



**comScore Media Metrix
U.S. Methodology
An ARF Research Review**
Confidential

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Introduction

This is an ARF Research Review of the Media Metrix Methodology as developed by comScore, Inc. (comScore). The purpose of this review is twofold:

1. To review the objectives, design, methodology and validation of the comScore Media Metrix panel service.
2. To render an opinion of the adequacy of the design, methodology, and validation to meet the stated objectives, both in theory and in practice, insofar as the practice has been represented to the ARF by comScore.

This review is based solely on the assertions and representations of comScore and is not an ARF audit.

Objective

The objective of the comScore Media Metrix panel is to provide a detailed, consistent view of consumer behavior and preferences across the entire Internet, including Web usage and buying behavior, to online marketers and publishers. With the continuous growth of the Internet, scalability has become a critical system need. comScore requires samples numbering in the hundreds of thousands in order to reliably report on web usage behavior.

With the introduction in 2006 of Media Metrix 2.0, comScore's goal was to expand their Internet measurement capabilities to over 20,000 online entities, despite the tyranny of the long tail – an increasing demand for reach measures on sites with reach of less than one-half percent.

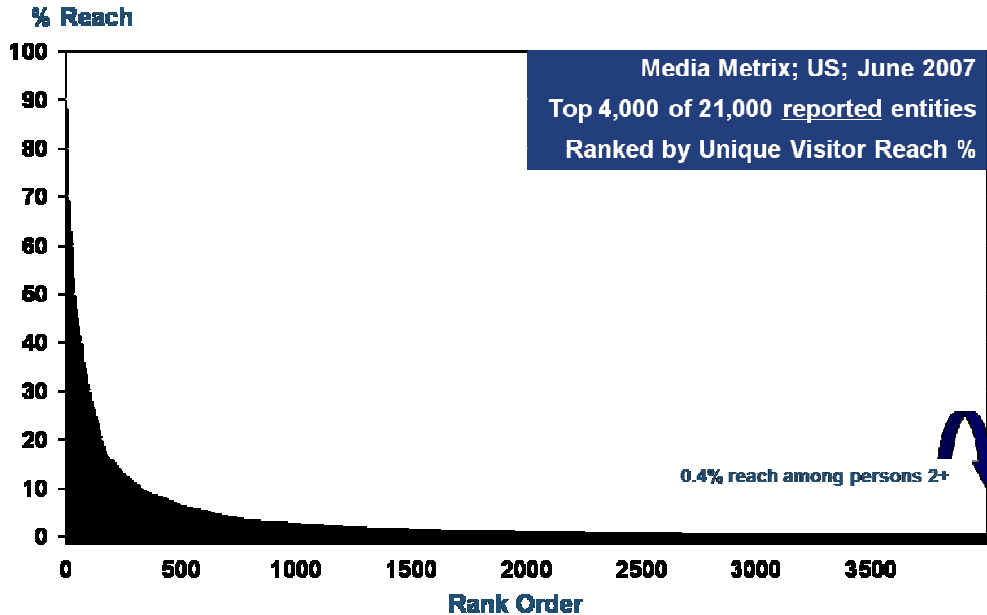


Figure 1. Top 4,000 Online Entities Ranked by Unique Visitor Reach, June 2007

Providing those measures requires a large volume of extremely granular data representing:

- Actions (starts, stops, clicks, etc.)
- Audience behaviors (exposures, time spent, etc.)
- Consumer behaviors (shopping, commerce, etc.)
- Online behaviors (IM, email, gaming, streaming, etc.)

It further requires the development of systems able to project that data to the large and diverse universe of people online without injecting bias or other error. To this end, comScore has deployed a passive, non-invasive measurement system coupled with a projection method designed to identify, quantify, and eliminate bias to the maximum extent possible.

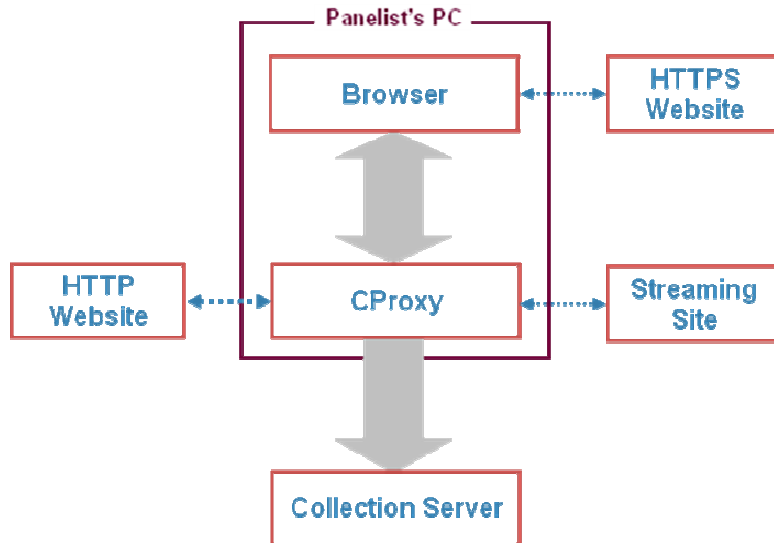


Figure 2. CProxy Technology Sits Closer to User's Browser than Does Remote Server

comScore deploys two different panels in the US. The machine panel (comprised of over 400,000 machines), from which data is projected and reported at the machine level, is used for search products, eCommerce, and other offerings. The Media Metrix panel, from which data is projected and reported at the person-level, is used for syndicated reporting of Internet audiences. The Media Metrix panel is essentially a subset of the machine panel, comprised of persons using machines from which comScore is able to attribute usage on the machine to individual persons. comScore determines session user based on a passive biometric technique called User Demographic Reporting (UDR), a patented technology that uses mouse and keyboard movement to attribute machine usage to specific persons.

Measures describing a web entity's traffic include:

- number of unique visitors (akin to a measure of "cume" or total reach)
- average number of visits per visitor
- average number of pages viewed per visitor
- average number of pages viewed per visit
- average minutes spent at web entity per reporting period
- average minutes spent at web entity per visit
- percent reach

These measures are routinely aggregated and shared weekly and monthly with the industry through the comScore MyMetrix interface.

Weighting

comScore re-weights its in-tab sample using a technique called “*Iterative Proportional Fitting*” (*IPF*). The *IPF* procedure brings weighted sample totals in line with comparable universe estimates for a key set of population cells, or “marginal values”.

comScore employs two sources of universe controls for weighting: an Enumeration Survey (12-month cycle, projected forward); and, a Calibration sample, utilizing a continuous passive measurement panel. The variables used in the weighting differ according to the Location subpanel and are shown below in Table 1. More details on the Enumeration and Calibration are available in the next section of the Review (Methodology).

Table 1. Variables used for Weighting According to Location of Computer

<u>Weighting/Stratification Variables</u>	<u>Source</u>	<u>Home</u>	<u>Work</u>
Gender	Enumeration	X	X
Age	Enumeration	X	X
Household income	Enumeration	X	X
Household size	Enumeration	X	X
Presence of children in HH	Enumeration	X	X
Census region	Enumeration	X	X
Number of employees	Enumeration		X
AOL as ISP	Enumeration	X	X
Broadband	Enumeration	X	X
Quartiles of Internet use (min)	Calibration	X	
Request of online sites similar to TAP partners	Calibration	X	X

comScore’s Six Reporting Levels

Critical to comScore’s dual performance goals of consistency and validity is the ability to accurately identify and classify Websites and sub-sites. Websites like CNN, Yahoo, MySpace etc. have many unique URLs; these URLs roll up into channels, channels can roll up into brands, etc. Website audience measurement demands both accurate capture of respondent behavior, and the accurate and consistent aggregation of discrete, granular person/URL observations into meaningful groupings.

The comScore Dictionary is a proprietary database which is constantly maintained and updated based on ongoing dialogues with publishers, and regular reviews of the monthly comScore data capture of urls visited by panelists. It provides rules for accumulating and aggregating page-level URLs into useful Web entities.

The increased granularity of reporting means that estimates are available for more discrete content areas. However, increased granularity also means smaller reporting samples, which introduces period-to-period variability into those lower-level estimates.

In general, sampling error is a function of two variables: sample size and the size of the audience estimate itself. Small numbers have greater relative error than big numbers.

Consequently, it is recommended that when using comScore Media Metrix data to make Internet advertising buys one should use the least granular reporting level that corresponds to the entity for which ads are being purchased.

Methodology

As vital as the servers and data-center architecture are to Media Metrix's reliability and accuracy, comScore's varied-source, multi-panel design and incentive systems are equally vital to the stability and scalability of the Media Metrix methodology. The Enumeration Survey and Calibration Panel act to reduce the bias and projection error in the data obtained from online recruited panelists, but the multiple incentives and recruitment methods used online also help to reduce bias and measurement error.

Enumeration Surveys

Enumeration Surveys are conducted in monthly waves of about 1,100 interviews, in order to size the universe of people who use various forms of Digital Media and to obtain detailed relevant demographic information for weighting. The Enumeration Survey is conducted by an RDD telephone method. Based on the enumeration data, Universe Estimates are developed for Total Internet Penetration using a 12-month moving average. That is, the trend line calculated from the last 12 months is used to project the size of the universe for the coming month.

comScore uses the enumeration to establish Universe Estimates for persons 2+ using the Internet from a home computer in the past 30 days; and, persons 18+ using the Internet from a work computer in the past 30 days. Demographic questions included in the enumeration survey allow comScore to further divide these universes by demographics such as age, gender, household income, etc. (see table 1, above.)

It is important to keep in mind that comScore estimates are projected only to the population of Internet users. Some have wrongly criticized comScore for failing to represent people that are not online. That is a criticism which is sometimes appropriate for online surveys, but comScore projections and estimates are designed to represent the online population, not the general population.

Calibration Panel

By design, an offline recruitment source is used to obtain this second key component of the Media Metrix weighting process. A random, offline selection process is used to create a "calibration" panel that is free from any recruitment biases associated with online recruitment. Originally, a core subset of Media Metrix RDD-recruited respondents were a primary source for the Calibration Panel. Now, comScore has begun to recruit panelists via offers printed at the checkout lanes of supermarkets that participate in the national Catalina Marketing system.

The Calibration Panel is an ongoing panel of 3,000 to 5,000 people that is used to develop the behavioral factors needed to remove bias from the panelists who are recruited online. The primary source of bias among online recruits is the over-recruitment of heavy online users, since the longer one is online; the more likely one is to receive an online offer. Secondly, the Calibration Panel is used to correct for the higher levels of visitation to property types that are likely to correlate with the affiliate sites from which comScore recruits online members.

Varying Incentives

When comScore first recruited panelists, barely 10 percent of Americans had broadband Internet access at home. At that time, comScore's offer of a Web acceleration technology was a compelling incentive to many prospective panel members. Today, home broadband penetration is about 85% (among Internet households) and every major ISP offers similar acceleration technology to dial-up users.

As broadband availability and usage has grown, comScore has offered new benefits, such as e-mail virus protection software. Members can also earn additional incentives by responding to survey questionnaires, which are also part of comScore's research business. In addition, comScore has developed:

- A Permission Research Panel, comprised of people that saw comScore banners advertising the Panel, or advertising for a user value proposition, and were thus persuaded to click through to a registration site.
- A Relevant Knowledge Panel, comprised of people invited to join the Panel when downloading software distributed for free by a software publisher with whom comScore has a partnership.

One additional panelist value proposition launched in 2008 (and available to both Permission Research and Relevant Knowledge panelists) is Trees for Knowledge, wherein comScore promises to plant a tree if the candidate joins the panel, and then an additional tree for each month the panelist remains installed. comScore has committed to planting a million trees through this program. Trees for Knowledge is designed to broaden the psychographic appeal of panel membership.

These types of incentives to participate appeal to a very broad demographic cross-section of the population, which in turn benefits the resulting research and the businesses that use the comScore services. That is, the size and representativeness of the comScore panel produces much more accurate information than other approaches.

Online Respondent Acquisition – Affiliate program

The Affiliate network is comprised of web entities which meet comScore's quality criteria. On these sites, panelists are recruited via banner ads. Appeals are targeted through a broad array of smaller web entities. Respondents are directed to comScore's online intake entity – www.permissionresearch.com. Panelists coming through the Affiliate program join the Permission Research panel.

Third Party Application Provider (TAP) Program

comScore partners with application providers who offer visitors a "quid pro quo" offer (something for free in exchange for "eyes on" the comScore recruitment solicitation.) Users visit sites to download valued items, such as free software, applications, and utilities that are given in return for joining the panel. Panelists coming through the TAP program join the Relevant Knowledge panel.

Relevant Knowledge panelists and Permission Research panelists comprise the Media Metrix panel.

Privacy Practices: Registration Process

Potential members are informed that they will be joining an online market research panel that tracks their online browsing and purchasing behavior.

Potential members are informed of the company's commitment to protect the privacy of members. Registrant provides basic demographic information, including birth date. The Privacy Statement and the User License Agreement informs users that they will be participating in market research programs involving passive tracking of their online browsing and purchasing

behavior AND requires their affirmative consent. After installation of software, users are asked to provide household information.

Home and Work Panels

comScore's online recruitment allows for very large reporting in-tab samples.

In order to track the totality of Internet usage, comScore maintains a home panel and a work panel, each projected to appropriate universes. The home panel universe is persons age 2+ in households from which at least one person accessed the Internet from a home computer in the past 30 days. The work universe is persons age 18+ who have accessed the Internet from an employer-owned computer in the past 30 days. These two universes are additive with respect to "intensity" metrics (Page Views and Duration) and are de-duplicated for projections of Unique Visitors, or reach.

comScore maintains a smaller University panel as of this writing; but the University panel is to be rolled into the Home panel effective March 2009. (Full time university students living in group quarters—i.e. dorms—will remain a part of the projected universe.) Figure 3 depicts the most current monthly in-tab totals.

Media Metrix US Monthly In-Tab	
Home	150,000 – 200,000
Work	8,000 – 12,000
Total	158,000 – 212,000

Figure 3.

Attribution of Sessions to Specific Users

Identification of a 'person' in a multi-user household environment is one of the most important challenges in Internet audience measurement. Self-reporting one's identification during every Internet session relies on respondent cooperation and risks offending respondents. comScore scientists believe this is problematic because it assumes the respondent is diligent and accurate in such reporting; additionally, the burden of self-identification in each user session (and then every 30 minutes thereafter) can affect online behavior, as well as causing an increase in panelist turnover. A more costly, but potentially valuable method is to use an intelligent agent technology.

comScore identifies users with a proprietary, patented procedure called User Demographic Reporting (UDR) which uses biometric signatures based on keystrokes and mouse patterns. UDR creates a unique fingerprint or signature for each machine user; then, sessions are attributed to specific users based on recognition of this biometric signature. comScore validates the performance of UDR in its calibration panel, a standalone offline-recruited panel in which both "Who are you?" pop-ups and UDR are deployed.

Validation

As a part of this Research Review of comScore Media Metrix, the ARF Research staff has carefully examined three separate comparisons of Media Metrix measures with measures derived from independent external sources. While convergent validity is not an end goal, but a process, we believe that these external validation studies provide corroborative evidence of the accuracy and utility of comScore's Media Metrix measurements, and we hope they continue.

Advertiser Validation

A major advertiser used the online advertising impression data from the comScore panel to examine the targeting effectiveness of randomly selected online display advertising campaigns which had been previously conducted. Since that analysis was executed after the campaigns had been run, the comScore ad impression counts relied on an image-matching algorithm to identify ad occurrences. Had the comScore measurement used tags placed on the ad IDs, it might have yielded more matches between the found ad and the target, since images are sometimes modified by the publisher before serving them without informing the agency or client, and therefore a higher impression count for comScore.¹

Table 2 below compares the advertiser's impression counts with the image-matching-based "found" impression counts from comScore. On average the comScore impression count was 5% lower than the media buyer estimate.

Table 2: Leading Advertiser's Comparison of Impressions Estimates – comScore vs. Buyer

Campaigns	Advertiser's Impressions	comScore Impressions	% Difference
A	30,756,130	29,145,101	-5.2%
B	56,400,000	55,809,000	-1.0%
C	18,500,000	18,564,000	0.3%
D	118,943,805	102,412,000	-13.9%
E	46,701,650	44,331,000	-5.1%
Average deviation			- 5.0%

comScore Ad Impression Validation

A more extensive post-buy campaign analysis was conducted by comScore that included 25 campaigns for 22 advertisers in 16 different product categories. This more extensive analysis also found that the difference between the comScore impression counts and those by the media buyers' were within 6%, and with the exclusion of an outlier case (probably resulting from an image matching failure), the difference was only 3%.

¹ We have excluded from this analysis a campaign for which the one of the creative executions was not found due to a failure in the image matching process. We have also excluded two campaigns for which comScore found and posted ad impressions counts beyond the time frame used in the buyer's analysis. With those campaigns, the difference between the media buyer count and the comScore count was less than half of a percent, but we prefer a more rigorous comparison.

Table 3: comScore Post-Buy Ad Campaign Validation

Campaign	Client Impressions	comScore Impressions	Index Client to comScore
Military	1,420,568	1,606,585	113%
Copier Brand	11,439,567	12,857,961	112%
Lending Institution	439,276,179	455,927,991	104%
Search brand	1,657,663,785	1,706,818,988	103%
Electronics retailer	286,248,700	291,707,985	102%
Department Store	273,191,426	272,263,299	100%
Luxury Car Brand	1,031,170	1,034,644	100%
Audio Equipment Maker	70,500,104	69,481,524	99%
Credit Card	305,632,257	304,028,096	99%
Online Education	61,589,332	60,586,487	98%
Department Store Campaign 1	170,410,106	166,172,159	98%
Department Store Spring Line	505,909,651	485,354,549	96%
Tax software	973,244,588	934,599,226	96%
Credit Card Brand	1,117,202,956	1,074,233,612	96%
Insurance Carrier	89,600,958	84,856,691	95%
Department Store	76,341,069	72,796,741	95%
Department Store Campaign 2	133,496,757	127,348,880	95%
Hotel Chain	612,946,977	577,803,100	94%
Business weekly	31,678,303	29,875,163	94%
Car Brand	309,971,724	284,238,222	92%
Dairy Brand	25,300,032	22,875,570	90%
Department Store	244,069,013	218,295,325	89%
Discount Retailer	2,424,833,392	2,034,531,294	84%
Discount Retailer	2,664,880,082	2,082,148,844	78%
Cell Phone Carrier	3,413,637,746	1,277,722,459	37%
Average			95%

Average Coverage including outlier: 94%

Average Coverage excluding outlier: 97%

Correlation including outlier: .91

Correlation excluding outlier: .99

Department of Commerce Online Sales Validation

A five-and-a-half-year comparison of comScore's quarterly online sales data with the sales estimates developed by the U.S. Department of Commerce provided another validation of the comScore measurement system. The correlation between the two quarterly estimates was .99 with an average deviation of 4%. (The comScore estimate included the total online non-travel sales less event tickets plus estimated auction fees.)

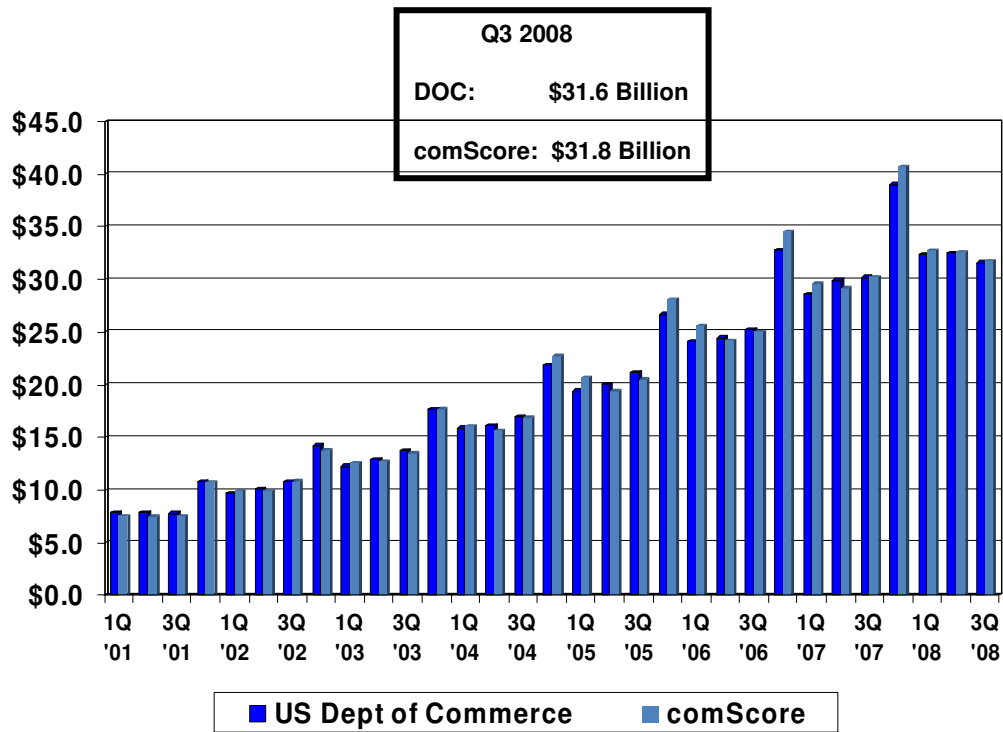


Figure 4. comScore Sales Validation: Comparison of Online Retail Sales (\$Billions/Qtr) $r=.99$

The deviation between comScore’s measures and external Department of Commerce measures averaged 4% across 22 quarters in the Department of Commerce study and 8% across 27 clients in the ad-impression study. The correlation coefficients between the comScore measure and the external measure in the two studies indicated strong relationships, $r = .99$ and $.92$, respectively.

ARF Point of View

The 2001 review of comScore's methodology involved a careful examination of a multi-panel methodology which was not highly dissimilar to the method reviewed here. While that earlier review resulted in a relatively favorable assessment, today's view is stronger and more positive.

Two developments have added to our sense that methodological improvements and enhanced credibility have occurred. First, the three validation studies reported above all provide empirical evidence that the variability between the comScore measures and those provided by external sources are around 5%. That is not perfect, but it is highly encouraging, and it certainly places a bound around the error which a user may expect to experience for similar measures.

Second, the expanding array of related services and tools developed by comScore since 2001 are also important contributors to our stronger perception of methodological rigor and confidence. For example, the recently launched Post-Buy Analysis Service has established a valuable foundation for two of the validation studies reported here.

We think that it is noteworthy to recognize the continued development of **comScore's Six Reporting Levels** in order to accurately and consistently identify and classify Websites and sub-sites. While the dictionary was underway long ago, the continued refinement of the process is important to resolve publisher and research provider differences when they occur. More importantly, it speeds the updating of the reporting system when publisher changes are made. comScore is encouraged to continue this process to build discriminant validity, in tandem with its convergent validity studies.

comScore's use of an offline-recruited Calibration Panel to adjust for bias due to heavy Internet use and the propensity to visit free-ware or coupon sites resonates with this reviewer's judgment that bias measurement and correction are necessary areas of focus for comScore quality enhancement. The use of supermarket checkout recruiting of panelists as a way to combat bias could be improved by triangulating with other behavioral sources, if they exist. We laud comScore's attempts to address this issue, and continue to explore solutions to overcome this distinct challenge.

In the area of coverage in the enumeration panel work, it is evident that cell phone usage is beginning to have an impact. As early as 2006, comScore began to observe a deviation in the age and gender composition of persons in the enumeration sample (total persons, not Internet users) as compared to census data. They surmised that this deviation was the result of the exclusion of Cell Phone Only (CPO) households from the enumeration frame. Effective September 2006, they incorporated design weighting by age and gender to align the enumeration sample with census data, before calculating universe estimates. *To the extent that persons of a given age and gender in CPO households are as likely to use the Internet as persons of the same age and gender in landline households*, this design weighting is corrective for the exclusion of CPO households. However, comScore has concluded, and the ARF agrees, that CPO households cannot continue to be excluded from the frame.

Beginning in March 2009, comScore will be incorporating cell-only calling into the creation of Universe Estimates. comScore is participating in a Mobil Omnibus conducted by a third party, and is weighting landline calling and cell-only calling based on the CDC NHIS estimate of cell-only US households (16.6% as of December, 2008 based on data from January to June 2008.)

This is comScore's first iteration into solving the cell-only issue; they expect the incorporation of cell phone calling to evolve over time.

The Omnibus survey begins with an SSI frame of cell phone numbers and produces four quarterly waves of 500 completes each; comScore has added the questions from their enumeration survey necessary to generate the universe projections needed for Media Metrix.

We would be remiss without stressing the ARF principle that continuous improvement in market research is a necessity, not a luxury. comScore would do well to continue to drive improvements as: (1) more complete data becomes available (e.g., effect of exclusion of cell-phone-only households from enumeration); (2) domains and populations evolve and change; and (3) more sophisticated statistical procedures emerge.

comScore Policies and Stakeholders

comScore Inc. is a publicly held research company with its headquarters in Reston, VA, and offices in New York, NY, Chicago, IL, Seattle, WA, San Francisco, CA, London, UK, Paris, France, Toronto, CA, and Tokyo, JPN. The CEO is Dr. Magid Abraham, Ph. D. and the chairman is Gian Fulgoni.

comScore Media Metrix, a business unit of comScore Inc., provides industry-leading Internet audience measurement services that report details of online media usage, visitor demographics and online buying power for the home, work and university audiences across local U.S. markets and across the globe. comScore Media Metrix continues the tradition of quality and innovation established by its Media Metrix syndicated Internet ratings -- long recognized as the currency in online media measurement among financial analysts, advertising agencies, publishers and marketers -- while drawing upon comScore's advanced technologies to address important new industry requirements. All comScore Media Metrix syndicated ratings are based on industry-sanctioned sampling methodologies.

comScore Inc. is a global leader in measuring the digital age. This capability is based on a massive, global cross-sectional panel of more than 2 million consumers who have given comScore permission to confidentially capture their browsing and transaction behavior, including online and offline. comScore panelists also participate in survey research that captures and integrates their attitudes and intentions. Through its proprietary technology, comScore measures what matters across a broad spectrum of behavior and attitudes.

comScore consultants apply this deep knowledge of customers and competitors to help clients design powerful marketing strategies and tactics that deliver superior ROI. comScore services are used by global leaders such as AOL, Microsoft, Yahoo!, Verizon, Best Buy, The Newspaper Association of America, Tribune Interactive, ESPN, Fox Sports, Nestlé, MBNA, Universal McCann, the United States Postal Service, Merck and Expedia.

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