthrough, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

Viomba's 24/7 1st party eye tracking panel generated training data enabled Con-vNet AI's to generate holistic attention analytics and multi device ad buy/bidding algorithms with line item level attention scoring and reporting. Viomba also deploys several other type of CNN AI's for various video and social media attention performance analytics. In addition, Viomba uses its AI capabilities to provide media publishers with holistic attention analytics.

Data AI/ML Models Based/Trained on:

For the past eight years, Viomba has recruited, managed and operates its own 1st party eye tracking panels. Each recruited eye tracking panelist is equipped with Tobii5 high precision eye tracker and Viomba's Chrome extension to generate a well-rounded and rich domain specific data. Viomba's eye tracking panels operate across various European markets (FI, DE, DK, SE) with approx. 300-400 daily active eye tracking contributors yielding over 250, 000 highly accurate and precise attention AI training samples each week.

Commercial Arrangements:

Custom/bespoke, syndicated, industry cooperative, direct SaaS and/or API based White label arrangement.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

- Study conducted on over 10,000 through correlation. Viomba validate the following: When predicted against retrospective campaign data, do the Viomba predicted seen impressions correlate with realized clicks and other measured conversions? How strong is the correlation in scientific terms? Does it prove that Viomba can predict visual Seenability of a selected ad creative in a selected media domain placement?
- The Spearman's Correlation Coefficient results in peer-reviewed study, rejects the Null Hypothesis with 0.58 result with p-value < 0.05. These study results, therefore, clearly indicate that there exists a moderately positive monotonic relationships between Viomba visually predicted seen impressions and already previously and separately realized clicks.

Organization's Utilization of Third-Party Data:

Viomba accesses or utilizes the following types of third-party data: other metadata, Tobii 5 eye tracker data and various DSP and SoMe provided campaign data.

Organization's Utilization of Human Subjects:

Viomba uses human subjects in the following ways: 24/7 stream of multi-market qualitative eye tracking samples for AI training, online survey and audience exposure reports with our carefully selected nat.rep territorial panelist and data partners such as Luth Research in the U.S.

Delivery of Results to Clients:

Viomba AI provides instant attention measurement results and campaign predictions. Results are delivered through scores, reports, indices to norms, self-serve user interface, API and Custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

None.

*Viomba submitted the following validation studies:
Pathfinder Custom Bidding Algorithm Performance; Viomba Attention Pathfinder Seenability Correlation Study and White Paper.

XPLN.AI

ORGANIZATION'S PROFILE:

XPLN.AI, founded in 2022, is a privately-owned, free-standing company that operates in the U.S., Latin America, Europe and parts of Asia—planning to expand further into markets within Canada, Australia/New Zealand, China, India and Africa.

Attention was part of the original purpose and focus of the company at its founding.

There are 10-24 researchers in a unit focused on attention measurement. All of these researchers hold data science skills, and most are Python/R coders and hold stat package skill sets. Some have qualitative and traditional quantitative skills.

XPLN.AI also uses external advisors and consultants for neuroscience and neuromarketing services.

ORGANIZATION'S MISSION OF SERVICE:

XPLN.AI drives efficiency for brands and agencies by measuring on-site metrics defining the quality of ad exposures and attention to media. XPLN.AI helps brands and agencies optimize media spending for less wastage and more efficient media.

Current Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Media/media planning and campaign post hoc measurement.

Future Type of Service (Creative/Media/Campaign Post Hoc Measurement):

Creative.

Media Types Organization Operates in:

Addressable television, connected television, digital programmatic, digital content, AVOD/FAST, social media and apps.

Brand Types Organization is Experienced With:

Automotive, clothing and fashion, consumer electronics/technology, CPG, entertainment, finance, health and wellness, insurance, real estate, retail, travel and food/beverage.

ORGANIZATION'S DEFINITION OF ATTENTION:

In his 1890 book, *The Principles of Psychology*, psychologist and philosopher William James wrote that attention "is the taking possession by the mind, in clear and vivid form, of one out of what may seem several simultaneously possible objects or trains of thought…It implies withdrawal from some things to deal effectively with others."

Key Academic or Journal References and/or Organization's Research That Support This Definition:

NA.

ORGANIZATION'S ATTENTION OFFERING(S):

Attention offerings are core to XPLN.AI's product suite:

Attention Measurement: measures real-time attention of advertising campaigns.

Attention Optimization: optimizes in real-time attention of advertising campaigns. Attention can be measured and optimized across all media and ad environments to build a comparative norm between media types and ad environments.

Measurement or Prediction of Attention:

Prediction of attention.

Measurement of Types of Content:

None.

Measurement/Prediction of Types of Formats:

None.

Attention Measures of Media Context: Control of Variables

Device context and demographics.

MEASUREMENT OF ATTENTION:

XPLN.AI differentiates between three kinds of attention:

Active attention—Watching the screen with active pupil movement.

Passive attention—User is watching content but eye tracking is static.

Negative attention—User is looking at lower right hand of screen (YouTube) looking for the skip button or staring at the count down.

Means to Measure/Predict Attention:

Forced exposure to platform, but choice of specific content (simulated natural exposure), natural exposure in laboratory and natural exposure "in the wild."

Eye Tracking Measurements:

Raw data from in-lab eye tracking devices: name of media, sites, desktop/mobile, ad screen share, ad position and additional signals such as number of simultaneous visual ads, context, source of traffic combined with viewable time—time spent on screen.

Positive and Negative Attention:

XPLN.AI differentiates between attention directed towards an ad (positive attention) and attention focused on skipping/avoiding ad (one form of negative attention).

XPLN.AI differentiates in their eye tracking dataset between fixation time directed towards the actual content of the ad and fixation time focused on avoiding the ad (skip button, cross-button, ad-length countdown).

METHODS TO PREDICT ATTENTION:

Viewability, duration of exposure, context norms, ad unit norms, placement on page norms, other norms—the source of traffic, user activity, artificial length of viewability through sticky ad units and alignment between ad and context.

Calibration Method by Which Algorithm was Developed to Predict Attention:

XPLN.AI predicts attention scores by providing a formula based on underlying scores. These scores are linked to the ad's affinity with the page's semantic context, the user's experience and perception and other factors. They calculate these scores by fitting regression lines to collected data.

ORGANIZATION'S PERSPECTIVE ON THE RELATION BETWEEN ATTENTION, VIEWABILITY, ENGAGEMENT AND EMOTION IN ADVERTISING:

Attention lives at the intersection of authentic viewability, positive engagement and meaningful emotion.

Organization's Perspective on Importance of Elements That Drive Attention to Ads:

Creative, media type, specific content context, device, targeting and brand effect are all important in driving attention to ads.

Attention and Emotion:

XPLN.AI does not report on emotion.

Reporting Additional Information:

XPLN.AI also reports on like, clickthrough, skip, view completion rate and alignment score between ad and context based on human content coding.

Prediction/Forecast of Additional Measures:

None.

Evidence That Method is Predictive of Lower Sales Funnel Outcomes:

Through sales effect, website visit, clickthrough, brand recognition, unaided or aided ad recall, copy points recalled, sales points recalled, first brand mentioned, brand awareness, persuasion, purchase intent, consideration, preference, brand affinity, ad liking, brand perception and brand trust.

ORGANIZATION'S USE OF MACHINE LEARNING AND/OR ARTIFICIAL INTELLIGENCE TO MODEL ATTENTION:

Use of ML/AI:

XPLN.AI uses ML/AI to build prediction models to determine the level of attention for each impression.

Data AI/ML Models Based/Trained on:

Their training dataset is based on eye tracking results. Features are data such as device type, ad size/player size, media type, geometric ad position, viewable time, domain/app, URL, ad clutter, sound, source of traffic and semantic context. The models are trained to predict fixation time and other metrics. Their eye tracking data is collected at the impression level during laboratory studies with panelists and by third-parties during webcam eye tracking studies.

Commercial Arrangements:

Custom/bespoke, syndicated and industry cooperative.

Performance of Validation/Calibration/Case Studies and Household/Persons Intab Sample Size of Studies:

Study conducted on 600-1,000 through random control trial, multitouch attribution and correlation.

Organization's Utilization of Third-Party Data:

XPLN.AI accesses or utilizes the following third-party data: content coding data, other metadata and sales data.

Organization's Utilization of Human Subjects:

XPLN.AI uses human subjects in the following ways: online survey, online panels, face to face survey, laboratory eye tracking panel and webcam based eye tracking panel.

Delivery of Results to Clients:

Results are delivered in real time through scores, recommendations, reports, consultation, indices to norms, self-serve user interface, API and custom algorithm.

Organization's Share of Data Through Third-Party Workflow Systems:

XPLN.AI does not share data through third-party workflow systems.