Digital Out of Home

A Primer

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An Introduction

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What are digital signage and digital out of home?

Digital signage is everywhere you look. It's the digital billboard you drive by when you're on the highway. It's the display at the airport that tells you what gate your flight is leaving from. It's the digital menu board you look at to see what's available to order from the counter of a restaurant. It's the digital touch screen map that helps you know how to get around a mall. It's even the black and white display running along the shelves of the grocery store that shows dynamic pricing for the items displayed. Digital signage is any digital display not in a private area that provides information and that's not personal to you. (The TV at your house? Not digital signage. Your cell phone or personal tablet? Not digital signage. The monitor for your computer at work? Not digital signage.)

The concept of digital signage can be confusing -- it's clouded by the overabundance of terms describing it: digital out of home (DOOH), captive audience networks, in-store media, video advertising networks, narrowcasting and audiovisual signage, to name a few of the more popular references.

So how do we actually define digital signage? Digital signage is a network of digital displays that is centrally manageable and addressable for targeted information, entertainment, merchandising and advertising.

DOOH stands for Digital out of Home. Although it sounds like it might be the same thing as digital signage, and is often used interchangeably, it's actually more specific. DOOH refers to digital displays outside of the home that have advertising and can have their advertising content changed remotely using digital technology. In a nutshell, all DOOH is digital signage, but not all digital signage would be considered DOOH.

Digital signage can be an extremely effective and affordable communications medium for businesses and institutions of all types and sizes. And although not all digital signage has advertising, DOOH and the opportunity for advertising are major drivers of the growth of this market.

Ecosystem (Players)

The current state of the digital signage market has evolved in a complicated way. Large scale messaging, OOH (out of home) advertising and really anything that used to be on paper can now be more conveniently shown on a display. This transition to digital has happened in a

short amount of time. Printed billboards and outdoor advertising posters went digital. Corporate communications via bulletin boards and memos went digital. Restaurant menu boards went digital. Retail store imaging went digital.

Unfortunately, the transition to digital happened without any industry standards or uniform approaches, which has led to fragmented technology and platforms. There are many different players doing the same things but in slightly different ways, using slightly different terminologies and methods of getting things done, some of which are incompatible. In recent years, the market has consolidated and standardized a bit, with more companies and technologies working together, but there are still many different players that you should know.

Network owners -- for whom this guide is written -- are those who own or operate a network of displays (or potentially a single display) that are in public spaces. That could include owners of digital billboards, a retail store or grocery store owner with displays at one or multiple locations, a university, a hospital, a hotel, an airport or any number of organizations that have public or semi-public locations with displays, or that could have displays, with messaging on them.

There are numerous technology providers. There are manufacturers that make a range of relevant hardware, including displays (of which there are many types), media players (which are sometimes just computers), mounts, kiosks, networking hardware. There are also manufacturers of software that create, manage and schedule content (called Content Management Systems or a "CMS"). Sometimes the CMS software is bundled with media players, and sometimes players are embedded inside displays. There are many different hardware and software configurations.

Digital signage CMS platforms can not only schedule and manage content, but many can also create the content. Most come with templates and plug-ins to allow a network owner to create content in-house, even without a design expert on staff. Many CMS platforms are designed for specific digital signage network types, with the scheduling and content features geared for that application, including ones that specialize in digital signage for educational institutions, retail environments or hotels -- but there are many possibilities. There are also companies that specialize in digital signage content design and management.

There are companies that design, manage and support the systems once they are installed. Installation and design is often done by an outside company that specializes in digital signage, such as an AV integrator or IT company. This is one way network operators can buy a system. Big network operators sometimes buy directly from a manufacturer, who can bring in a team to design and install the system if the sale is large enough.

Any network owner that wants to include advertising as part of the content needs to understand the many players in this part of the industry as well. Many networks are entirely ad-based, but there are other networks that only have advertising part-time, or need to consider advertising as a revenue source even though the main purpose of the network is another type of communication. Many network owners rely on advertising revenue to pay for the costs of putting in and maintaining a network, even if there's other content on the network. A good example is companies that install free wayfinding kiosks on city streets that help pedestrians find their way around or to points of interest. The company that installs the network of displays sells ads and shares revenue with the city, which gets the benefit of the wayfinding system and some extra money without having to pay anything up front.

The network owners can sell ads themselves, hire an outside company or person (a sales representative or sales rep firm), partner with another company that deals with the advertising side or do it all using software. There's software that helps manage, serve and track ads. This is often a part of a CMS, but not always. On the other side, there are advertisers and the people who represent them -- ad buyers, ad agencies and media planners.

The process of selling and buying DOOH advertising can now be automated on both sides via programmatic advertising platforms. Programmatic advertising is simply the automated buying and selling of advertising based on data and computer systems. Sellers use an SSP (Supply Side Platform) to make their DOOH advertising inventory available to multiple buyers. Buyers use a DSP (Demand Side Platform) to place ads across multiple media owners and environments simultaneously. In between these platforms is an ad exchange, which is basically an auction-driven marketplace for digital advertising inventory. DOOH is now available on ad exchanges that sell multiple kinds of digital ad space, allowing DOOH ads to be bought and sold on a large scale alongside mobile ads, Internet display ads, paid social media and many other kinds. The cross platform integration is key here, because the ability to see the value of audiences reached by DOOH, in the context of all other digital audiences an advertisers wants to reach, is what is allowing the DOOH market to grow and scale.

Because advertisers need data to decide where to place ads and how much to pay, there's also a whole industry around the collection of audience and impression data. There are several organizations that collect audience location data across a wide range of media and locations, such as Geopath (non-profit and specializing in OOH -- out of home -- advertising audiences) and Nielsen (private, global measurement and data analytics company well known for radio and television audience measurement). The Media Rating Council (MRC) was established by the U.S. government in the 1960s to improve the quality of audience measurement. It now works with numerous organizations in the OOH space, including Geopath, to establish standards and protocols for measurement of OOH audiences.

There are numerous companies that analyze a range of audience data to provide further insights beyond impressions. Location data from mobile devices (GPS, cellular, etc.) and technologies that work with it have been very helpful in tracking and analyzing metrics in this space, providing previously unavailable insights into consumer behavior and how people engage with brands that advertise on OOH and DOOH displays. There are also now numerous types of advanced technologies that leverage cameras, computer vision and artificial intelligence to "see" people and things in front of OOH and DOOH displays and make observations about what is seen. Facial detection software can detect people in spaces and report on whether they look at a display and for how long, as well as demographic data about those people (age, gender, etc.).

As you can see, there are numerous players in digital signage, all offering different types of hardware, software, analytics and data, support, content design and services. It can be overwhelming, but there are many companies offering turnkey networks, including hardware, software, support, maintenance, content and audience analytics. Who you engage to help you depends on your goals, resources and budget. Further below is a needs analysis that will help you.

Environment Types

Environmental Classification	Definition
Shopping Mall	Indoor or outdoor shopping area traditionally considered a "mall"
Shopping Center	Smaller shopping facility in which a group of stores tend to face the parking lot
Lifestyle Center	Multi-use shopping facility of retail/offices/housing/etc.
Outlet Mall	Shopping facility with large parking areas and overflow stores, often outdoor without a food court
Food Court	Facility with multiple food vendors and a common seating area
Retail	Store selling one or multiple types of products, in which shoppers spend a moderate amount of time
Grocery Store	Store mainly specialized in distribution of groceries
Convenience Store	Location that offers a variety of goods for purchase -- usually a quick shopping experience such as the store in a gas station or a bodega
Bar	Facility where the majority of patrons go for the purpose of drinking

Environmental Classification	Definition
Sit-down Restaurant	Dining facility where the majority of patrons sit at a table to order food
Quick-Serve Restaurants	Dining facility where patrons order food from a counter then sit or leave to eat, or sometimes go through a drive-through
Transit Hub	A multi-modal transportation stop; usually multi-platform and allows pedestrians to transfer between trains, busses, streetcars, light rail, etc.
Transit Station	A stop along a transit line that is unique to one mode of public transportation
Airport	Regional, international or private airport
Office Building	Multi-business office building
Business	Single business office
Theater	Single or multi-auditorium venue for watching movies/plays/musicals/etc.
Casino	Gambling facility and associated hotel if one exists
Hotel	Hotel, motel or resort
Stadium	Sports stadium
Indoor Recreation	Indoor location where patrons spend leisure time but do not necessarily buy anything
Outdoor Recreation	Outdoor location where patrons spend leisure time
Academic Building	Classroom building or library (universities, as well as primary and secondary schools)
Institutional Housing	Housing designed for temporary use
Student Center	Collegiate building designed for multiple purposes such as dining, studying and shopping
Spiritual Center	Place of worship
Gas Station	Gas Station
Rest Stop	Facility along roadway for stopping, often with food, gas and convenience shopping

DOOH is typically divided into two categories that address audience types:

Large-format displays are seen by large and varied audiences, typically in public areas where pedestrians and/or vehicular traffic are passing by. Examples include highway billboards, ads on buses or the outside of other moving vehicles and street furniture, which are displays along sidewalks such as those on benches and bus shelters.

Digital place-based media are digital displays in destination locations -- places people are going for a reason other than seeing the display (as opposed to, for example, a movie theater). The audiences are more specific than large format displays, because the content can be related contextually to the place that the audience is and their reason for going there. These include displays in airports, on university campuses, inside taxis, in restaurants and bars, in retail stores, in doctors' waiting rooms -- the possibilities are endless.

Digital signage can also generally be categorized in other ways that address the unique challenges of specific environments.

Outdoor (Outside)

Outdoor digital signage has different technology challenges than indoor environments. Displays must be visible even when there's a lot of ambient light, such as direct sunlight, so they have to be bright. The hardware has to be able to withstand heat, cold, dust, water and more, depending on the environment.

Examples:

- Drive-through restaurant menu boards
- Outdoor electronic billboards
- Outdoor wayfinding displays
- Digital street signs
- Street furniture

Indoor (Inside)

Indoor environments offer more flexibility than outdoor environments for digital signage, as the weather, temperature and vandalism concerns are mitigated. Indoor environments vary greatly, and present opportunities to use a wide array of display types, sizes and shapes to meet particular use cases. With this in mind, the most important consideration is generally context. Decisions must be made that balance objectives, available space and the ambient environment. Teams must think through a number of concerns including:

- Ideal spots to install
- Viewability based on behavior near the display
- The use (or non-use) of audio

- Number and genre of competing/complementary messages around it (particularly in a store)
- What type of content will enhance the value for the viewer
- Typical viewer dwell time
- Cost and complexity regarding power provision and proper mounting
- Network/display connectivity
- Ability and methods to properly measure traffic and engagement

Small format (Inside)

Small format displays present less technical challenges than large format ones, since you'll typically just be picking the size of the flat panel display you're going to use. A single flat panel display wouldn't typically be larger than 110" (measured diagonally), which is currently about the largest display of that type that can be manufactured. Most of the time you still wouldn't use a single display that big, because it would be more cost effective to build a small video wall with smaller displays.

Examples:

- Doctors' office waiting rooms
- Indoor digital menu boards
- Single displays in retail stores
- Corporate communications
- Indoor kiosks for wayfinding or information

Large format (Inside)

When it comes to large-format displays, there are more decisions to make, and they have different trade-offs. For large format displays, options include video walls composed of either flat panel displays (LCDs or OLEDs) or direct-view LEDs, as well as projection.

Examples:

- Flight information displays (arrival and departure boards)
- Indoor digital billboards
- Some retail store displays

Interactive Technology

Interactive displays have touch technology incorporated as part of the solution. Projection can technically have touch incorporated using IR or other types of sensors on the projection

surface, but most digital signage applications that need touch will be flat panel displays, either single displays or video walls. Direct-view LED displays would not be used in a touch application. Touch technology can be added to a display using a touch overlay, or be incorporated directly into the display technology. It can work in both indoor and outdoor applications.

Examples of applications that might use touch:

- Public information displays that require user control to navigate menus
- Retail
- Infotainment type displays, that entertain and inform a user at the same time
- Wayfinding kiosks

Audience

So who sees your content? The audience, and what information they need or you want to communicate to them, should be a primary consideration when considering how to build your digital signage network and how you design your content.

Audience measurement will be a key part of your network's success, and is especially critical if your network or display has advertising. Advertisers need information about your audience so they can decide if they want to buy and display ads on your network, how much they are willing to pay for them and what content they should put in their campaigns to target them.

There are numerous ways to measure audiences, which are explained in another part of this document. Standards for audience measurement should be followed by network owners -- this is very important to ad buyers, who need to be able to compare consistent metrics across many different networks and places.

Market Growth

Consumers are more mobile than ever -- increasing the visibility of out of home media. The growth of mobile usage correlates to Americans spending about 70% of their time outside of the home, an increase of 50% over the past two decades, according to research by the OAAA. 60% of consumers' digital media time is now spent on smartphones, tablets and apps, according to Comscore's "2014 U.S. Mobile App Report." The rise of the mobile consumer has expanded marketers' ability to connect with audiences across multiple touch points.

Out of home (OOH) advertising revenue is now $7.7 billion, based on figures released by the (OAAA). The revenue total marks a record all-time high for OOH with 31 consecutive quarters of growth since the most recent recession.

Almost $4.5 billion is expected to be spent on DOOH advertising by 2019 in the United States, which is an increase of $1.2 billion since 2016. According to an article in Adage, "Zenith forecasts that DOOH will grow faster globally than all other buying methods, and PricewaterhouseCoopers predicts that DOOH advertising revenues will overtake traditional media spend in 2020, growing at a rate of 15% a year for the next four years."

The global digital signage market as a whole is expected to grow from $20.74 billion in 2017 to $31.62 billion by 2023, at an estimated CAGR of 7.28%, according to a report by Orbis Research.

Effectiveness

DOOH has shown itself to be a very effective medium for communication and for advertisers. In a 2010 study by Arbitron, 70% of U.S. residents (aged 12 or older) reported seeing a digital video display in a public venue in the last month, and 52% recall seeing one in the last week. The same study reported that 47% of those who had seen a digital place-based video in the past month specifically recalled seeing an ad, and 19% of those say they made an unplanned purchase after seeing an item featured in the ad. A recent InfoTrends study said that digital displays offer 47.7% effectiveness increase on brand awareness and increase the average purchase amount by 29.5%, as well as generate a 32.8% growth in repeat buyers. 42% of shoppers have said they would prefer to shop in a store with in-store video displays, and retailers with digital signage displays experience a 31.8% (average) increase in sales volume.

A study published in 2015 by Nielsen showed that 75% of respondents reported seeing a digital billboard in the past month and 60 percent in the last week. 55% of those were highly engaged, recalling the message on the display. 82% recalled advertisements in the last month with 35% noticing AMBER Alerts or missing child reports and 18% noticing weather alerts. In corporate communications, digital signage displays capture 400% more views than printed displays.

According to a Hospitality Tech study, 38% of those surveyed said they'd be more likely to dine at a quick service restaurant that offered a self-service option, and 41% said they'd be more likely to stay at a hotel that had a self-service check-in / check-out kiosk.

As an advertising medium, DOOH offers advertisers the opportunity to reach broad audiences and have high-impact campaigns. Unlike other types of digital advertising, there are no ad blockers and no click fraud. Technology has allowed for improvements in audience measurement and impression analytics.

And audiences like them! The statistics show that people like digital displays and seek out places that have them. They like completing transactions (even in less traditional ways) on digital displays. They are more likely to look at messaging on a digital display than a printed one. They remember the information they see on them and have higher brand recall when they see ads on digital displays.

Digital signage communications has many advantages over printed communications -- it's faster, easier and less expensive to change. It's scalable. Much of the process can be automated. It offers many benefits to the companies that want to communicate -- and it's clear that audiences like it too.

Data & Privacy

Guiding Principles Regarding Privacy and the Use of Consumer Data

Privacy and Consumer Data Usage Guiding Principles are recommendations intended to provide baseline markers that respect consumer privacy and the use of consumer data. Recognizing that the operational characteristics of DOOH practitioners often differ from one another and technology itself changes rapidly, the following guiding principles anticipate individual companies may need to adopt modifications that are consistent with particular business models.

1. **Privacy by Design:** DOOH practitioners take privacy into account in the entire engineering process to develop products that anticipate and mitigate any privacy concerns.
2. **Transparency Is Critical:** Consumer data collection practices should be transparent and accurately disclosed.
3. **Legitimate Purpose:** DOOH practitioners only collect consumer data for specific, explicit and legitimate purposes.
4. **Compliance with Laws:** The collection and use of consumer data must comply with all applicable laws.
5. **Individual Control:** Consumers should have control over whether to disclose personally identifiable information.

6. **Protection of Personally Identifiable Information:** DOOH practitioners should take reasonable precautions to protect personally identifiable information in their possession from loss, unauthorized access or theft.

The Impact of Privacy Laws

The General Data Protection Regulation (GDPR) was recently enacted in the European Union (EU) related to the data protection and privacy for all individuals within the EU. It also addresses the export of personal data outside the EU. The GDPR aims primarily to give control to individuals over their personal data and to simplify the regulatory environment for international business by unifying the regulation within the EU.

The regulation contains provisions and requirements pertaining to the processing of personal data of individuals inside the EU, and applies to any business established inside or outside the EU, processing personal data of people inside the EU.

GDPR provisions are encouraging lawmakers to consider similar regulations in other regions, most notably the recently adopted California Privacy Act which reflect many aspects of GDRP. These laws pertain to the collection, storage and use of personal consumer data by companies.

DAA

The Digital Advertising Alliance (DAA) establishes and enforces responsible privacy practices across the advertising industry, providing consumers with enhanced transparency and control through multifaceted principles that apply to multi-site data and cross-app data gathered in either desktop, mobile web or mobile app environments. The DAA is an independent non-profit organization led by leading advertising and marketing trade associations. Both IAB and OAAA are members of DAA.

Ad Buying Overview

When planning the deployment of a DOOH network (networks that are completely ad-based or a mix of ad content with non-ad content), you must take into consideration how you will sell ads to buyers, and how they will buy them from you.

Advertisers typically buy ad space from media platforms in one of three ways: directly from the media platform / network itself, via an agency or using technology that automates the buying of ads such as an ad buying platform or programmatic buying via a DSP (demand side platform). Sometimes a network will have a mix of ads purchased in different ways -- think of

when you watch a television broadcast on a local TV channel -- you'll see ads from large, national (or international) companies, which you could find on various TV stations across the country, and also local businesses in your area that are sold by the local TV station, often produced by that TV station itself. Network owners also have choices -- they can sell ads using an in-house sales team, using a rep firm or using technology such as an ad network exchange or SSP (supply side platform).

When a network owner sells ad space directly to advertisers, they form a direct relationship and must negotiate together all the terms of a campaign -- how often the ads will run and for what length of time, how long the campaign will be, what the price will be, how many other ads can be shown in the same spot, who the audience is and how to target them, etc. They will do this using an in-house sales team or a sales rep person or firm.

Sometimes ad buyers may work with an agency that negotiates directly with network owners to purchase ad space. The agency will negotiate all the terms of the campaign on behalf of the advertiser, typically for a percentage of the total ad spend. Larger ad buyers, and even many smaller ones, will frequently use agencies, so all DOOH network owners should become familiar with how agencies work, how they make money and what they require to work with them successfully.

Finally, ad buyers can buy ad space across multiple platforms and networks through programmatic technology. Programmatic is technology that automates the ad buying and selling process, offering efficiency and speed that allows the sales process to scale. The ability to scale DOOH campaigns is critical to its success as an advertising medium and ability to increase its share of advertising revenue.

While there will always be unique publishers, media outlets and venues that advertisers will pursue regardless, increasingly ad buyers are relying on software, data and technology that lets them buy ad space on a large scale based on their desired audience (and other parameters) -- and not because of a relationship with a media or network owner. Standards allow for re-use of creative materials. This means that a single ad buyer could purchase ad space and deploy one set of creative materials to potentially thousands of locations and network types, from cell phones to websites to DOOH -- in a very short time frame. Networks that don't work with programmatic platforms on the sales side are missing out on ad revenue purchased this way.

On the buying side, buyers use a DSP (Demand-Side Platform), which automates the process of buying, serving and tracking ads. All the data (supplied by the network owners or publishers from the other side of the platform, called an SSP -- Supply-Side Platform) is available there and can be looked at as part of much larger buying and media planning

decisions. The ad buyers can buy the ads with what's called Real Time Bidding (RTB), in which they bid against other ad buyers for available ad space. They can also go through a process called programmatic direct, in which qualified buyers (often agencies) are granted access to a programmatic network and can buy directly from the network. The difference is that programmatic direct gives an ad buyer more direct insight into the specific audience of the network its buying from. Using RTB, ad buyers bid based on parameters they set and will have less specifics about the networks their ads actually show up on. Both are sold in a cost per thousand views (CPM) pricing structure, and the views from programmatic direct are typically more expensive, due to the additional information provided on the network and its audience, the views are more valuable.

Most network owners can be successful utilizing a mix of local inventory, selling programmatic direct and RTB sales. No matter what route you choose, it's important that you consider how you want to sell ads at the beginning of your network implementation process, so you can make sure you have the necessary resources set up for that strategy, particularly if ad revenue is an essential part of your network's success.

Extensions & Interactivity

As it becomes increasingly challenging to reach today's consumer in the fragmented media landscape, the effectiveness of DOOH advertising has become more significant to brand marketers. There are a variety of digital marketing avenues that can be used in conjunction with a DOOH campaign to extend the reach and impact of the campaign, driving measurable behaviors such as app downloads, social interaction and content generation, almost all through users' mobile devices.

When combined with other advertising as part of an integrated media plan, OOH has been shown to extend reach and drive consumers to engage with brands online and in-store. A 2012 Media Behavior Institute study showed OOH has the potential to increase the reach of a mobile campaign by up to 316 percent.

Integrating digital marketing via mobile devices with OOH extends the conversation beyond the physical location of the OOH media. Consumers can continue to engage with a brand on a more personal level, even as they move past the physical media. A DOOH campaign can encourage a user to download an app, post to social media using a hashtag, participate in a contest, like a brand on Facebook or follow them on Instagram and so much more.

OOH advertising can incite a consumer to interact with a brand in some capacity (visiting a store, making a purchase, sharing on social). When combined with mobile, immediate action is much more likely. When a consumer interacts with a brand through mobile, it empowers

them to take an action in the moment, whether it's broadcasting the brand's message to their network through social media, RSVPing to an event or even purchasing a product. OOH is a local medium, so mobile can amplify a brand's message when combined with OOH because it creates an avenue through which a consumer can digitally and immediately engage with a brand.

OOH can also be a public venue for user-generated content, either as a way of asking users to submit content or as a way of displaying pictures, text or video. For location-based social media, an OOH display can be used as a check-in point, extending the reach of an OOH campaign to that consumer's social media friends, who may not be (and probably aren't) in the same location. DOOH also allows its content to be updated in real-time based on many factors, including interaction with and communication from viewers. It can also offer immediate feedback and incentives for consumers to participate. For example, a consumer could be prompted to take a photo and share it using a hashtag that immediately shows up on a DOOH display exhibiting user content, like a Twitter wall or Instagram wall.

DOOH also offers another level of interactivity beyond printed OOH because of its ability to integrate touch. Touch interaction allows users to directly interact with DOOH content -- they can play games, personalize content, give their contact information, record and display content, and much more.

Developing a Needs Analysis

The need to understand and, most importantly, to articulate the specific objectives of what you are trying to achieve with the signage system is critical. And you need to do so well before you begin the actual design process of selecting hardware and software, and creating the content to be displayed on-screen.

It is not only imperative to understand what you want the digital signage system to accomplish but also how it will be evaluated. Once the objective has been set, the second most important question revolves around what is called the criteria for judgment. In short, "How will the success or failure of the system be judged and by whom?" What metrics of judgment will be used: ROI, ROO or other qualifiers? How much time do you have to succeed and what are the repercussions if you do or do not meet your objectives? If you do not meet your objectives in short order, will you have time to regroup and try again? On the reverse side of the coin, if you are wildly successful, are you prepared to go from five displays to 50 or even 500 in a large deployment?

No matter what size system you may have in mind, efficient and effective design is of great importance, and it begins with the needs analysis and asking questions critical to the eventual

design. Even if the graphics are bright and colorful and the resolution is high, if the system is not designed through a careful needs analysis, it will not reach its full potential, and it will end up costing more than it should.

Several factors need to be considered when performing a needs analysis on a potential digital signage project, and they follow a deceptively simple process. Understanding what the needs analysis tells us, and applying the information to the hardware and software selection is a key to eventual success. The ultimate design criterion is for the end user to realize and receive true return on investment or return on objectives.

Design

- What is the objective or purpose of this installation?
  - A call to action
  - To sell a product or service
  - To inform the viewer
  - To entertain
- Who is the intended audience/viewer?
  - Customers
  - Employees
  - Visitors
  - Passers-by
- What information do you want to communicate?
  - Product advertising
  - Current information
  - Personalized messages
  - Instructions or directions
- How many displays will be required?
  - Are you looking to deploy the signage in more than one location?
  - Do you have the buy-in from all offices and departments?
  - Are you planning an incremental roll-out?
  - Can the platform you're considering be scaled easily to support an expanded system or will you have to upgrade and sign a contract for more advanced technical support?
- Do you have a lead person designated to evaluate and test the system?

Content

- Where will the content come from? Who is responsible for updating it?
- Who will be responsible for the overall "look and feel" of the content to ensure it reflects your organization's branding?

- Do you have graphic designers on staff or the services of a design firm?
- Can suppliers, vendors or partners of yours help supply content?
- Do you need any special approvals, permissions or waivers?
- What mix of content will make your signage attention-getting and memorable? (To be truly engaging, combine marketing content with informative, even entertaining, content.)
- Will you need to add audio with your content?
  - Is audio permissible in the environment that you have chosen for the digital signage system?
  - Have you planned for the control of audio in the limited area of the display so as not to disturb others not viewing the display?
- Are you prepared for the investment of time and money required to keep the content fresh and relevant?

Advertising (DOOH)

- Will your network have advertising? If yes, is the network all ad-based or a mixture of ads and other content?
- Will you never have advertising on your network, or could you potentially want to add it later? Can the hardware and software you're specifying now support advertising later if you do want it?
- How much money do you expect your network to make? Does it need to pay for itself? Does it need to be a significant source of revenue?
- Does the CMS you're using support advertising? Can you integrate it with other types of software, like an ad server or SSP?
- Who will advertise on your network? Local businesses? Anyone who wants to? Do you need to maintain control over who advertises on your network or what content the ads contain?
- Would you prefer to use an automated system that's part of a larger ad buying platform, or will you sell ads yourself or hire someone else?
- How will you track your audience? How will you track impressions?
  - How will you report it back to advertisers?
  - How will you show proof of play?

Connectivity

- What is the network configuration?
- Are there any bandwidth limitations?
- Will you be sharing a network with other applications outside digital signage?
- Do you have special security concerns?

- Do you need to integrate your digital signage with in-store or company-centric databases?
- Who specifically will be responsible for installing the equipment and connecting it to the network?
- Where will primary servers or players reside? Centrally or remotely?
- What are the distances between the displays and your players?
- For displays located far from a source, what kind of signal distribution are you considering?
- Are you looking to integrate video from another source into your content feed?
- Will the location you're choosing for your displays present any special challenges for cabling or other technology?
- How do you plan to distribute audio as well as control signals?
    - Will these signals travel over their own wiring or use the same cabling used for the video distribution? Does your cabling support these multiple channels?
- What level of network security is needed? Where are there potential network security vulnerabilities and how can they be mitigated?

Operations

- Will you have a single person administer or multiple people who require passwords and permissions for any specific content?
- Who ultimately will be the "owner" of the information?
    - Will it be HR, corporate marketing, MIS, a web content/design team, product marketing/sales or your IT/AV department?
- Is IT involved in the project? Who is the primary contact for IT issues?
- Will any ad agencies or multimedia production companies be involved?
- Who will be responsible for content sourcing and the actual uploads?
    - What are their skill sets? Who are their backups? Are they technically skilled?
- Will you need to update content frequently so it's relevant and timely? How often? Where will those updates come from?
- Is local input from remote sites required to allow users at the displays to make updates?
- Will you need to integrate additional building operations, such as paging, security or fire alarms into the digital signage?
- Who will be notified if a display or player goes offline?
- Will you have someone on-staff to troubleshoot issues and be dispatched to get a display or player up and running?
- Will you have to perform real-time status checks and log reporting of content?
- Does the system support troubleshooting from a remote location or will it require an on-site service call from someone who's hundreds of miles away resulting in lengthy system downtime?
- Are there provisions for proper system backup for operation and storage of content?

- Have you properly estimated the amount of time it takes not to just implement a system, but also manage it and update it with fresh, relevant content later, after the novelty wears off?
- What are your service and support requirements?
- Will your service provider support the entire system?

Software

- Are you considering a hosted or software as a service (SaaS) solution or a single purchase, licensed software solution?
- Will you need to reformat your existing content for the display?
- Will you be streaming multiple media streams and files simultaneously?
    - Does the software interface support this (and will your player have enough CPU processing and memory to prevent lag)?
- Do you plan to send HTML content and XML feeds to your digital signage?
- Do you want to display information crawls or RSS news feeds to audiences?
- Does the player software support this? Is it a standard feature or an add-on?
- If you're considering a system that uses preloaded templates and layouts, have you test driven the system for ease of use and to explore its creative potential?
- Is the system capable of generating automated email alerts in case of system and/ or display failure?
- Does the system perform status checks of connected devices and log content play out for reporting purposes?
- Does the software support image rotation for portrait and landscape layout orientation?
- Thinking of stretching an image across multiple displays in video wall? Does the software support video wall processing?
- Will touch displays be used in your application and will the software support them?
- If you plan to integrate advertising into your content, is the software capable of handling it?
    - Can it interface with ad buying platforms?
- Can it potentially handle both locally purchased ads and ads served from an ad buying platform?

Hardware

- Where will the content be served from?
    - Is there a local media player? If yes, is it part of the display(s)? Can it be placed behind or near the display? How far?
- Does the system need to interface with external hardware, such as a PoS system?
- What display size(s) and resolution(s) will be used?
- Do you plan to orient displays in both portrait and landscape configurations?

    - Does the player solution you have in mind support the rotation of images?
- How exactly will the displays and appliances be mounted? On the ceiling, floor, or wall?
- Do aesthetics play a major part in how you mount displays?
    - What is your wall or floor made from? Do you have a way to wire the hardware in an inconspicuous way?
- How many hours a day will the displays be in use?
- Do you have round-the-clock access to the equipment or do you have to wait until non-business hours to service equipment?
- Based on display locations, will you have potential security issues? Do you need to limit physical access to the hardware that's located in public areas? Can you secure not just the hardware, but also the network ports?
- Do you want to remotely control the display(s)?
- Are there safety considerations with the signage and/or player installation?
- Are there space and heat-dissipation issues?
- Will you need to protect displays and equipment from dust, debris, and the elements, as well extremes in temperature or moisture?
- What are your power needs and can they be met with the existing infrastructure?
- What electrical codes apply? Do you have any power consumption limits?
- Will you have to contend with images being seen in brightly lit or sunlit areas?
- Will your digital signage installation meet all local and federal codes and requirements?
- Does your display or system need to meet ADA requirements?
- If your system has advertising, how does need for audience measurement affect your hardware requirements? Do you need additional hardware (cameras, beacons) to help measure views and keep track of audience information?

Business

- What are the objectives of the digital signage project?
- How will the project be judged in terms of a failure of success and by whom?
- What is the timeline for judgment and what are the repercussions for failure or success?
- Is the digital signage system based on revenue generation, i.e., ROI, and if so, what is the business plan for revenue generation?
- Is the digital signage system based on attainment of objectives, i.e., ROO, and if so, what is the business plan and strategy?
- If the digital signage system is ad-driven, who are the key advertising players and what are their needs?
- Are there participating partners in the project and if so, what is the division of responsibilities and metrics of completion of tasks?
- Have specific vendor/partners been chosen and properly vetted?
- When evaluating a supplier for your digital signage system, also ask:
    - What does the price include? What are the options?

- Is technical support extra, and who provides that support?
- What are the shipping terms, return policies and warranties?
- Is training available? In what format and delivery method? Is the training good? Is the training appropriate for whomever will be managing various parts of the system (content, physical maintenance, etc.)?
- How is customer service handled, and how are complaints adjudicated?

Section 2:

Digital Out of Home

Technology & Infrastructure: How do I build and operate a digital out of home enterprise?

Table of Contents: Section 2

Key players you need (talent required)

There are many types of business models that provide potential network owners options for adding digital signage to their organization. These include but are not limited to:

- Turnkey providers that provide everything, from hardware to content (or everything except content)
- Integrators that design and install systems, with optional maintenance contracts
- Purchased outright, owner-maintained and owner-operated
- Ad-subsidized networks -- vendors install networks and take a larger percentage or all of the advertising revenue, but provide the digital signage system at a reduced cost or no cost)
- DSaaS - Digital Signage as a Service -- systems are typically leased for a fixed monthly cost, for a set term

Bandwidth & Network

A dispersed digital signage network is a network utilizing multiple displays over a geographically large or small area. This area may be a single building or a single campus, as well as citywide or nationwide. The network connectivity could consist of standalone units, a wired LAN, Wi-Fi, cellular broadband or a combination of these. Content management will be by a single CMS and player platform, System on Chip (SoC) or multiple content management systems and player types. Presentation and playlist changes can be as simple as a standalone unit running from a USB, to as complex as a nationwide network managed through a cloud-based or enterprise platform. Regardless of the components making up the network, making sure you have the proper tools and support in place will enhance management productivity, maintain connectivity and enable future capabilities.

Keys to managing the network efficiently:

- Have display and network status communication protocols in place. Should a display or media player go down or network connectivity be lost, have an established system for reporting. This could be by a system notification via email, or on-site personnel instructed to call a support number. Communication is key to eliminating downtime.
- Know your CMS and hardware well. Understanding the platform, scheduling, content types and where the content is originating from will help eliminate many content issues unrelated to the display or media player. Many times, a black display is a content issue and nothing more.
- Have a “display down” plan of action in place. A checklist as to the mission critical relevance of the display should be considered. Is there redundancy in place? Do you

have local trained support techs available for onsite resets or replacements? If so, make sure the local support team is aware of a confirmed service-level agreement (SLA) in advance. This adds value to the product regarding services and increases response time.

- Establish a Responsibility Communication Flowchart. Content schedules, network permissions and support, facility and location access are managed by someone other than you. Have a communication list in place for quick notifications and permissions to access and correct issues. Include your hardware and software vendor support as well as third party onsite support/installation provider. Many times, warranty issues require multiple people to be involved and working together throughout the resolution process.
- Plan for the future. Establish a potential growth plan with the client. Will there be an increase in locations, change in type of content or change in the size and scope of the displays? Preparing for these items in advance will keep you as their management support. It will allow for you to train and prepare for network upgrades and growth. This includes new locations and retrofitting locations to upgrade to the platform.

Whether the network is local or nationwide, homogenous to one CMS, player and connectivity type or a hybrid of all three, understanding every attribute of the solution you are managing is key. Having the right communication support, network component knowledge and on-site personnel will enable you to manage the network more efficiently and successfully.

Display Types and Selection

There are several types of displays available for consideration in a digital signage system – primarily flat panel monitors (such as an LCD displays or OLED displays), direct-view LED displays (such as those in Times Square or large displays viewed from a distance at sporting events) and projectors.

Flat panel monitors can also be arrayed into what's called a video wall format, in which multiple displays are placed next to each other, to present a larger image than could normally be achieved with a single flat-panel monitor. A video wall can be small - a 2x2 video wall is four flat panel monitors arranged in a two-on-top, two-on-bottom configuration or huge configurations with many displays.

Flat Panel Displays

There are two primary types of flat panel displays, which are LCD (Liquid Crystal Display) displays and OLED (Organic Light-Emitting Diode) displays. Plasma displays fell into this

category, but are rarely if ever used anymore due to energy usage, weight and improvements in LCD technology. It is likely we'll see more technologies that fall into this flat panel display range.

Flat panel LCD Displays

LCD stands for Liquid Crystal Display. The liquid crystals are sandwiched together between two pieces of glass. The crystals don't produce light themselves, so another light source, such as an LED, OLED or CCFL must be used. (In consumer TVs, "LED TVs" are actually LED-backlit LCD TVs, which has caused some confusion in the marketplace.) The image is created when an electric current is sent through the crystals, which causes them to shift and show an image, which is visible when a light shines through the moving crystals.

LCDs are bright, widely available in a range of panel sizes and resolutions and generally the most affordable display option for smaller display applications. LCDs become less affordable as they become larger, and max out around 110" diagonal for a single display. Many digital signage applications require displays larger than this. For those applications, you would need to consider using an LCD video wall, direct-view LED or projector.

LCDs also have visible bezels, with less expensive displays typically having wider bezels. In some cases, bezels can be only millimeters thick, but are typically still visible to the human eye, depending on how close a person is standing to the display. This is mostly an issue to consider when using LCDs in a video wall format.

LCD details:

- Sizes range from 3" to 110" with many variations in size of panels available
- Can be used as individual displays or tiled for video walls
- Must have a light source within the panel, such as an LED or CCFL
- Displays can be either edge-lit or back-lit
- Current resolutions include 1080p, 4K and 8K
- Very wide range of qualities and prices
- Can be used in indoor and outdoor applications, either natively (if it's an outdoor rated panel) or within outdoor display housing, such as a kiosk
- Can be curved
- A wide range of brightness levels available
- The most affordable option for displays in digital signage
- Have visible bezels
- Reliable technology with long lifespan, with some commercial versions easily able last for years even with 24/7 usage

OLED Displays

OLED (Organic Light-Emitting Diode) displays are a fairly new technology for use in larger formats, though they have been used in smaller applications such as cell phones, for longer. The emissive layer is sandwiched between a cathode and an anode. OLEDs are sensitive to oxygen, moisture and other environmental factors and must be encapsulated.

Only recent manufacturing improvements have allowed larger format OLED displays to be available to the market. This is a newer technology, and only available from a few manufacturers, but it has many potential advantages for digital signage applications – brightness, flexibility, thinness, ability to be two-sided, even in curved applications. There is likely to be a lot of rapid development, with more options and lower pricing becoming available. At the moment though, OLEDs are limited in availability, particularly in the size of the panel, and expensive.

OLED details:

- Limited sizes available – mostly 55" panels, though an 88" was announced in 2018
- Does not use a separate backlight like LCD displays, since pixels are self emissive
- Displays are very light and thin, in some cases being only 4 millimeters thick
- The thinness of the material easily allows displays to be two-sided
- Current resolutions include 1080p, 4K and 8K
- Has a wide range of flexibility and can be curved, both convex and concave, including two-sided applications
- Can be transparent
- Can be used alone or in video-wall applications
- Has visible bezels
- Still a fairly fragile display technology

Direct-View LED Displays

Direct-view LED displays have been around for a long time. An example is what you might know as Jumbotrons – the big displays at stadiums and concerts that you've seen for decades. (The original JumboTron was produced by Sony in the 1980s, and even once other manufacturers came into the market, the word "jumbotron" became the word everyone used to describe direct-view LED displays they saw in these locations.)

LED stands for light-emitting diode. On direct-view LED displays, the LEDs are mounted directly on a panel and produce both the light source and a color, which changes depending on the voltage of the electricity passed through them. If you walked up to one of these displays, you can easily see the individual LEDs, and even touch them, because there is no glass covering the LEDs.

The size of these LEDs is what's known as pixel pitch. The smaller the pixel pitch, the higher the pixel density and the closer a viewer can be to the display. Pixel pitches range from 0.7-millimeters to 10 millimeters. Displays with smaller pixel pitches and higher pixel density are more expensive and less rugged than those with larger pixel pitches.

The panels the LEDs are mounted on don't require bezels, since there's no glass that needs protecting, so when many panels are combined into a video wall, very large displays can be created that appear seamless to the human eye. They are available in smaller, manageable panels for transport and access for maintenance, but the total sizes of the walls are virtually unlimited. Most of the largest displays you see outdoors – electronic billboards, displays on the side of skyscrapers, the displays in Times Square or Piccadilly Circus – are direct-view LED displays.

Direct-view LED display details:

- Can be used in either outdoor or indoor applications, and are the most common choice for large format, outdoor display applications
- Resolution is dictated by total wall size and pixel pitch
- Can be curved
- Wide range of brightness levels, and is typically the brightest option on the market for applications with direct sunlight or high ambient light
- Panels are robust and reliable, with some options being ruggedized
- Ideal for applications in which displays need to be moved around
- Virtually limitless in size
- Similar life length to LCD displays
- Generally more expensive than LCD displays

Projectors

Projectors are not extremely common in digital signage, but there are few reasons to consider them in certain applications.

Projectors must be projected onto a surface, either from in front or behind, and nothing can obstruct the area between the projector and what it's being projected on. Short throw and ultra short throw projectors use a special lens that allows them to throw a large picture even from a very short distance -- typically inches or centimeters and not feet or meters -- and other technologies like off angle lens shift make it possible for a projector to be placed where it's convenient for the application without affecting picture quality.

There are many types of projector technologies in regular use today – DLP (Digital Light Processing), LCD (Liquid Crystal Display), LED (Light Emitting Diode) and others, as well as a few different light source technologies used in conjunction with them – traditional lamp-

based projectors, laser, laser-phosphor and also LED, again. For example, a projector can be both DLP and LED, or just LED, since LED is both a light source and a way to show an image.

Most digital signage applications would use a laser or laser-phosphor projector because they last much longer and are more robust than their counterpart technologies. Lasers, unlike lamps, are what's known as solid state – they don't have any moving parts. Lamps have to be replaced, sometimes as much as three or four times over the life of the projector itself, because they both burn out and dim over time. Lasers last much longer and need much less maintenance during their lifetime. That makes the total cost of ownership less expensive over time, even though they're more expensive up front. Lasers are also significantly brighter than LED-based projectors (another type of solid-state projection), which most digital signage applications require.

Laser-phosphor is a kind of compromise technology – projectors using laser-phosphor are brighter and less expensive, but they don't last as long or maintain their brightness levels as long as a pure laser projector does, which are also considered to have superior picture quality.

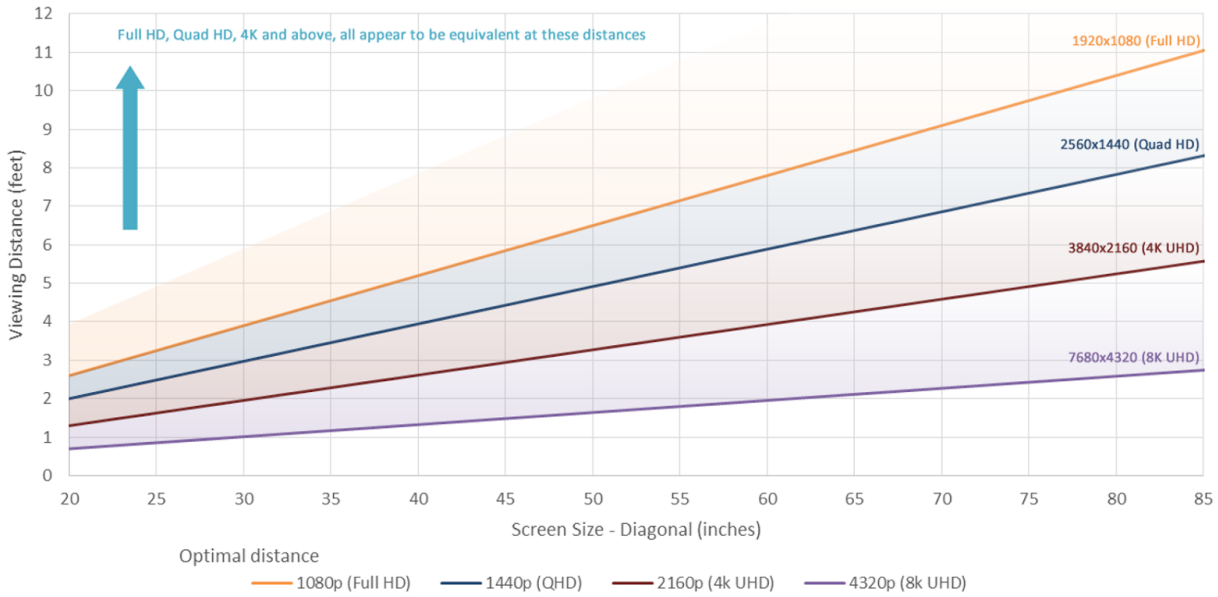
You would typically only consider using a projector in digital signage if you needed a large display image and for whatever reason, a video wall doesn't work. The area perhaps can't support the weight of the displays and their mounts, but can support a projector, or you don't want visible bezels or pixels. If your digital signage application can accommodate a projector, it may also end up being significantly less expensive than the same size video wall.

The biggest potential advantage of projectors over panels is something known as projection mapping. Using special software, projection surfaces can be mapped and then content designed for that particular surface, no matter how irregular the texture or shape is. Almost anything of any size can be projected on, from small 3D objects to skyscrapers. The final result is nothing less than artistry. Many famous buildings, from the Sydney Opera House in Australia to Big Ben in London, have had projection mapping displayed upon them. This unique digital signage application is only possible with projection. It also requires content designers and projection experts with specific expertise and special software.

Projection is also useful for temporary or part-time digital signage use cases because when not in use, projection surfaces can "disappear" much more easily than any kind of display, which will be a big, black box that must be covered up physically to disappear. Projection can be projected on anything (with projection mapping technology), and projection screens can be different colors and textures that more easily blend in with the environment around it when the content is off.

Display Size

The ideal display size depends on the audience size and typical viewing distance. Below is a chart that illustrates ideal display size and resolution based on audience distance.



Hardware Shelf Life

Commercial vs. consumer grade technology products

For budget-minded network owners, it may be tempting to consider using consumer products, particularly displays (TVs), which are often available in the same sizes as commercial displays for less money. While that is certainly an option, some of the reasons to use commercial-grade hardware can be less obvious at the outset. Considerations for why using commercial grade hardware (displays, media players, etc.) are more preferable to consumer grade equipment for digital signage include:

7. Duty cycle use -- consumer products are much less robust since they're not built to be used for long periods of time
8. Total cost of ownership (TCO) -- consumer grade products will have to be replaced more often
9. Connectivity acceptance and options are normally more available in commercial grade equipment
10. Serviceability of the device
11. Installation friendly options, such as rack mounting
12. Greater environmental adaptability

13. Warranties -- commercial equipment has commercial warranties more appropriate for the application; consumer warranties are often invalidated when the product is used in a commercial application

Content Management Systems

Types of content management for digital signage varies. Displays with no advertising can have loose content management schemes, but displays with advertisements require highly structured management, scheduling and reporting.

Scheduling

Scheduling paradigms differ between CMS platforms, but there are two broad categories of approach. The first is loop-based or strict scheduling. In this approach, users set a hard playlist with a set number of spots per loop covering both advertising and non-advertising content. Campaigns are scheduled either based on a set number of spots per loop or on a frequency of number of plays per hour. The second approach is rules-based scheduling, in which content and advertising are dynamically scheduled based on business rules such as audience criteria, price and more.

Cloud-based Systems vs. On-premise Management

On-premise CMS platforms are ideal for media systems that are managed locally and require high security. A cloud-based CMS is ideal for media systems that are managed remotely, require extensive asset storage and have a fast internet connection on-site or a method to cache content locally to mitigate internet outages.

Vendor vs. Commercial Hardware

Some digital signage system providers recommend or require their hardware be used, instead of commercial hardware. Using vendor hardware can help make a system easier to service, since the system is familiar to the vendor. However, using vendor hardware creates system "lock-in." If a client decides to switch to a different CMS or player, they are forced to purchase new hardware.

Player Requirements

Choosing a player is dependent on which content features you want to support, what resolution you need to run, and if you need frame-syncing between multiple computers. It is important to consider your needs today, but also your future needs, as the cost to replace

hardware can be prohibitive. Investing more upfront can yield long-term savings and allow you great flexibility in adopting new technologies as they arise.

Most hardware available today can handle basic 1080p video, however multi-frame layouts and dynamic content such as HTML5 animations will put more of a strain on the player. Higher resolution content (4K and higher) will need players specifically equipped to handle that resolution.

Live Video Input and Feeds

Internet-based video feeds allow displays to show video from live events in real-time. Physical video inputs can also be used to show live video that is available locally. Video capture cards are often necessary to support this.

Real-Time Content

Real-time content is typically produced using HTML technologies, but can also be developed using CMS-specific SDKs. Not all CMS platforms support real-time, generative content. Real-time content that uses external data requires an internet connection to fetch from web-based APIs.

Frame-Syncing

One media player can typically run one large display or many small displays in sync, but when running many large displays, many players may need to be used, in which case, frame-syncing technologies are necessary to keep players in sync with each other.

Content Scheduling & Ad Serving

Content scheduling can be managed either with a playlist or a rules-based system. Playlist systems are easy to alter and quite intuitive, allowing managers to slot new content into a playlist wherever and whenever they choose. This is well-suited for small networks that do not have complex content delivery needs.

For complex or larger networks, however, it can be incredibly time-consuming to add, remove or edit content within many playlists. For these larger networks, a rules-based system will be preferable. These systems allow network operators to set conditions for when and where content should be played, with content delivery automated by the content management system.

Ad serving almost inevitably adds complexity. Advertisers might want content delivered at particular times of day, may not want their ads to play within the same loop as a competitor or may only want certain ads to be played in response to certain conditions (level of foot traffic in a building, the weather outside, etc.) When working with a number of advertisers, managing these kinds of needs on an ongoing basis is most easily done with a rules-based, automated system.

An ad server is a web-based tool that stores, maintains and delivers advertisements to screens. It is a tool used by publishers to help with campaign management and ad trafficking. An ad server also provides reporting on ads displayed. In programmatic transactions, when an impression is available on a media owner's network, the ad server alerts the supply-side platform (SSP) that an impression is available for a programmatic buy to fill. This notification is then broadcast through an exchange, typically providing additional details of the location and other data about the inventory. Buyers can then bid on the inventory in real-time via a demand-side platform (DSP) that is also plugged into the exchange.

Security

Internet access is extremely important to digital signage networks and needs special consideration in terms of integrating the signals across an organization's existing IT network or building a dedicated one. Redundancy should be addressed, as should backup plans for Internet failure -- the more critical the network is to an organization, the more important the backup plan is. For example, a network that goes down in an airport is obviously a much bigger problem than a single display in a doctor's office waiting room.

Digital signage networks are of interest to hackers and other cyber criminals due to the public nature of the displays and the ability to reach a wide audience. Network operators need to take cybersecurity very seriously.

Nature of Threats

An attacker does not need to gain control of your systems to do damage. They only need to disrupt normal operations. If an attacker gains control of a system they can display whatever they want. Physical security of the display and the accessibility of its ports is also important; security on your player and network will mean nothing if the attacker can simply bypass them and plug their own device directly into the display.

Areas of Concern

Run applications with the minimum amount of privileges required. Disable or remove any "Easter Eggs," or maintenance backdoors. Test for overflow and injection vulnerabilities.

Most systems out of the box are not secure. You will need to perform a full review of services, accounts and software. Remove or disable what is not needed.

All communications should be encrypted by default. Certificates or keys must be used. Each mode of communication has its own unique exposures whether it is wireless, DSL, cable or plain old telephone service.

Lockdown and enclose each component. A lock is only a deterrent. Assume that it will be bypassed. Cases should have no external screws; cables should all be routed internally. Expose only what you must (antennae, touch screens, etc.) Develop automatic fallbacks if any item is compromised. A disabled system is better than a compromised system.

Social engineering is one of the most powerful tools available to a hacker. Put policies in place that ensure that information is only revealed to those who need to know and only through proper channels. Make sure that staff is trained in the policies and that training is a continuous process.

Strategies for Protection

Make security an integral part of your plans from the ground up. Don't rely on a single piece of software or hardware for security. Assume each device is vulnerable to attack. A Virtual Private Network (VPN) does not guarantee network security.. Disable unused ports on your Ethernet switch. Disallow all network cards, except for the MAC addresses you know should be on your network.

Reduce the avenues of attack by removing all applications and services that are not needed.

Remove or disable all guest or system accounts that are not needed. Use strong passwords, change them periodically and do not have one universal password that gives away the keys to the kingdom if compromised. Remove the easy web configuration software on your router.

Prepare a plan for patch management. Ensure you identify all items that could need security patches or firmware updates. Routers, hubs, touch screens. Every day hackers find new ways to wreak havoc. Bring an outside expert to review your security.

Make sure that staff is trained in basic policies and procedures. Only share information with known people outside the company.

Turn on logging and enable monitoring of each system that you can and prepare for off-hour notifications via email, text or pagers.

Managed DNS Services

A managed DNS service queries DNS (Domain Name Service) queries through a secure network of servers around the globe. These systems use threat intelligence to produce real-time perspectives on which websites are safe and which sites are known to include malware or other threats. If the system detects that the site you want to reach is known to be infected, you'll automatically be blocked from entry -- keeping your data and boards safe. While there are different managed DNS services, one of the top-four services in the world is Quad9. Unlike other services that either charge users a fee or sell users' data, Quad9 is highly privatized, free and GDPR-compliant.

Two Factor Authentication

Moving beyond the simple username and password sign in, the industry security standard is two-factor authentication. This capability mitigates certain brute force attacks, by having a user authenticate themself first through the standard username and password and then either through a randomly generated number provided by a service (e.g., Okta) and authenticating a user through the app or by having their mobile phone tied to the account and receiving a randomly generated number that they then type into the website.

Email Phishing Mitigation

The number one attack surface for cyber criminals is you and your employees. The vast majority of all successful cyberattacks first begin with a phishing campaign. By pretending to be someone else and sending either an attachment that the user downloads or a link that a user clicks on, a cyber-attacker will gain access to a user's network. One of most efficient means to mitigate phishing risks is to make sure that you are adequately protecting your emails with the following protocols: DMARC, SPF and DKIM. One of the easiest ways for you to see if your emails are protected is by going to DMARC here. This site will allow you to put in your email address and tell you whether or not you are protected and if so at which level. If you are not protected, the site will then walk you through the appropriate steps so that you (or your IT administrator) will have the appropriate script to copy and paste into your email server.

Physical Access

Digital signage systems are often physically accessible to the public. Direct access to hardware dramatically increases the susceptibility of digital signage networks to potential

attack. Network owners must take precautions to limit access or block off physical access to ports and inputs on displays and players.

Where to Go for Additional Information

While it can be overwhelming, the NIST Cyber Security Framework is the all inclusive and ever evolving catalog of knowledge when it comes to cybersecurity. More information on data security can be found on the American Institute of Certified Public Accounts' website and on its SSA16 standards here.

Proof of Play

Proof of play (PoP) is the term used to describe the logging of data on media players. Each time a piece of content is played, the player logs the occurrence and stores it, which is then available for use in reporting to verify the advertiser has received what it paid for. The term "proof of play" is often interchanged with "proof of posting" or "proof of performance" that are used within the OOH market.

These logs are used to validate that what was planned to play on a display did (or didn't) play as expected. It's important to note that player logs on their own can't confirm the display was turned on. Without accurate PoP data, it is difficult to accurately measure success; there is a need to cross reference PoP with other data sets such as impressions from cell phone data, computer vision, webcams or screen grabs.

There is currently a working group setting proof of play standards on a global level; it comprises businesses and trade organizations from around the world. This framework is constantly evolving as new technology emerges and these standards have been developed to support that. Below is the first version.

Purpose

The purpose of this framework is to define consistent proof of play (PoP) standards that can be used globally to support advertisers, media owners, publishers, agencies and third parties involved in the digital out of home industry.

The intention is to introduce a vocabulary and definition to avoid confusion when discussing systems and avoid errors when developing or operating proof of play services. The terms, syntax and definition of the data types are defined to facilitate easy and efficient integrations between systems.

The framework defines eight reporting levels, the data required to generate the report, the method of delivery and any supporting data or systems that can provide secondary or tertiary validation. Importantly, it makes the distinction of self-validation or third-party validation; the latter offers a higher degree of trust and transparency for the advertiser.

For a more detailed view of this table, view the PDF version here. This table will continue to be updated; below is the first iteration. To see the latest version, visit this online document (you must request access).

Proof of play global reporting standards 26 October 2018

		<<<<< Self Verification >>>>>							
		<<<<< Independent Verifcation >>>>>							
Reporting Level		1	2	3	4	5	6	7	8
Delivery method	None	Manual, e.g., figures in an email	Manual, e.g., CSV sent by email	Manual, e.g., CSV sent by email	Manual, e.g., CSV sent by email	API	API	API	API
Format	No play-out information provided	Non-standard data and template	Agreed standardised data and template	Agreed standardised data and template	Agreed standardised data and template	XML or JSON via push or pull API	XML or JSON via push or pull API	XML or JSON via push or pull API	XML or JSON via push or pull API
Proof of play data provided	None	Total number of plays by day	Total number plays by day: - Unique Frame Identifier(*) - Date - Hour - Number of Plays - Spot length - Share of Time	Total number plays by day & hour: - Unique Frame Identifier(*) - Creative ID - Start Date - Start Time - End Date - End Time - Number of Plays - Spot length - Share of Time	Total number of plays by day & hour: - Unique Frame Identifier(*) - Creative ID - Start Date - Start Time - End Date - End Time - Number of Plays - Spot length - Share of Time	All individual play outs: - Unique Frame Identifier(*) - Creative ID - Start Date - Start Time - End Date - End Time - Spot length	All individual play outs: - Unique Frame Identifier(*) - Creative ID - Error codes - Start Date - Start Time - End Date - End Time - Spot length	All individual play outs: - Unique Frame Identifier(*) - Creative ID - Dynamic ID - Error codes - Start Date - Start Time - End Date - End Time - Spot length	All individual play outs: - Unique Frame Identifier(*) - Creative ID - Dynamic ID - Error codes - Start Date - Start Time - End Date - End Time - Spot length - Custom report data validation
Delivery lead time	None	Within 1 week of campaign end date	Within 1 week of campaign end date	Within 24 hrs of campaign end date	Morning after each day of the campaign	Within 1 minute of play	Within 1 minute of play	Within 1 minute of play or faster	Within 1 minute of play or faster
Computer Vision	None	Optional	Optional	Optional	Suggested	Suggested	Suggested	Required	Required
Pixel Tracking (is the screen on, device health?)	None	Required	Required	Required	Required	Required	Required	Required	Required
Verification of display (e.g., webcam grabs)	None	Optional	Optional	Optional	Suggested	Suggested	Required	Required	Required
Mobile data	None	Optional	Optional	Optional	Suggested	Suggested	Required	Required	Required
3rd party impression tracking pixel									
Archiving of data MO side, duration	None	3 months	6 months	1 year	1 year	2 years	2 years	2 years	2 years

(*) Unique Frame Identifier refers to a unique ID required to identify the specific panel where the ad was displayed.

Vocabulary & Definitions

Term	Definition
Self verification (SV)	Self verification is when the media owner or publisher provides the PoP reports without a third party verifying they are accurate.
Independent verification (IV)	Independent verification is when the PoP reports are verified as accurate by a third party.
Campaign	The advertising campaign that the PoP report relates to. This is often referenced in different ways by different stakeholders; further definition is required.
Level (0-8)	The numeric value on a scale of zero to eight that defines what data is included in the PoP report. The higher the number, the more detail the report will provide.
Proof of play data provided	The agreed data provided from each format PoP report to reach the “level” of report.

Term	Definition
Format	The name of the media format that the PoP data is being provided from; this could be a single display or a network.
Delivery method	The way or format the PoP data is delivered, e.g., CSV, Excel, PDF, XML, JSON, API.
Delivery lead time (time)	The amount of time a media owner or publisher takes to deliver the PoP report to a system or individual.
Computer Vision (CV)	The use of image recognition software to count the number of times people looked at the campaign content.
Screen heartbeat (HB)	A system that polls the display at regular intervals to confirm that it is turned on.
Verification of display (VD)	Access to a live webcam or display grabs to show what content was or is displaying on display.
Mobile impression data (MID)	A service or system that provides information on the number of people within a defined demographic who have come within a defined proximity of the display. Typically referred to as “impressions” and represented by a number in the report.
Third-party impression tracking pixel	
Archiving of playout data	The amount of time that the PoP data will be available from the media owner or publishers platform.

Data Schema & Syntax

Terms	Syntax example	Definition
PanelId	Alphanum	Unique Frame Identifier refers to a unique ID required to identify the specific panel where the ad was displayed.
StartDateTime	yyyy-MM-dd HH:mm:ss+/-UTCHH:mm:ss 2018-01-04T12:54:35.916+02:00	Start date and time of reported playout in ISO8601 for date-time in UTC format.
EndDateTime	yyyy-MM-dd HH:mm:ss 2018-01-04T12:54:35.916+02:00	End date and time of reported playout in ISO8601 for date-time in UTC format.
CreativeId	Alphanum	Unique identifier per campaign that indicates the creative displayed.

Terms	Syntax example	Definition
DynamicId	Alphanum	Unique identifier per campaign that indicates the exact asset displayed.
Number of Plays	Integer	Total number of times a creative played by a specific period of time.
Spot Length	Integer	The number of seconds a creative is supposed to be displayed per loop.
Error codes	Alphanum	Codes that relates to errors when communicating with APIs.
OrderId	Alphanum	Sales Order Identifier

Reporting Level Convention

It is recognized that the different stakeholders will be able to achieve different levels of reporting and supply additional supporting data. The following describes how to define what reporting level has been achieved for any format using specific definitions from the framework and what supporting data is available.

Refer to vocabulary and definitions table for detail.

Convention longhand

Level_VerificationType_LeadTime_ComputerVision-ScreenHeartbeat-VerificationDisplay-MobileImpressionData

Convention shorthand

8_IV_RT_CV-SH-VD-MID

Support & Service

Ensure your display provider has revision traceability for both the software and hardware when a new display is deployed this ensure you have a known starting state. Once you have your display system in place, over time there will likely be software updates that can be driven by multiple factors such as innovations, end of life components, operating system, security patches, etc. These notices are typically external drivers that you may receive as a notification from your supplier.

Implementation, a checklist to verify the execution of software and hardware changes should be used to ensure functionality is as expected as well as include steps to ensure any areas of vulnerability are reviewed such as verification of disabled unused ports.

Recording changes, a change log for tracking purposes should be generic in terms of type of update to the display system will serve you well for tracking over the longevity of the display life. Last step would be to log the implementation with; change description, date, revision and identification of person applying the change. Save the change log data in a secure location that is backed up as well as only shared with known people.

Training staff with respect to the policies and software and hardware update procedures should be completed upon display system installation. Scheduled ongoing training should be planned to address personnel and policy changes.

Section 3:

Digital Out of Home

Buying & Selling: How do digital out of home transactions work?

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DOOH is more than a marketing channel; it is a behavior. It is present throughout consumers' travels and daily routines, whether commuting to work, visiting family or taking a road trip. These screens are uniquely positioned as a communication channel that reaches consumers with unparalleled frequency, especially considering on average consumers spend 75 percent of their time on-the-go.

While out of home is one of the original advertising mediums, digital advancements are continually introduced to give consumers the dynamic interactivity, social connectivity, and relevant local brand messaging they value, in real-time, driven by data that fosters authenticity. Buyers utilize familiar data-driven capabilities to increase efficiency for marketers to reach their customers at the right time in the right place. Critically, these advancements have also finally allowed for the scaling of campaigns across multiple mediums, including DOOH.

How ad buyers buy ads

Ad buyers buy ad space on DOOH networks because of the audience, location, timing, share of voice and context of the placement on the network. They pay for either a placement or for impressions (typically priced on a CPM -- cost per thousand -- impressions).

DOOH ads are bought generally in one of two ways:

The first is in a direct, relationship-based transaction between a network and an advertiser. There may be other players within this relationship -- networks may sell via a rep firm and buyers often buy via an agency, but it is a direct transaction, in which pricing and inventory are negotiated between the two players.

DOOH can also be purchased through a programmatic transaction, in which ad sales are automated using software and data. Programmatic technology allows for inventory to be bought and sold in an automated fashion and also enables targeting, measurement and data-driven purchase decisions as well as streamlined ad serving, performance tracking and campaign optimization.

Direct from Media Owner

Ad buyers can purchase inventory directly from network owners. These buys are well suited for campaigns that require guaranteed inventory placements in specific locations, such as experiential, full takeovers or highly customized executions.

Via an Outdoor Specialist Agency

"Outdoor specialist" agencies can be found within international agency holding companies as well as many independent organizations in the market. The outdoor specialist grew out of the need to have people in each market (or DMA -- designated marketing area) who knew where all the billboards were located and what was available to buy at any given time. They had "specialist knowledge" on the medium, hence the name.

Today, media planning agencies will work with outdoor specialists within their holding company or an independent organization to help with the planning, buying and placement of outdoor media, including DOOH. Many brands also work directly with outdoor specialists because they still offer specialist knowledge about the medium and often have planning tools unique to the medium. They also have buying power since they are brokering high-value deals on a regular basis.

Programmatically

"Programmatic" refers to the automation of buying and selling of advertising through software. This is executed via an auction-based marketplace, also known as an exchange, or through private-marketplace deals.

Essentially, network owners (also sometimes referred to as "publishers" or "media owners") provide available inventory discoverable at the individual impression or spot level. Buyers can evaluate and bid on that inventory in real-time, based on certain business rules such as audience criteria, price and more.

For buyers, this is typically executed through a Demand Side Platform (DSP). A DSP is a computer-based platform that automates media buying across multiple sources. DSPs combine wide access to inventory, the ability to apply data-driven targeting rules, real-time bidding capabilities and the ability to serve, track and optimize ads.

Programmatic buying platforms offer advertisers aggregate supply through a single point of access. This means buyers can access a full ecosystem of inventory instead of individually navigating transactions across a fractured media landscape. This provides a centralized purchasing process and better transparency into budgets and campaign performance.

This streamlined buying process eliminates the need to manage individual contracts and insertion orders (IOs). The more efficient workflow that comes with programmatic means that buyers can execute large-scale media programs with much smaller teams.

Furthermore, programmatic allows for the use of data to inform buying decisions across those large-scale media programs. Programmatic technology leverages data to assess every ad placement at the impression/spot level, for truly data-informed purchasing.

Finally, centralized buying through programmatic platforms allows marketers to apply an overarching measurement solution, providing clearer performance and impact insights through aggregated measurement.

How to sell ads

In-house Sales

DOOH networks can sell ad inventory directly to ad buyers. This is a traditional way of doing sales, largely relationship based. It will be a good option for network owners that want to have ads from local businesses.

Rep Firm

Network owners may want to sell direct without using software or programmatic, but not have the capabilities of using an in-house sales team. In this case, they might hire a rep firm or company that specializes in selling advertising on DOOH networks. This is a good option for niche networks, in which a rep firm could represent multiple networks with a unique value proposition to the ad buyers who would like to reach those networks' audiences.

Programmatic Platform

As described above, "programmatic" refers to the automation of buying and selling advertising through software. For DOOH media owners, they can sell their inventory via a supply-side platform (SSP).

An SSP is a computer-based platform that automates media selling across multiple demand sources and a software tool that media owners use to make their inventory available via an exchange. An ad exchange is a digital marketplace that enables advertisers and media owners to buy and sell ad placements via an auction. The ad exchange receives the inventory details, announces each impression/spot and asks buyers if they are interested in buying said impression/spot and at what price.

Programmatic platforms provide media owners (also sometimes referred to as publishers) with aggregate demand, by offering inventory to a large set of buyers through a streamlined access point. Media owners can make inventory discoverable in an instant by leveraging a programmatic exchange. This also enables media owners to access programmatic advertising

groups beyond the standard channel buyers (e.g., digital buyers, agency trading desks, etc.), thus creating a new revenue stream.

Thanks to this large connection to demand, programmatic helps monetize unsold inventory. Through a channel that requires minimal effort, media owners can expose unsold inventory to digital buyers for bidding, effectively maximizing the yield on their full network.

Programmatic technology allows media owners to curate inventory by segmenting target audiences. By surfacing inventory that best aligns with specific audience goals, media owners can justify increased advertiser spend as they'll be reaching their intended customers with efficiency.

What are ad buyers buying and why?

Impressions

An impression is a unit of measure that includes the total number of people with an opportunity to see and notice an ad and that person's dwell time, calibrated to the media spot's length. It can also be defined as the total number of times people passing a DOOH display are likely to notice a message.

Impressions can be measured directly using several different methods, or extrapolated from data published by third parties such as Geopath and Nielsen on either large format or Digital Place-Based types of displays/networks.

Geopath reports impressions and ratings for DOOH advertising across thousands of demographics. Geopath reports each ad unit or spot separately within each digital structure. Using data from mobile devices, connected cars and inputs from its viewability model (Visibility Adjustment Indices, or VAIs), Geopath calculates a dwell time and contact zone that is unique for each location, then calculates how many people see each spot on each structure. This process is applied to street-side, street furniture, transit digital advertising and place-based locations. Variables include traffic speed and congestion, maximum noting distance, road type, digital noticing rate and ad length.

Nielsen's On Location studies measure similar metrics for venue-based DOOH networks. Their studies showcase metrics with average spot impressions, gross impressions and audience distributions across various demographic breakdowns for specific place-based networks. Traffic data is modeled using a variety of transactional inputs, syndicated data sets and on-site counts, while demographic data is collected through a combination of on-site counts, in-person intercepts and online surveys.

Geopath, OAAA and other organizations have also worked with the Media Ratings Council (MRC) to develop standards for audience and ad measurement across all types of OOH media. The MRC is a government entity established by Congress that has the mission "to secure for the media industry and related users audience measurement services that are valid, reliable and effective; to evolve and determine minimum disclosure and ethical criteria for media audience measurement services; and to provide and administer an audit system designed to inform users as to whether such audience measurements are conducted in conformance with the criteria and procedures developed."

In addition to data provided by third parties, network owners can also provide their own impression data that is collected a variety of ways -- using technology such as computer vision, surveys, in-person intercepts, geofencing and others. If you collect impression data for your network, it's important that you disclose your venue traffic, screen traffic and screen audience measurement activity recording process to buyers and other users of the measurement data. An organization's methodology for accumulating media advertising audience measurements should be described in detail to users of the data, including methods for calculating unit audiences where applicable. Specifically, the nature of counts and/or measurements, methods of sampling used (if applicable), data collection methods employed, data editing procedures or other types of data adjustment or projection, calculation explanations, reporting standards (if applicable), reliability of results (if applicable) and limitations of the data shall be included in the disclosure.

The following presents examples of the types of information disclosed.

Nature of Digital Place-Based Media Audience Measurements

- Name/type of venue and displays included in the measurement, including display classification parameters
- Name of measurement report
- Measurement period
- Type of measurements reported
    - Time periods included
    - Days included
    - Universal estimates and coverage estimates used for projection or basis for measurement (measurement unit)
    - Venue or Geographic Areas
    - Significant sub-groupings of data
        - Demographic categories
- Formats of reported data
- Special promotions impacting measurements

- Auditing applied and directions to access the audit report
- Sampling/projections used
    - Sampling methods Used
    - Explanation of projection methods

Data Collection Methods Employed

- Method of data collection
- Venue level data
- Display level data
- Audience qualifiers, views specifics, etc.
- Types of data collected
    - Surveys, diary, observations, electronic measurements, etc.
    - Frequency of collection
- Contacts with users (if applicable)
- Research on accuracy of basic data
    - Latency issues with periodic measurement, as applicable
- Rate of response (if applicable)

Editing or Data Adjustment Procedures

- Checking records for completeness
- Consistency checks
- Accuracy Checks
- Rules for handling inconsistencies
- Circumstances for discarding data
- Handling of partial data records
    - Ascription procedures

Computation of Reported Results

- Description of how estimates are calculated (illustrations are desirable)
- Weighting techniques (if applicable)
- Verification or quality control checks in data processing operations
- Pre-release quality controls
- Reprocessing or error correction rules

Reporting Standards (if applicable)

- Requirements for inclusion in reports, based on minimum activity levels
- Demographic and geographic breaks reported – See DPAA Audience Metrics Guidelines for recommended breaks

Reliability of Results

- Sampling error (if applicable)

Data retention rules

- Maintaining sufficient data or processes that allow for audit trail

Limitations on Data Use

- Non-sampling error
- Errors or unusual conditions noted in reporting period
- Limitations of measurements

In addition to paying for impressions, ad buyers will often pay a premium for access to real-time analytics. This data, which is only available through the use of new technologies (and not older ways of analytics collection, such as surveys, which are too slow to be useful here), is helpful to advertisers because it allows them to test and optimize campaign content and adjust quickly.

Audience

Ad buyers may also buy based on audience, usually defined either by average statistics for a location where a DOOH network (or single display) is installed or by additional data that indicates movement patterns or locations of a desired audience (typically through the use of mobile location data).

There are a some key terms you should understand that will help you understand how marketers in particular talk about audience:

Audience composition: Attributes of the audience of a given campaign or set of campaigns. Very often based on demographic (e.g., 56% male / 44% female) or geographic attributes.

Audience reach: Percentage of an addressable target audience reached by a given campaign.

Behavioral profiles: Profile based on past-observed behavior, typically within 30-90 days of recency. Behavioral profiles may or may not refer to a profile about unique users.

Behavioral segments: Segmenting audiences that are defined by previous behaviors, frequently their recent online behavior, or offline purchases and visitation. For example, an auto advertiser may seek to reach anyone who's visited an auto review site in the last 30 days.

Buyer-graphic: Profile based on past purchase behavior, such as: What items? When? How much was spent?
Census demographics: The U.S. Census Bureau's population statistics.

Consumer spending data: Data on consumer spending.

Demo targeting: Targeting audiences that are defined by demographic attributes, e.g., age, gender, household income, presence of children.

Geographic targeting: Targeting audiences defined by their location in the real-world. Location attributes can vary from granular attributes such as mobile/GPS-enabled latitude/longitude data to broader attributes such as DMA or state/province. In technical specifications, targets may simply be referred to as "geo," "user," or "audience" without spelling out the full term.

Look-alike targeting: Targeting audiences that have some number of attributes in common with an audience of interest. For example, an advertiser may target "look-alikes" of past purchasers, i.e., people who share demographic or behavioral characteristics of past purchasers, but have not themselves made a purchase.

Psychographic targeting: Targeting audiences defined by personality, interests, attitudes or mindsets, e.g., financial optimists or environmentally-conscious consumers. Often driven from offline surveys and stated preferences.

Retargeting: Targeting audiences that are defined by having recently shown interest in an advertiser or having been previously exposed to a campaign in some fashion. In the online world, interest most often is defined as visiting the advertiser's website. In DOOH, this might be based on audiences exposed to a DOOH campaign previously.

Segmentation: Dividing a broad group of consumers or businesses into subgroups (known as segments) based on shared demographic/psychographic/behavioral attributes. Segmentation is often used to create target audiences (comprised of one or more segments) or to customize an offer or message for specific segments.

Target audience: A specific group that an advertiser seeks to reach with its campaign. Target audience is defined by a certain attribute or set of attributes (e.g., women aged 18-24, sports car lovers, shoppers in-market for a new sedan).

Time/Share of Voice

Ad buyers also sometimes buy based on the length of time their ad is on a screen and how often their ad is shown. They may also buy based on Share of Voice (SOV), which is how often and for how long their ad is visible vs. the time other content is visible.

Digital billboards serve as a simple example for demonstrating how SOV is calculated. A typical loop-based digital billboard has eight slots in a loop, each 8 to 10 seconds long. Each advertiser therefore receives 1⁄8 SOV if 100% of the inventory is sold. An advertiser could buy multiple slots to increase their SOV.

Ad buyers can also buy based on frequency, where instead of a spot-in-loop calculation, campaigns are scheduled based on the number of times an ad will play in a given hour on a given display.

Location

DOOH media is frequently bought based on location. Many advertisers -- those seeking space in specific markets -- buy inventory based on CBSA (core based statistical area) or DMA (designated marketing area). Location can also be much more specific than just a geographic area. Even without other demographic information, a person's presence at a specific location or venue provides data valuable to an advertiser, such as proximity to points of interest.

Location can be especially valuable when marketers use location for the creative design of a campaign. For example, British Airways purchased digital billboard space in Piccadilly Circus, not only because of the huge audience numbers in that location, but also because British Airways planes were easily visible flying overhead from that location. Using specialized surveillance technology, they were able to design an ad campaign called #LookUp, in which a video of a child shows him "looking" at the plane flying overhead and puts details about the specific flight that is flying right then. In this example, the ad says "Look up, it's flight BA475 from Barcelona."

Context

Using data and taking into consideration location and time of day, marketers can also use context to design highly targeted campaigns that make a big impact on consumers. The evolution of OOH to DOOH has allowed for fast updates and even real-time updates depending on changes in context. By layering data from third party sources (weather, time of day, day of the week) and even input from viewers with ad content, dynamic and engaging DOOH campaigns can be created in real-time.

An ad on a DOOH display could update if it's raining in the location it's visible in or the temperature dips below a certain percentage. An ad on a digital highway billboard fans see

after watching a game at a sports stadium could change depending on if the team won or lost. Ads can be run for very short periods based on specific events. For example, ads on a train in Chicago the weekend of the Chicago marathon can be marathon-themed or geared toward runners visiting from out of town.

Interactivity also allows another kind of context for ad content. Interactive touch displays in a retail store can have content that engages directly with consumers, letting them decide what content they want to look at and for how long. When combined with social media, displays can integrate user-generated content such as photos or video in real-time into an ad.

Context lets marketers engage more directly with consumers, making the campaign more relevant, memorable and higher impact. The method that allows ad content to be changed in real-time based on data and/or context changes is called dynamic creative optimization.

Inventory Access & Ad Placement

Slots & Loops

Slots and loops are how DOOH has been traditionally bought and sold. A display has a schedule of ads that recur in a set rotation.

Ad Serving

Ad servers allow publishers to control their ad schedule for more flexibility outside of a spot-in-loop structure. Ads can be scheduled based on business rules that account for shifting inventory availability, pricing requirements, different types and lengths of creative, time of day and audience-based campaigns. Most digital signage software is integrated with an ad server, which allows network owners to schedule, plan and sometimes create all of their content.

Ad servers can also be controlled on the advertiser's end, allowing advertisers direct control over the serving and tracking of their ads. The ad serving code would be embedded in a slot on the media owner's platform, but control over what's being served in that location would stay with the advertiser.

Guaranteed vs. Non-Guaranteed

In a programmatic marketplace, there are different types of transactions. These guidelines use four discrete types of "programmatic" transactions -- Automated Guaranteed, Non-guaranteed Fixed Rate, Invitation-Only Auctions and Open Auctions. Some transactions, but

not all, allow buyers to guarantee placement on specific networks or displays, in specific locations or at specific times (or all of these).

Automated guaranteed transactions have reserved inventory with fixed pricing. It allows network owners to set a specific price on specific inventory for a specific ad buyer.

Non-guaranteed fixed rate transactions have unreserved inventory with fixed pricing. Network owners set aside ad inventory and fix a price for it, but offer it up to any ad buyer that is willing to purchase at that price.

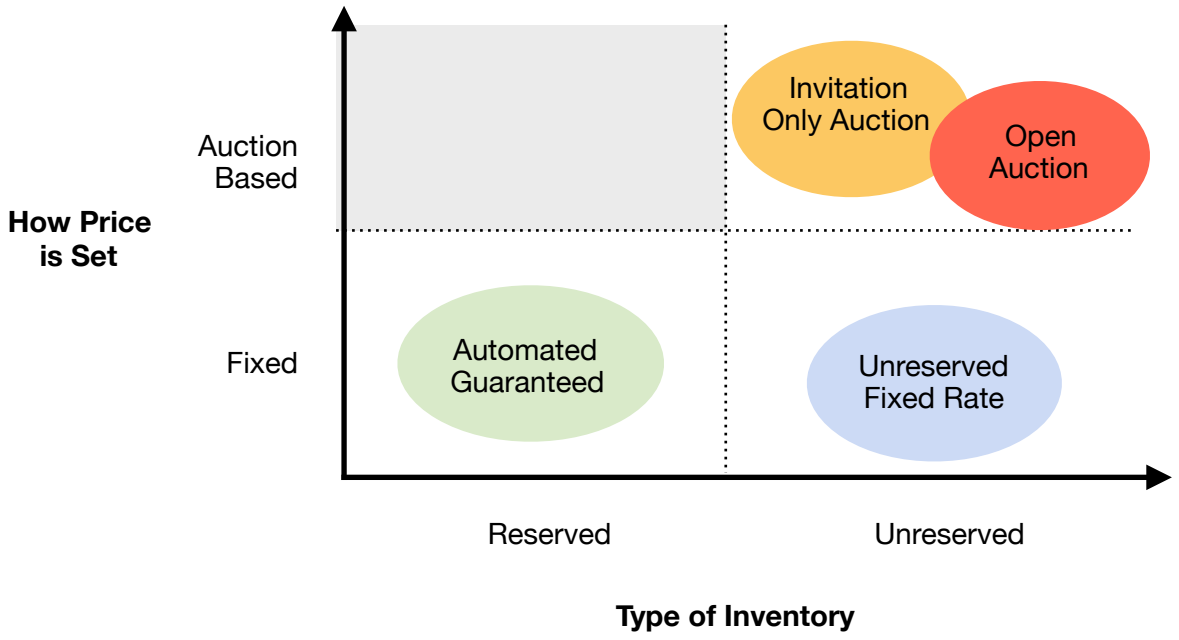
Both invitation-only auctions and open auctions are RTB (Real Time Bidding) based auctions without fixed pricing. For invitation-only auctions, participants have to be invited. This lets ad buyers bid in real-time against other buyers on specific types of network ad space (hence the invitation-only), but transact on impressions without having to commit a specific ad spend up front.

	Type of Inventory (Reserved1, Unreserved)	**Pricing** (Fixed2, Auction)	**Participation** (One Seller-One Buyer, One Seller-Few Buyers, One Seller-All Buyers)	**Other Terms Used in Market**	**Other Considerations**
Automated Guaranteed	Reserved	Fixed	One-One	Programmatic guaranteed Programmatic premium Programmatic direct Programmatic reserved	• **Prioritization in the ad server** • **Deal ID** • **Data usage** • **Transparency to buyer** • **Price floors**
Unreserved Fixed Rate	Unreserved	Fixed	One-One	**Preferred deals** **Private access** **First right of refusal**	
Invitation-Only Auction	Unreserved	Auction	One-Few	**Private marketplace** **Private auction** **Closed auction** **Private access**	
Open Auction	Unreserved	Auction	One-All	**Real-time bidding (RTB)** **Open exchange** **Open marketplace**	

1. Reserved Inventory is advertising space on a publisher's site that is put aside for a specific advertiser for an agreed price
2. Fixed Price is any arrangement where the buyer and seller agree on a flat price that the buyer pays rather than the highest bidder in an auction environment

Mapping the Programmatic Technology

These four types of transactions can be visually mapped based on two key criteria -- how the price is set and what type of inventory is being transacted.



Source: Interactive Advertising Bureau 2019

Section 4:

Digital Out of Home

Creative & Content: How do I develop content and ads for a digital out of home campaign?

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Content & Ads

DOOH is continually innovating in creativity and content production. With full motion video, dynamic real-time content, social media engagement, mobile geo-targeting, multi-screen messaging, syncing and touch screen interactivity, augmented reality, mobile to screen, gesture recognition and more, DOOH advertising rivals the innovation of every digital platform with the ability to reach consumers other mediums simply cannot. It is also an effective reach partner for print out of home campaigns as well as for larger media campaigns that integrate television, audio, online, mobile and print.

Advertisements

Ad content is typically designed by advertisers, creative agencies or production houses. Network owners need to supply content specifications to designers, including:

- Loop or slot length (if applicable)
- Capabilities: linear, dynamic, data-driven, real-time optimization, etc.
- Physical display size
- Resolution of display and aspect ratio
- If sound is available
- Motion types accepted
- File type and maximum size accepted
- Video codec type (if applicable)
- Content restrictions such as adult content, alcohol, violence, drugs, political, etc.

Networks that serve ads programmatically will possibly require additional information, based on the application and specific marketplace.

Content

Third-party content can be displayed in the loop occupying its own slot or it might form part of the overall composition of the creative.

Third party content could be something that is contextually relevant to the location of the screen. For example, there might be local service announcements from the town or municipality to help the citizens aware of something happening in or with their community. Typically this type of content might occupy its own slot.

Content that forms part of the overall content composition could be bus or train times that are relevant to the specific location or a scrolling news headline feed; these are normally seen 100 percent of the time, along with the paid advertising.

Branded/Sponsored Content

Branded or sponsored content is often found on formats that have a longer dwell time such as inside taxis, on gas pumps or in elevators. This content is often from a third-party content producer such as a news or TV station who is making longer-form content that will be in the loop alongside paid advertising.

Branded and sponsored content can also be created by a media owner and sold to an advertiser. For example local weather conditions could be displayed and the advertiser's brand could be present. This approach offers the advertiser an awareness proposition for the audience.

User Experience

Today, audiences have come to expect a high-quality user experience in all of their interactions with brands. If their experience is suboptimal, it's unlikely they will interact in the way the brand intended.

User experience in DOOH can be as simple as making sure the copy size is sufficient for the audience to read it from the intended viewing distance to ensuring the display is bright enough to be viewed in its environment to ensuring a gesture based interface is intuitive enough for the audience to successfully complete the task or reach the goal.

Executional Techniques

Please note that executional techniques and motion and sounds levels can be combined in any combination. For example, dynamic and linear content can be either one of static, subtle motion, full motion, or equally all three motions levels could be applied to a single executional technique. Because of this, the definitions are all individually defined. The combinations are normally defined by what technical capabilities the displays have and what level of motion and sound is permitted based on the contractual or municipality obligations.

Linear (A Static Ad or a Video)

Most DOOH content is linear. Linear ads are full-display ads, either static or video, that are sandwiched between segments of other content. That other content can be other ads (for example, a loop of static ads that show for 10 seconds each or a loop of video ads that play for 15 seconds each). In the case of video, linear ads can also be sandwiched between other

types of video (entertainment or information-providing), the same way you're used to seeing commercials periodically interrupt shows on television.

Linear ads can theoretically (although they often don't, to allow for fast and frequent updates) live locally at a display location to minimize potential for disruption. Ads could play on a loop even if the Internet connection was lost. These are some of the simplest and easiest types of DOOH campaigns to deploy.

Even though they can be deployed simply as a loop, it's also possible for linear ads to be fairly sophisticated. Using scheduling, pre-designed content can be shown if certain conditions are met. For example, different versions of the same ad can be shown depending on the time of day, day of the week, location and so forth. The key difference between this kind of linear ad and the next type, dynamic creative optimization, is that the content already exists and isn't actually redesigned on the fly -- it's waiting and ready to go if conditions change. That means when the creative is being designed on the front end, potentially many different versions of the content would need to be designed.

Dynamic Creative Optimization

Dynamic creative optimization (DCO) is a technique that updates ads based on a variety of data and conditions. In DOOH, DCO is best used to create a higher level of contextualization of the ad based on the audience.

There are three categories of data that can be considered when developing DCO for DOOH.

3. Local player information: Longitude/latitude, date/time, player ID
4. Third party: This could be almost any data feed available from a free or paid services such as weather data, sports scores, social media, stocks and shares, travel information.
5. Owned data that is specific to the brand, such as pricing, availability, user analytics, etc.

DCO can increase the media value by improving sales uplift, adding relevance, increasing attention, making more people more likely to recommend a brand or product or improving response rates. There are many studies to support the use of DCO.

Interactive

Interactive content can create surprising and memorable experiences. Through the use of creative technology, interactive campaigns offer deeper levels of engagement for the audience.This is possibly one of the most exciting areas of digital OOH, with a wider range of

technologies available to deliver unique and innovative executions. Some of the technologies are:

- Touch: Touch screen technology allows for physical interaction with the display
- Gestures: Infrared-based cameras can be used to translate user gestures into interactions
- Recognition: Technology with the ability to know who is looking at content or what is within proximity of the display and when, then tailoring content based on these conditions
- Camera-based: Interacting with a camera for user generated content to create potentially sharable content
- Mobile: Interactions that use smartphones as a method to control on screen content
- Augmented, virtual and mediated reality: Using tools that can make the audience appear to be anywhere, doing anything with anyone
- Physical to digital: Transforming physical, kinetic or haptic interactions into content triggers
- given display.

Motion Levels & Sound

Static

Static DOOH ads are still images with no motion or video. To an advertiser or a viewer, they appear not much different than printed OOH ads.

They can still be served digitally, a huge advantage for ad buyers, which allows easier re-use of existing creative assets, quicker turnover/changeout (at no cost, unlike printed posters or billboards) and the ability to be bought and sold programmatically.

In addition to frequent change outs, digital static ads can also be looped, which means that a single screen can show eight or ten ads at once, for example, or scheduled based on time of day.

Subtle Motion

Subtle motion is a creative technique that allows for the addition of some limited motion graphics to otherwise static creative. Examples are fades, partial motion, especially along the edges of a graphic, and slow movement. This allows for dynamic ad content. Studies have shown that even subtle motion on a digital advertisement can have a positive impact and increase engagement.

Subtle motion ads exist because of federal and state regulations of billboards and other large format OOH that can be seen by vehicle drivers. Video and full motion graphics are typically prohibited by law in this application.

Full Motion

Full motion ads are video or full-motion, computer-rendered graphics. Full motion ads are high impact and desirable to marketers, with such advantages as the use of adapted video content and the ability to display multiple copy messages within a single ad. The length of the ad spots should be dependent on the location and dwell time of the audience.

Format Specifications

Physical Display Sizes

Direct View LED Content

For direct-view LED displays, the relationship between resolution and the display size are a bit different than for other types of displays, and this affects how the content is designed. On a direct view LED display, the pixels (essentially a cluster of LEDs) are mounted directly to the circuit board. On large pixel pitch displays, a pixel contains three separate LEDs -- one green, one red and one blue. On smaller pixel pitch displays, in which the pixels are much smaller, the three emitters (also known as sub-pixels) are placed into a single LED.

Pixel pitch measures the distance between the center of each pixel (LED cluster) in millimeters. So a 5mm LED display has 5 millimeters between the centers of two pixels, while a 1.5mm would only have 1.5 millimeters between the centers.

Since resolution is determined by the number of pixels and the pixels in direct view LED displays are fixed, the resolution of a direct view LED display is determined by only two factors -- the pixel pitch and the physical size of the display. For example, if a direct view LED display has a pixel pitch of 4mm, there would be about 76 pixels in a linear foot (there are 304.8 mm in a linear foot and 304.8/4 = 76.2). To achieve a high definition resolution, which would be a minimum resolution of 1280x720 pixels, the size of the display would have to be approximately 16.8 feet x 9.5 feet.

On other types of displays, content that is the same aspect ratio can often be scaled with the use of a high quality scaler, either up or down. Because of the visibility of the pixels on direct view LEDs, content should ideally be the exact resolution of the display. So if a display has a

resolution of 1280x720, the ideal content is designed to exactly 1280x720, rather than another 16:9 aspect ratio resolution.

Pixel Width & Height

Content for DOOH screens are typically in the following aspect ratios (for full-screen ads):

16:9 (horizontal) or 9:16 (vertical)
Common resolutions:
HD: 1920x1080 or 1080x1920 (often referred to as 1080p)
HD: 1280x720 or 720x1280 (often referred to as 720p)
UHD/4K: 3840x2160 or 2160x3840

16:10 (horizontal) or 10:16 (vertical)
Common resolutions:
HD: 1920x1200

Other common resolutions:

- 160x600 (skyscraper)
- 448x252 (rectangle - small)
- 300x250 (rectangle - medium)
- 640x480 (rectangle - large)
- 728x90 (leaderboard)
- 400x1400 (bulletin board)
- 400x840 (poster billboard)

File Types & Sizes

IMAGE SPECS
The following specs cover image creative types. Some specifications may allow animations where others are static images. Image files should not require additional manipulation prior to delivery to the out of home console.

Size	Name	File Format	Animation	Minimum DPI	Max File Size
1080 x 1920	Poster (V)	.jpg, .bmp, .gif	No - static only	72	500 kb
1080 x 1920 Dyamic	Poster (V)	.jpg, .bmp, .gif, html5	No - static only	72	500 kb
160 x 600	Skyscraper	.jpg, .bmp, .gif, html5	Yes - up to 15 seconds	n/a	200 kb
1920 x 1080	Poster (H)	.jpg, .bmp, .gif	No - static only	72	500 kb
1920 x 1080 Dynamic	Poster (H)	.jpg, .bmp, .gif, html5	No - static only	72	500 kb
300 x 250	Rectangle - medium	.jpg, .bmp, .gif, html5	Yes - up to 15 seconds	n/a	200 kb
448 x 252	Rectangle - small	.jpg, .bmp, .gif	Yes - up to 30 seconds	n/a	250 kb
640 x 480	Rectangle - large	.jpg, .bmp, .gif	Yes - up to 30 seconds	n/a	250 kb
728 x 90	Leaderboard	.jpg, .bmp, .gif, html5	Yes - up to 15 seconds	n/a	250 kb
400 x 1400	Bulletin Board	.jpg, .bmp, .gif	No - static only	72	
400 x 840	Poster Billboard	.jpg, .bmp, .gif	No - static only	72	

- Orientation: Describes whether the image will be displayed in portrait or landscape
- File format: Highlights the available file formats for creative submissions
- Animation: Identifies whether the execution allows for any animation
- Minimum DPI: Defines the minimum pixel dots per inch to ensure clarity of the image for rendering on media consoles of various screen dimensions
- Max file size: Represents the maximum file size allowable in kb (kilobytes) or MB (megabytes)

VIDEO SPECS (NO SOUND)

The following specs cover video enabled executions which do not offer sound. Video creative can be a full-motion video or animated gif format. Some video files may be encoded to enable successful delivery to the media console.

VIDEO SPECS (NO SOUND PLAYBACK)

Size	Name	File Format	Codec	Ratio	FPS	Max File Size	Animation Length (seconds)
1080 x 1920	Video - Silent	.mov, .mp4	H.264, Apple ProRes	9:16	29.97	7 MB	8, 10, 15, or 30
1920x1080	Video - Silent	.mov, .mp4	H.264, Apple ProRes	16:9	29.97	7 MB	8, 10, 15, or 30
640 x 480	Video - Silent	.mov, .mp4	H.264, Apple ProRes	4:3	29.97	7 MB	8, 10, 15, or 30

Note: Alternatively, an animated .GIF can be submitted utilizing the image specs

Terminology:

- File format: Highlights the available file formats for creative submissions
- Codec: Software for encoding and decoding digital video
- Ratio: Defines the video aspect ratio
- FPS: Video recording should match the recommended frames per second
- Max file size: Represents the maximum file size allowable in MB (megabytes)
- Animated GIF: Identifies whether an animated .gif file format can be delivered for the video execution
- Animation length: Describes the maximum length of the video animation

VIDEO SPECS (WITH SOUND)

The following specs cover video enabled executions which offer sound. Video creative can be a full-motion video or animated GIF format. Some video files may be encoded to enable successful delivery to the media console.

Size	Name	File Format	Codec	Ratio	FPS	Audio Codec	Max File Size	Animation Length (seconds)
1080 x 1920	Video	.mov, .mp4	H.264, Apple ProRes	9:16	29.97	MP3 or AAC	7 MB	8, 10, 15, or 30
1920x1080	Video	.mov, .mp4	H.264, Apple ProRes	16:9	29.97	MP3 or AAC	7 MB	8, 10, 15, or 30
VAST	IAB VAST	.mov, .mp4	H.264, Apple ProRes	16:9	29.97	MP3 or AAC	7 MB	6, 15, or 30
1920 x 1080p Cinema	Cinema Video	.mov, .mp4	Apple ProRes 42 2HQ	16:9, 1.85, 2.35	23.98	ACC or AC-3	Unlimited	8, 10, 15, 30, 60, 90 or 120s
640 x 480	Video	.mov, .mp4	H.264, Apple ProRes	4:3	29.97	MP3 or AAC	7 MB	8, 10, 15, or 30

Terminology:

- Codec: Software for encoding and decoding digital video
- Ratio: Defines the video aspect ratio
- FPS: Video recording should match the recommended frames-per-second
- Audio codec: Software for coding and decoding a digital audio stream
- Max file size: Represents the maximum file size allowable in MB (megabytes)
- Animation length: Describes the maximum length of the video animation

Content Production Teams & Curation

Content production is the process of originating or modifying creative assets using specific techniques to deliver the desired final asset that will be played out on screen. With the wide range of executional techniques available and with advertisers having an ever increasing ambition to push creative boundaries, it is important to have a production team that has the specialist skills needed to deliver that ambition.

A full service production studio in today's landscape is likely to include the following team members: creative and technical directors, experience, motion graphic, 3D and graphic designers, copy writers, illustrators, front and back end developers, technicians, project managers or producers, quality assurance specialists and account management.

These teams will be capable of modifying or originating the assets, then outputting them to meet the defined specifications of each format and generally work on time- and material-based invoicing, which means each project will be quoted on a case-by-case basis.

When curating a team to work on a project, it is important to find one that has the experience to deliver the project requirements within the time and budget constraints that have been defined. It is important to share quality expectations and state the budget that is available, which will allow the team or production house to accurately define the scope of what they will deliver. This is normally in the form of a scope-of-work document, which can be used as a schedule in contracts, protects all parties and should facilitate the delivery of the project.

Content Rights Management

Given the number of potential stakeholders in the production and delivery of content to a display, it is important be aware of content rights management. On the most basic level, no content should be shown on a display without the permission of the content owner.

For example, large sporting events such as the Olympics or FIFA World Cup have copyrights on the event names and all associated content. They do not allow that content to be displayed unless you are an official sponsor and even then, only working within the constraints of the content agreement.

The responsibility of content rights management normally rests with the advertiser, but the media owner should be aware of any potential implications based on the agreements with the landlord of the site the media is on. If there are any doubts about content rights, we suggest that specialist legal advice is sought.

Section 5:

Digital Out of Home

Measuring Success: How do I know digital out of home is effective?

Table of Contents: Section 5

Business Rules

Networks want to sell ads and advertisers want to buy ads, but the many diverse networks and the many diverse advertisers have presented a challenge for DOOH as a whole. How does the right advertiser find the right network and the right network find the right advertiser? This desire for cooperation between networks and advertisers, as well as the continued technology advancements, has presented an opportunity to identify and implement industry-wide policies to satisfy the needs of both buyers and sellers, simplify the buying process and enabling DOOH advertising to be more competitive with other media.

Complete assimilation of DOOH industry standards is only possible through compliance by the buyers and sellers operating within the DOOH industry and a high level of commitment.

Buyer Expectation Management

Buyers expect prompt responses to their inquiries and thorough information before, during, and after a DOOH campaign. Expectations will also vary depending on who the buyer is and how they are buying -- an advertiser (local or not) that wants to buy direct from a network, an agency buying ad space on behalf of an advertiser directly from a network or one of those two that is using programmatic ad buying to buy ad space either via RTB (real time bidding) or programmatic direct. Who provides the information above and when will also depend on how the ads are purchased. For example, if a network only sells ads programmatically via RTB, all the standardized audience data will be gathered and entered into their SSP (sales side platform) and updated on a regular basis, with ad sales going on continuously. If a network is selling to a local advertiser directly, they would provide the most recent data they had available at the time the advertiser requested a media kit or a proposal, and perhaps with audience demographics specifically requested by that advertiser.

Generally, buyers will expect to receive before they buy ads:

- Information on the network itself -- number of screens, location data, etc.
- Information on the audience, including size, location and other specific demographic information
- Pricing for an ad spend depending on their campaign details (unless being purchased via RTB)

After the ads play, the ad buyer will expect to receive:

- Proof of play (confirmed venue list with initial playback counts)
- Proof of performance (verified venue list with final playback that indicate fulfillment of contract terms)

Proof of Play

Advertising buyers require proof that an ad played back on a digital signage system, often referred to as PoP (proof of play). This is done with logs provided by digital signage software or ad scheduling platforms, though this typically measures scheduling of ads, not technically whether it actually showed up on the displays or not as planned. An ad could be scheduled and then not be shown as planned if for example, a display overheated and went dark, or a system lost power or a piece of software malfunctioned. Technical problems can and do happen, even to the best maintained systems.

Because of this, some advertisers will require additional metrics for proof of play, such as via third-party audits of play logs or external cameras that externally record what is played on a display. They may also require records that show that the display was on and functioning as intended. "Proof of display" or "proof of performance" data can take data from the hardware itself, verifying that the display is receiving power and is connected to the network and doing what it's supposed to be doing.

It is important that PoP be consistent across networks, so the following recommendations are made for PoP. Network owners should adapt these guidelines as needed, depending on requests from an ad buyer or if a platform requires something different.

A framework has been defined to standardize proof of play and how it work with other forms of validation. This is defined in our document "Technology & Infrastructure," visit this link for the latest version.

KPI Measurement

BRAND LIFT

Brand lift is a measurement of an advertising campaign's effectiveness in driving a positive shift in customer awareness and perception of a brand. Simply put, did a brand see a lift in sales or other key metric immediately after running a campaign? If there are simultaneous campaigns, it can be difficult to sort out which campaign affected the metric, so it's important that if brand lift is a KPI that campaigns be done one at a time. Marketers sometimes also use Brand Health as a KPI, which is the way a brand is viewed by its customers and how the audience feels about the brand (also known as "brand equity.")

FOOT TRAFFIC

Foot traffic attribution is the measurement of a campaign's influence on physical visitation to a specified location. It can also be attributed to DOOH media exposure through mobile location data by analyzing the locations a device visited upon being exposed to a campaign. Anonymous device-level data from passive GPS sources or from mobile ad impression data can be used to attribute a store visit to mobile ad exposure, DOOH ad exposure or both,

based on a consistent device ID. Lift in foot traffic attributable to DOOH media can be benchmarked to traffic to that location.

ONLINE TRAFFIC

Online traffic is very measureable, with established standards and metrics that presents valuable information to marketers. This measureable traffic can be integrated into an OOH campaign using unique URLs, unique language and keywords that can be tracked via online searches, hashtags and website visits. Like brand lift, it would be easy to have confusion on attribution of online traffic if a campaign is running on multiple platforms. To successfully attribute online traffic to a specific DOOH ad, URLs, language or keywords would have to be unique to only that DOOH ad and not also included in other media or campaigns.

APP DOWNLOADS

App downloads are a particularly valuable goal for marketers -- apps can offer a wealth of additional data to a brand about the users, offer continued chances for brand exposure and communication about new products or promotions and the opportunity to interact with users on a more personal level. Using location data, marketers can make inferences about whether a user was exposed to a DOOH campaign before downloading a particular app.

SOCIAL MEDIA IMPACT

Social media offers an opportunity for marketers to interact with consumers on a more personal level. Now, with nearly everyone having a mobile device, social media interactions can be immediate and ongoing. DOOH campaigns can encourage consumers to interact with brands on social media using hashtags and keywords, follows or likes, the submission of user-generated content and more, all of which is trackable. Unique hashtags and location data from the social media apps themselves or mobile devices can help brands determine whether social interactions occurred after a consumer saw content on a DOOH display.

Audience Measurement Methods

A complex area of DOOH is the varied nature of measurement techniques used. Almost all networks depend on a combination of measurement techniques. Some rely on third-party sources of traffic data and other audience information, while others rely solely on third-party measurement organizations that may themselves depend on third-party sources for certain data. The following presents a summary of most of the techniques used. If a specific technique is not presented here, the network and measurement organization should use the concepts expressed herein to develop controls and disclosures for their technique.

Passive measurement methods are acceptable when feasible, and in many situations are preferred, though passive measurement is not a requirement. When seemingly passive

measurement technologies require involvement or action by a respondent or panelist, it is incumbent on the measurement service to employ sufficient techniques to ensure each individual complies with the assigned tasks, otherwise the potential benefit of passive measurement will be rendered less effective.

Note that not all of the methods are necessarily applicable to each of the component metrics (e.g. Venue Traffic, Screen Traffic etc.), and that each method, regardless of whether it be a technology-based solution or dependent on respondent recall has inherent limitations that should be studied and disclosed.

As it relates to counting techniques, whether census or sample, more passive observational techniques are preferred because of the likely minimization of non- response.

Venue and Screen Traffic

- Third-party Source Data
- Industry or Government Data
- Electronic counts from cameras, sensors, beacons, or similar devices
- Manual Counts – Census
- Projected Manual Counts – Sample (must be very rigorous and comprehensive in coverage)
- Respondent Recall; Surveys/Interviews
- On-Site Surveys/Interviews

Audience, Including View

Average Unit Audience

- Technology-Based Measurement Tools
- Manual Counts – Census
- Projected Manual Counts – Sample (must be very rigorous and comprehensive in coverage)
- Respondent Recall; Surveys/Interviews

Ad Units

- Respondent Recall; Surveys/Interviews of Specific Ad Awareness
- Technology-Based Measurement Tools focused on Ad Activity
- Projected Manual Counts – Generally Executed at the Time of Consumption and Generally Sample Based

Dwell Time

- Respondent Recall; Surveys/Interviews

- Manual Counts – Census with Time Stamps
- Projected Manual Counts – Sample, Generally Executed at the Time of Consumption
- Technology-Based Measurement Tools with Time-Stamps

Reach

- Respondent Recall; Surveys/Interviews
- Projected Manual Counts – Sample Based
- Technology-based measurement

Frequency

- Almost Exclusively Respondent Recall Based, Due To Difficulty in De-duplicating Activity
- Technology-based measurement

Computer Vision

Computer vision is artificial intelligence, in which computers can "see" things using cameras and make observations about what it sees. In the case of digital signage, computer vision can:

- Use heatmap technology to see where people migrate
- Use eye-tracking technology to see what people look at (such as displays) and for how long
- Anonymously analyze audiences and present observations about those people's demographic data (age range, gender, ethnicity, etc.)
- Quantify vehicle and pedestrian traffic in real time across a variety of ad units (digital billboards, spectacular, bus shelter, etc.)

Using this method is a way of gathering impressions and understanding engaged audiences.

Some technology companies claim to be able to not just count the number of impressions, but also provide information on audience interaction and emotion. There will be rapid development in technologies such as these with regards to facial detection and other audience awareness technology, but network operators should be be aware of qualities that enable an effective solution and evaluate if it will be useful for their business.

Camera technology is a system to count the number of impressions. While some camera technology companies only claim to be able to count the number of impressions, others claim to be able to provide you with the ability to know if an impression actually interacted/looked at your advertisement and how the person felt. While the ability to track eye movement with heat maps is well established, there are some studies on the challenges being addressed that are inherent in the tracking of human emotions. In short, the National

Institutes of Health reports that, "Despite recent progress, studies on human emotions have been hindered by the lack of consensus on an emotion theory suited to examining the dynamic aspects of emotion and its expression." Success in using emotion and expression analysis with computer vision can be seen in many interactive campaigns. A simple example might be "smile for a [insert consumer product here]."

Technologies such as facial recognition and emotion measurement and analysis are still developing, and network owners should expect to see frequent advancements and changes in terms of what can be measured accurately and what is acceptable to advertisers and agencies for inclusion in data.

Computer vision technology can be found integrated directly into existing digital signage software products, or in some cases can be added to a network using a separate product.

Industry Currencies

Established in 1933 by the OAAA and the ANA, Geopath is a not-for-profit organization governed by a tripartite board composed of advertisers, agencies and media companies. Geopath was established for the purposes of: providing audience measurement for out of home media; to create standard practices for the measurement of audiences for out of home; for the collection, recording, authentication and verification of traffic and other data related to the measurement of audiences for out of home media; and to efficiently and effectively expand and enhance the audience measurement system. They leverage state-of-the-art technology, mobile data and media research methodologies to measure and analyze audience location and how consumers engage with out of home advertising. The Geopath audience metrics serve as the "currency" for defining the media value of Geopath audited out of home locations.

Mobile

The measurement of DOOH media is improving with new methodologies for attributing both exposure and ad effectiveness, made possible through mobile device location data. Mobile location data can be utilized to verify anonymous devices' precise location and verify presence by looking at whether or not consumers' devices were in proximity to a screen at the time an ad played. Through location intelligence, advertisers and media companies can measure the offline ROI of DOOH campaigns to understand if and how well DOOH campaigns are driving in-store visits. They can also gain consumer intelligence by analyzing offline insights from exposed users to learn where users spend time in the physical world. These kinds of insights can prove extremely helpful for retargeting and planning. Finally, since the ROI of DOOH is measurable, advertisers can easily validate their spend on the channel. Being able to guarantee results from DOOH means that they can confidently allocate dollars to this channel when developing strategies and media plans.

Location data is a powerful tool to help planning and measuring DOOH campaigns, however, to ensure accurate and actionable results, the quality of the data used is crucial. This is why how the data is actually collected matters.

There are several sources of mobile location data, collected using different methodologies, namely: panel-based data (data collected by a single mobile app); bidstream data (data collected via ad exchanges); SDK data (data collected via SDK integrated in mobile apps); network-based location data (carrier location data); and aggregated data (data collected via a mix of the above methodologies and aggregated in one database).

Each data collection methodology has its pros and cons. What is important to consider when evaluating a partner is the combined presence of four key factors: accuracy, vast scale, high-data density and privacy compliance. The combination of these four elements is crucial to ensure that the final output is actually an accurate representation of offline consumer trends. Below is a brief explanation of why these factors matter so much when it comes to location data:

6. Scale is important because it allows granularity in the analysis without losing statistical relevance, such as analyzing patterns at the DMA or store level.
7. Accuracy goes hand-in-hand with scale to ensure that the data is accurately identifying the anonymous users' location. There is very limited value in having vast scale if the data is not accurate, just as there is limited value in an accurate panel with little scale.
8. Data density adds a third dimension to this picture by allowing you to understand if and how much time anonymous users actually spend at a location. The data could be highly accurate but if you can't tell apart a user who spent 20 minutes in store vs. one who was just driving by, you are not able to understand how consumers are actually behaving in the offline world.
9. Last, but definitely not least, is privacy. It is paramount that the end user is informed of the data being collected, has the ability to opt-in and can easily opt-out.

There are a few additional considerations with regard to using location intelligence derived from anonymous mobile data for campaign planning and audience measurement purposes: the ability to identify users actually exposed to an ad and privacy compliance.

Mobile location data may be used to determine presence, which is the most basic qualification for display audience exposure and a way of knowing whether a person is in a particular area. It is not the same as an impression, in which case a person would have to actually look at a display. However, when leveraging location data players that have the ability to collect and analyze accurate and persistent location data at scale, the determination of

whether a consumer was exposed to a display can be considered a very good proxy for impression delivery. In fact, a sound DOOH exposure methodology based on location data allows you to narrow down the exposed consumers not simply because they were in the area where a board is, but rather based on the following strict principles:

1. Determine viewing distance: such determination can be done by identifying the cone of exposure, using standard viewing distances and angles to confirm the area of exposure is in the correct facing direction of the ad. Any consumer falling out of the cone of exposure should not be considered.
2. As a following step, only select consumers who are moving in the direction facing the board: Persistent location data allows you to identify users' travel path and only consider using those who are progressing in the correct viewing position.
3. Finally, only select consumers who are in the area of exposure: Persistent location data allows you to identify users' travel path to confirm that their roadway of travel puts them directly in the area of exposure.

With regard to privacy, it is paramount to carefully choose your location partner also based on its privacy compliance. Privacy is a key area to which governments and courts are paying very close attention. GDPR, which went into effect in 2018, is legislation in the European Union that adds strict guidelines to data privacy and data consent for all EU citizens, and it applies to all companies that process or control personal data, regardless of where the data is located, including the cloud. Non-compliance can result in large fines for companies with any EU operations. The main objective of the regulation is to give end users greater control over their data. While consumers are often prepared to allow companies to access their data in order to improve their user experience, they expect their data to remain private and secure. Some consumers may not want to share their data at all. The GDPR provides a comprehensive set of data collection rules that require companies to obtain user consent and exhibit transparent processes when collecting data from users.

Many companies, even those that are not based in the EU, are adopting GDPR data privacy standards, because it's simpler to operate within the strictest standards available when data exchanges between companies all over the world are so common, and because it is entirely possible that similarly strict data privacy laws will come into play in the United States and elsewhere in the world. When evaluating location data partners you'll want to ensure that they can provide a solid privacy framework and that they can show a strong commitment to privacy at the foundation of all of their efforts. The OAAA Guiding Principles for the OOH Industry Regarding Privacy and Use of Consumer Data can be used to provide a clear evaluation framework around consent, transparency, control and accountability.

Mobile integration will be critical for cross-platform campaigns and related measurement methods such as website visits, social media use and app downloads, all of which can be done via a mobile device after having viewed an OOH ad, and can help with both amplifying OOH effectiveness and measuring its impact within the media mix.

Geofencing

Geofencing is creating a virtual geographic boundary around an area by means of GPS or RFID technology, enabling software to trigger a response when a mobile device enters or leaves the area. The consumer location can be determined based on GPS, a cellular network or a Wi-Fi signal. Location-based information allows advertisers to more efficiently target consumers and measure performance.

Impression Data

A number of organizations have been instrumental in leading the charge to standardize measurement for place-based and outdoor media. These efforts have focused on aligning the way out of home is measured and transacted with television, print, online and mobile media in order to remove barriers to investment in this channel.

Geopath reports weekly impressions and ratings for DOOH advertising across more than 200 demographics. Geopath reports each ad unit or spot separately within each digital structure. Using speed data from Inrix and inputs from its viewability model (Visibility Adjustment Indices, or VAIs), Geopath calculates a dwell time and contact zone that is unique for each location, then calculates how many people see each spot on each structure. This process is applied to all street-side, street furniture and transit digital advertising. Variables include traffic speed and congestion, maximum noting distance, road type, digital noticing rate and ad length.

Nielsen's On Location studies measure similar metrics for venue-based DOOH networks. Their studies showcase metrics with average spot impressions, gross impressions and audience distributions across various demographic breakdowns for specific place-based networks. Traffic data is modeled using a variety of transactional inputs, syndicated data sets and on-site counts, while demographic data is collected through a combination of on-site counts, in-person intercepts and online surveys.

Geopath, OAAA and other organizations have also worked with the Media Ratings Council (MRC) to develop standards for audience and ad measurement across all types of OOH media. The MRC is a government entity established by Congress that has the mission "to secure for the media industry and related users audience measurement services that are valid, reliable and effective; to evolve and determine minimum disclosure and ethical criteria for media audience measurement services; and to provide and administer an audit system

designed to inform users as to whether such audience measurements are conducted in conformance with the criteria and procedures developed."

Surveys & In-person Intercepts

Although used often as a tool by the impression data collection organizations mentioned above, audience surveys/interviews may also be used by a network owner to provide additional information to ad buyers about a network, a location or a campaign itself. These types of metrics are often collected via exit intercept surveys in test and control locations or post-exposure telephone or online interviews with test and control groups.

When you want specific feedback about a DOOH campaign, it can be challenging to do surveys later via telephone or online survey -- you have to figure out a way to know specifics about who was in a location, including a way to contact that person. Respondent recall can also be spotty. This can be, of course, helpful information in and of itself (how much time can pass post-exposure and a person still remember a campaign or brand). But when it comes to feedback on the content and how it affects the audience's perception of a brand, in-person intercepts, which are surveys done on-site in person, can be the most useful type of survey. You'll be able to know for certain a person was in a certain place or at a certain event, with potential exposure to a campaign. The campaign content will also be fresh in a person's mind, so valuable additional details may be available.

Even when audience exposures are counted in the best possible way, the metrics obtained are silent on the value of the exposures they count. The relative value of each network's impressions can be gauged by how well the advertising placed on these networks performs. Potential metrics include:

Recall

- Brand (unaided)
- Brand (aided)
- Ad (unaided)
- Ad (aided)
- Number of ads/brand recalled out of total

Branding

- Brand favorability
- Brand loyalty
- Brand attribute lift

Persuasion

- Purchase intent
- Brand buy next
- Consideration set

Behavior

- Usage lift
- Traffic lift
- Sales lift
- Number of website visits
- Tell a friend
- Net promoter score

These methods are time-consuming. Network owners should weigh the costs of obtaining these additional metrics against their relative value to potential ad buyers and how much it might improve the value of their network. If performed on behalf of an ad buyer to gain campaign metrics, plan this before a campaign is launched and include it as part of your agreement with the ad buyer.

Multi-touch Attribution

Attribution is when brands give credit to an ad or campaign for causing a consumer to take a desired action -- buying a product, visiting a website, entering contact information, thereby becoming a qualified lead. Single-touch attribution gives all of that credit to a specific ad or touchpoint. Touchpoint can be broadly defined as when a brand "touches" a consumer in some way. Touchpoints are not purely brand-driven messaging -- it can be word-of-mouth communications from peers, publicity from press outlets or social media. The touchpoints that come more directly from brands are also wide-ranging, including print ads, television ads, online ads, mobile brand messaging, as well as customer service interactions, product packaging and of course DOOH.

In actuality, consumers are often touched by brand messaging many times before taking action. The consumer decision journey may entail, for example, a person seeing a brand mentioned on social media, then viewing a DOOH ad, being served a digital banner ad that they click to go to the brand website, joining a newsletter from the website and then finally making a purchase after opening and reading something in the newsletter. The sale shouldn't be 100 percent attributed to the newsletter, when the consumer encountered multiple touchpoints prior that led to the final sale.

Salesforce says a consumer needs to be touched by messaging six to eight times before becoming a viable sales lead. Others say it can take even more than that, and of course, it can vary between industries.

Multi-touch attribution uses data modeling to allocate credit for a sale or other desired consumer action across multiple channels, touchpoints, campaigns and messages. Weighted touchpoint modeling divides up the credit into percentages and potential touchpoints. How that's done will depend on the type of multi-touch attribution model that a brand chooses to use.

Measuring Success: How can the reach and impact of a DOOH campaign be extended?

Mobile

Mobile display advertising amplifies DOOH media with the ability to deliver contextual mobile content and advertisements to users on their mobile devices through mobile apps and web apps, based on various targeting parameters. Targeting methods include location-based tactics such as geofencing, geo-conquesting and geo-behavioral-based tactics such as audience segmentation, visitation history, app usage and retargeting.

As with any technology that accesses consumer data, privacy concerns are of the utmost importance. Marketers should ensure they have permission to send content to consumers and the ability to opt out must be clear and simple to execute. Tying touchpoints into social media can be an easy workaround, as a number of sites including Facebook and Twitter have location-based functions their users have already opted into.

Social

The extent of social or mobile engagement possible for advertising campaigns will depend on whether the formats have the option of a feedback loop (two-way programs) and if they require real-time or near-time display.

A one-way program sends information directly to the consumer's device or instructs them on where to find or send content online. One-way programs can show social media on DOOH displays, but do not have feedback sent to the user. An example would be a program posting Twitter messages to a screen without a confirmation message being sent to the user.

A two-way program both receives content from the user and can communicate back to the consumer. The message can be a simple confirmation or can provide additional pathways for

interaction. An example would be a display that takes a photograph of a user and emails the picture back to the consumer or posts it to a social media channel of the user's choice.

In both the two-way and one-way path, real time experiences may take place. Pragmatically, "real-time" means updating content on a display or sending a response back to a user within 15 seconds to 15 minutes. Networks and technologies that can only update periodically for economic or infrastructural reasons (e.g., a nightly satellite link) are classified as one-way or two-way non-real-time communications.

THE SOCIAL OOH MESSAGE PATH

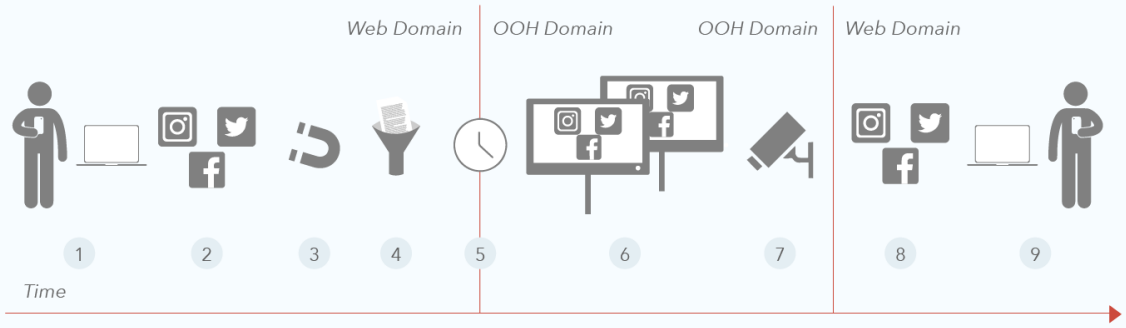

FIG.2 The Social OOH Message Path

1. User sends a message/photograph to a social network.
2. Social network posts message/photograph, which can be viewed/accessed publicly and/or by authorized users.
3. Media system pulls messages/photographs based on various criteria such as, but not limited to, hashtags, keywords, account names, usernames, locations, trending topics and more.
4. Media system filters and/or enables moderation of messages/photographs according to moderation guidelines set by campaign/brand/venue.
5. Filtered and moderated message platforms are now available for DOOH systems. For real-time campaigns, the platform pushes messages/photographs to a DOOH system, which then updates content as soon as it runs. Alternatively, for non-real-time campaigns, a DOOH system pulls the platform when it is able to connect to the Internet.
6. DOOH system displays the social content media. Note: At this stage the only difference between two-way and one-way campaigns is determined by the ability to display the message/photograph in real-time. Non-real-time campaigns and/or

networks will display the message/photographs at a time determined by system capabilities and/or by the campaign design.

7. For two-way campaigns only, a feedback loop is created with the user. This can be done in a number of ways such as capturing the user's message/photograph on a display via a webcam and feeding the webcam image back to the user. Other feedback strategies include, but are not limited to, enabling an online version of the content for end-users or sending a confirmation text, tweet, post or email.
8. The feedback is sent to a website, social network or user's email.
9. The user is able to spread the user experience around their social geography (e.g., their friends, family, fans, and followers) using social options available based on a specific social platform (e.g., like, share, tweet, email, etc.).

Another advantage of integrating social into a DOOH campaign is that social media measurement tools can track lots of data around users, more accurately than measurement of digital signage metric gathering. Social media listening tools can also gather information how a brand or campaign is received and by whom.

Successful integration of DOOH and social media, particularly when it comes to tracking and listening tools, will require specific expertise and software so you're encouraged to partner with social media management companies that have knowledge in these areas.

Cross Device

Measurement organizations should consider and strive to develop systems that are comparable with other competitive media types to help facilitate the integration of DOOH with data on other media. Accordingly the following measurement attributes are encouraged:

- Use of measurement techniques that are similar to best practices in other media
- Development of a gross rating point type measurement for advertising audiences to facilitate metric comparability
- Consider a method to produce unique audience when combining estimates with other media
- Adopting a frequency of measurement that is relevant across media types, which may entail increasing the frequency of measurement in DOOH
- Segregating content from advertising measurement -- a technique that is emerging in other media
- Measurement and reporting of demographic and geographic characteristics comparable to those available for other media

Measuring Success: How can DOOH extend the reach of a multi-channel campaign?

Integrating mobile with OOH extends the conversation beyond the physical location of the OOH media. By interacting with an OOH campaign through a mobile device, consumers can continue to engage with a brand as they move past the physical media. For example, print OOH can be used to promote an artist's upcoming concert, while a mobile component that allows the consumer to digitally interact with that media point, will let a user buy tickets in that moment, as they continue walking. DOOH formats make the pairing even more compelling, displaying a picture of a brand's newest Facebook fan and thanking them for "liking" the brand on Facebook, for example.

When combined with other advertising in an integrated media plan, OOH is proven to extend reach and drive consumers to engage with brands online and in-store. A 2012 Media Behavior Institute study showed OOH has the potential to increase the reach of a mobile campaign by up to 316 percent.

Benefit of Scale Using Existing Assets

The digitalization of DOOH, the spreading use of programmatic advertising and the availability of data in DOOH is opening up previously unavailable marketing dollars to the industry. Ad agencies and brands are now able to potentially use existing creative for DOOH and integrate DOOH programmatically into a marketing plan the same way they do other types of media. OOH advertising has always been appealing to ad buyers, and now these tools are removing hurdles to easily incorporating it into large ad buys.

Quick to Post, Quick to Market

The digitalization of OOH has offered significant opportunities to everyone in market. Digital displays can have multiple ads during a specific time frame, instead of just one. The time between an ad sale and the time it appears on screen is significantly shorter -- sometimes just minutes. Content, including ads, can be posted very quickly and scheduled to play on a display using software, without anyone going to the display location at all. With common resolutions and specs, creative doesn't always have to be custom designed, allowing reuse from other campaigns. Programmatic ad sales streamlines the process of matching ad buyers with available inventory, shortening the sales process.

A Proven Medium

Nielsen: Ads Driving Online Activity
Nielsen: Out of Home Advertising Study
Nielsen: Digital Billboard Study 2015

ABOUT THE DOOH PRIMER

This project was compiled using a combination of original writing and sections taken from over 400 pages of documents owned and originally produced by the five industry associations that came together to produce the project. All sources were used with permission from the five associations.

ABOUT THE DIGITAL SIGNAGE FEDERATION (DSF)

DSF's Mission is to support and promote the common business interests of the world-wide digital signage, interactive technologies and the digital out of home network industries. The DSF is a not-for-profit independent voice of the digital signage industry reflecting the diversity of its membership. It promotes professional recognition through certifications, continuing education, conferences, publications, and presentations offered by the DSF and affiliate groups. It provides advocacy by leveraging the collective strength of members and represent their interests at the higher levels of government and the community. The DSF provides leadership and networking opportunities focused on building a strong foundation for the advancement of the digital signage industry.

For more information, please visit digitalsignagefederation.org.

ABOUT THE DIGITAL PLACE BASED ADVERTISING ASSOCIATION (DP-AA)

The Digital Place Based Advertising Association (DPAA) leads the Digital Out of Home (DOOH) industry as marketing to consumers *outside* the home is experiencing aggressive growth versus advertising *inside* the home, which is continuing its fragmented decline.

DPAA fosters collaboration between advertisers, agencies, ad-tech, mobile companies, location data, software, hardware and others while providing guidelines, standards, best practices and industry-wide research all promoting the effectiveness of digital place based advertising.

For more information, please visit dp-aa.org.

ABOUT GEOPATH

Founded in 1933, Geopath is the industry standard that powers a smarter OOH marketplace through state-of-the-art audience location measurement, deep insights and innovative market research. The organization is headquartered in New York and governed by a tripartite board composed of advertisers, agencies and media companies spanning the entire United States.

For more information, please visit geopath.org.

ABOUT THE INTERACTIVE ADVERTISING BUREAU (IAB)

The Interactive Advertising Bureau (IAB) empowers the media and marketing industries to thrive in the digital economy. Its membership is comprised of more than 650 leading media and technology companies that are responsible for selling, delivering, and optimizing digital advertising or marketing

campaigns. The trade group fields critical research on interactive advertising, while also educating brands, agencies, and the wider business community on the importance of digital marketing. In affiliation with the IAB Tech Lab, it develops technical standards and best practices. IAB and the IAB Education Foundation are committed to professional development and elevating the knowledge, skills, expertise, and diversity of the workforce across the industry.

For more information, please visit iab.com.

ABOUT THE OUT OF HOME ADVERTISING ASSOCIATION OF AMERICA (OAAA)

The Out of Home Advertising Association of America (OAAA) is the national trade association for the $7.8 billion US out of home (OOH) advertising industry, which includes digital out of home (DOOH), and is comprised of billboards, street furniture, transit advertising, and place-based media.

Comprised of 800+ member media companies, advertisers, agencies, ad-tech providers, and suppliers that represent over 90 percent of the industry, OAAA is a unified voice, an authoritative thought leader, and a passionate advocate that protects, unites, and advances OOH advertising in the United States.

For more information, please visit oaaa.org.

ABOUT THE RAVE AGENCY

Founded in 1998, THE rAVe Agency, co-owned by Gary Kayye and Sara Abrons, is a creative agency focused on B2B technology markets, particularly the audiovisual and digital signage industries. It offers consulting and creative services such as marketing strategy, market research, speaking, social media marketing and more. Gary Kayye has been an assistant professor at the UNC School of Media and Journalism, focused on advertising and new media, since 2009.

For more information, please visit THErAVeAgency.com.