Center for Entrepreneurship & Technology
University of California, Berkeley

Future of Digital Advertising

Abstract

Advertisements (Ads) today have become a nuisance causing people to ignore them and leading to very low conversion rates. However, the massive adoption of technologies such as mobile, wearable devices, Internet of Things (IoT), Virtual & Augmented reality, in combination with the ability to collect process and make inferences about user behavior, actions and their preferences will disrupt the way and manner by which advertisers and sellers can influence a customer. We predict that technology and big data analytics will transform ads from being a nuisance today to need-based in the future. The future advertising system will be able to understand what product a user wants to buy, predict exactly when they wish to buy, and also infer the correct time to interrupt the user with an advertisement. Thus users are more likely to pay attention to the advertisement leading to much higher conversion rates. In this report, we review the evolution of advertising, and discuss the current advertising landscape. We also present some changes that are happening in the advertising landscape today that portend a disruption in the way ads are delivered to the user. Finally, we present some hypotheses on how massive adoption of technology will impact advertising and some challenges & roadblocks in the process.
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INTRODUCTION: FUTURE OF DIGITAL ADVERTISING

Digital has taken the world by storm, upending traditional advertising and requiring the 21st-century marketers and advertisers to become savvy about a broad range of digital advertising options ranging from social media to mobile to IoT to augmented reality. The good news is that digital advertising, unlike traditional advertising, is far more traceable, allowing marketers to determine what is working for them and what may not be as effective.

According to the report, Digital Marketing Landscape: The Power of Digital Experiences in 2014 [1], majority (59%) of respondents consider the creation of digital experiences to be either "high" or "very high" as a marketing priority. Furthermore, they found a relationship between those organizations placing a high priority on digital experiences and revenue growth: 76% of study participants reporting revenue growth in the most recent fiscal year had also placed a high priority on digital experience. Only 6% of those who reported declining revenue growth considered digital experience creation to be a high priority. While the authors of the report point out that they cannot show a direct cause-and-effect relationship (as correlation does not imply causation), they still believe that "there is a connection that marketers should not ignore when setting marketing priorities."

Ads are regarded by many consumers as a nuisance. With the lack of proper checks and balances, this can cause Ad-Fatigue to consumers, who get bombarded with irrelevant and/or repeated ads as shown in the diagram below. This is a kind of Push based advertising, where advertisers are either guessing based upon incomplete consumer data or bombarding a segment of consumers. Many ads today follow the push marketing model where an advertiser makes information available to consumers irrespective of whether they are a prospective customer and/or interested in buying their product.

Nuisance to Need based: In the future, we expect advertising to go from being a nuisance to being need-based. We expect that a number of technologies such as Big Data, Location and Context based communications, Video, Mobile and wearable devices, Multi-platform consumption, Personalization, IoT, and Augmented & Virtual Reality are going to come together and allow advertisers to know more about the user and thus be able to serve ads producing high engagement and making high conversion rates a reality.
EVOLUTION OF ADVERTISING

Advertising has evolved over time. In ancient times people have used wall or rock painting as means of advertising. With advent of time it has evolved into print media and that becomes primary media for advertisement which is prevalent even today. People used different tools like billboard, catalog, newspaper etc. for advertisement. In 20\textsuperscript{th} century other media like radio, television emerged which changed face of advertisement.

Following diagram highlights some of the significant changes in advertising over the years.

One of the simplest and most prevalent forms of advertising is through print. Printed ads have been around since 1472, and even today it is hard to do anything without seeing an ad on a billboard or in a newspaper or magazine. Since these ads are static, it is hard to personalize them to any specific user. The best we can do is making broad guesses about the general audience. For example, people driving around Silicon Valley may see billboards listing out various products or services or even companies trying to attract prospective future employees. People subscribed to certain magazines such as The Economist may see ads related to financial products such as new investment opportunities.
As new forms of entertainment emerged such as radio and TV, advertisers found a new medium to reach out to consumers. By inserting commercials between songs or in the middle of TV shows, advertisers were guaranteed to get the consumers’ attention. Similar to print, advertisers still were not able to target products to very specific individuals. However, they were able to segment consumers into smaller groups. For example, advertisers could choose which ads to play on the radio in the morning for certain stations that people may listen to when driving to work. Similarly, homemakers watching sitcoms at home during the day may be more receptive to certain types of commercials, such as those for household goods. Other targeting based on demographic information such as average income and age may be available for these forms of media.

The Internet and mobile devices have started the Digital period of advertising, which provides a completely different and new way for advertisers to reach out to consumers. These technologies have enabled advertisers to better understand their customers and engage them at the right time with the right products. For example, when you search for something on the Web, advertisers know exactly what you are looking for. Once advertisers show you an ad, they can see what you do next. For example, advertisers know what products you looked at, whether you put something in an online shopping cart, and how much you ended up spending if you bought something. This takes advertising to a much more personal level than anything we’ve seen before.

We believe that we are still early in the second machine age and expect there to be many more changes in how advertisers will engage customers and make the experience feel more personalized and need-based. As illustrated in the diagram below, we refer to this as the Extreme Digital period since it builds upon what is already happening now in the Digital period.
Here are three changes that we expect to see over the next 10 - 15 years.

1. As mobile and wearable devices become more prevalent, advertisers will have much more information about consumer’s behavior and actions; therefore do a much better job at engaging consumers at the right time with the right promotions and products.

2. As the Internet of Things (IoT) continues to expand, advertisers will have a much better understanding of consumers’ short and long term needs which will enable advertisers to engage with consumers in a way that is less of a nuisance and more need-based.

3. As virtual and augmented reality become popular mass market technologies, people will start to explore and experience the world in different ways, giving advertisers an opportunity to engage consumers in a new medium with different and unique capabilities.
ADVERTISING ECOSYSTEM

The diagram below represents the realization of the above IAB Arena with real players in the display-advertising ecosystem\[^5\]. Please note that this diagram illustrates key players in each box for illustration purpose only and is not comprehensive.
Digital advertising has exploded in the last 20 years and will continue to do so for the future. Below are some projections on the digital advertising market.

In 2015, about $150B will go towards digital advertising, which will account for about ¼ of the total media advertising spend. Over the next few years digital advertising spend is expected to grow by 10% per year. This growth will occur for several reasons. Many advertisers are slowly moving budgets from traditional forms of advertising to digital advertising which is often more effective. Consumers are interacting with more electronic devices throughout the day and are spending more of their leisure time doing activities that enable digital advertising (e.g., on-demand video, augmented reality, online education, and video games).
Below table represents spent growth across various digital media format as forecasted by eMarketer. As numbers speak, digital advertising continue to grow in double digit percentage.

<table>
<thead>
<tr>
<th>Digital Ad Spending Worldwide, by Format, 2013-2019</th>
<th>billions, % change and % of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search*</td>
<td>$59.16</td>
</tr>
<tr>
<td>% change</td>
<td>17.4%</td>
</tr>
<tr>
<td>% of total</td>
<td>49.2%</td>
</tr>
<tr>
<td>Display**</td>
<td>$49.01</td>
</tr>
<tr>
<td>% change</td>
<td>23.5%</td>
</tr>
<tr>
<td>% of total</td>
<td>40.7%</td>
</tr>
<tr>
<td>Classifieds</td>
<td>$9.52</td>
</tr>
<tr>
<td>% change</td>
<td>6.6%</td>
</tr>
<tr>
<td>% of total</td>
<td>7.9%</td>
</tr>
<tr>
<td>Other***</td>
<td>$2.58</td>
</tr>
<tr>
<td>% change</td>
<td>8.7%</td>
</tr>
<tr>
<td>% of total</td>
<td>2.1%</td>
</tr>
<tr>
<td>Total</td>
<td>$120.27</td>
</tr>
<tr>
<td>% change</td>
<td>18.6%</td>
</tr>
</tbody>
</table>

Note: includes advertising that appears on desktop and laptop computers as well as mobile phones and tablets on all formats mentioned; *paid listings, contextual text links and paid inclusion; **banners (static display, rich media, sponsorships, video (in-stream, in-banner, in-text); ***email, mobile messaging and lead generation

Source: eMarketer, March 2015

Below chart represents mobile advertising revenue forecast across display, search, social and video formats. Mobile advertising continues to enjoy healthy 20+% growth rate over next several years to come and has been the fastest growing advertising segment within digital medium with the continued penetration of smartphones.
FORECAST: Mobile Advertising Revenue (US)

Source: BI Intelligence Estimates, IAB
TECHNOLOGY EVOLUTION

Various technologies like mobile, wearable devices, IOT, virtual reality are going to shape future of advertising.

IMPACT OF WEARABLES AND MOBILE

Next big thing in personal electronics is wearables, lot of new wearable devices is surfacing day by day and future is going to get consolidated into few wearables. Both wearables and mobile devices have packed with many sensors and this trend is expected to grow as these personal devices are turning into fitness, health monitoring and convenience tools. iPhone, Samsung Galaxy have many sensors, most notable are proximity sensor, accelerometer, light sensor, moisture sensor, gyroscope & compass. Apple iWatch has more than 10 sensors like accelerometer, heart rate sensor, GPS etc.

On mobile devices, 82-88% of user activity is on apps and rest is on mobile browser (exhibit from eMarketer below)

![Share of Time Spent with Mobile Apps vs. Mobile Web Among US Smartphone and Tablet Users, June 2014](chart.png)

This depicts a shift in how users are interacting with Internet and consuming information compared to traditional web browsing. On average every smartphone has 10+ apps that users actively use on daily basis.

Trends: Data from various sensors that users are wearing, carrying with them will provide real-time information of user and surroundings and users shift towards mobile app usage
will greatly influence advertising going forward. In futuristic advertising world, data from wearables, mobile devices (sensors) combined with offline data will enable ads to be catered on mobile apps users are interacting with. Ads will be highly personalized but delivered at right time to serve the need.

Following picture depicts a use case where user walks into a shopping mall, depending on time, day, weather and mood of the person - Personalized Ad shows up in app that user is interacting with on mobile/wearable device for a restaurant, apparel store or movie running in theater.

Most of current advertising is using location, which is just one signal of many that will be available in future, and it is proving to be very effective. Below are few case studies from xAd.com, which demonstrated clear gains by doing location based targeting.

- Pinkberry: 100% lift in conversions when location based ads were targeted.
- DunkinDonuts: experienced click-through rates that were 6x industry rates
- Columbia Sports: noticed 52% lift in click through rates when targeted based on location.

IMPACT OF IOT

Today it is rather challenging for advertisers to create a cohesive campaign across numerous and disparate channels (e.g., Internet, TV, radio). IoTs will allow companies to have a “complete view” of their customers. Advertisers will be able to understand various aspects of a consumer including their likes, dislikes and preferences leading to action. This new paradigm will also enable companies to be more nimble and provide them with the ability to react to markets in real-time. For example, a seller will be able to price their
goods based on the customers’ situation and ability to pay. All of the above will play a key role in transforming ads from being a nuisance in the present age to need-based in the future.

Big data is also going to play a critical role in the future of advertising. Cisco estimates that by the year 2020, over 50 billion devices are going to be online. These devices will be able to sense and measure everything ranging from the number of steps you take, to the amount of time you spend sleeping, to the route you take to work, to the cereal you like, to the type of car you drive, to where you like to go on vacation and everything else that one can measure.

We also believe that the bar for an ad in the future is going to be exponentially higher than it is today. Put in another way, in addition to being need-based, knowing when the customer can be interrupted and for what, is going to be very important. We believe that IoTs are going to play a crucial role in helping advertisers understand when it is acceptable to interrupt a customer. For example, imagine you are driving down the highway at 100 mph and you phone keeps flashing a coupon for 20% off a cruise that you can take on your vacation. Planning your vacation is not something we do while driving (at least not today).

The above figure illustrates an IoT enabled advertising system of the future. The devices connected to the Internet, advertisers, and a futuristic advertising system is going to combine to provide the user with need-based ads. The advertising system will consist of AI-enabled big data processing algorithms with the ability to understand and make inferences about the user based on data from the wide array of devices associated with the user.
Consider the case when you are running low on eggs, and you are driving back from work. The advertising system (engine) knows that you need to buy eggs, and also your location. If you happen to be close to a grocery store offering a discount on eggs, the system alerts you to make a purchase. We hypothesize that the click-through-rates in such a scenario are going to be close to 100%. Yet another application may be that your car is running low on engine oil; it relays this information to the advertising system, and if you are close to your car dealership, the system alerts you about an ongoing sale on oil changes. These kinds of need-based ads have the ability to radically revolutionize the way we receive and consume ads.

According to the *Harvard Business Review*, the Internet of Things will reframe the definition of advertising in five ways:

- Integrates advertising messaging, where the product is the media platform, into the social flow of everyday life.
- Creates an advertising message to augment a product via participative (or crowdsourced) creative.
- Enables users to personalize products in unique ways.
- Converts existing, even generic, products into functionally intelligent ones that, with the help of smartphones, can deliver dynamic ad messaging linked to specific physical objects.
- Creates a rationale for the consumer to have an ongoing relationship with the brand, by linking continuing online interaction to real world product-based experiences.

**Augmented and Virtual Reality Evolution**

Augmented and virtual reality is an emerging technology areas which are receiving large amounts of investments and strong interest from many companies. For example, Google has experimented with Glass, and recently led a $542M funding round for Magic Leap. Facebook acquired Oculus VR for $2B and Microsoft has been developing HoloLens.

Although it is not clear how exactly augmented and virtual reality will change how people interact and experience the world, these technologies will almost certainly become a part of many people’s daily experience. This is because the computation and equipment required will become smaller and more available as the use of mobile and wearable devices continues to grow exponentially. Virtual reality is a closed and immersive technology which is well suited for gaming. In contrast, augmented reality may be more versatile and lead to more applications since it enables people to interact and change their...
experience with the real world. For example, augmented reality as part of our glasses can allow us to annotate what we see in the real world or add and remove objects to experience those changes.

Here are some projections on how the augmented and virtual reality revenue will grow. These projections suggest that we are just at the beginning of how these technologies will change our world.

![Augmented/Virtual Reality Revenue Forecast (SB)](image)

Rather than predict exactly where augmented reality will be 5-10 years from now, let’s look at a recent application and imagine how it can change the advertising space. My wife is an architect and often puts a lot of thought into designing living spaces in our house. There have been times when the two of us would spend half a day rearranging our living room, and then a couple days later we would spend another half day putting everything back. This may include buying and returning furniture. Although my wife views this as the normal cost in coming up with a better living space, I find it time-consuming and tiring. It turns out that Ikea has already developed an app to help consumers figure out what furniture to buy and visualize how it would look in their real living space.
This app uses the phone camera to view a living space and then enables a consumer to place furniture in the display. This image illustrates what the living space would look like with a red couch. The consumer can easily move, rotate, or change the size of the couch in addition to moving the camera to visualize furniture in other parts of the living space.

Right now this Ikea app knows almost nothing about the consumer and only includes the Ikea catalogue. Imagine how much more flexible and powerful an app like this could be. As technology develops, the ability to manipulate objects in such a space will become more natural and flexible. A more general app could have an interface for many more companies to integrate their catalogues. The aggregation of consumer information and behavior combined with Big Data techniques will enable recommendations of specific furniture or objects as well as ways to restructure the space. Instead of just looking at a small living space, we may be able to easily manipulate entire houses, buildings, or communities. This will provide companies with unique opportunities to reach out to consumers and engage them with the right furniture and products at the right time in a way that meets their immediate needs rather than be a nuisance.

The market for home remodeling is large and expected to grow at a consistent rate for quite some time. Therefore we believe there is an opportunity for technology around augmented reality to provide a new way for consumers to think about how to change
living spaces, and for advertisers to provide the right products at the right time.

Home Remodeling is Growing Fast

Source: Home Improvement Research Institute
PRIVACY & POLICY

Online privacy with respect to advertising has two sides. One side are browsers, operating systems and platforms - other side are marketers and advertising systems. End user along with government regulations influence change on browser and platform side, where as marketers desire to reach customers or potential customers motivates them to overcome challenges with privacy tools and laws.

When email clients stopped loading remote content (especially images in emails), it impacted marketers from tracking whether end user is reading emails or not. To work around this marketers had to put in effort to get their email address into end users contacts list so that remote content gets loaded automatically. Similarly when browsers offered mechanisms to turn off advertising cookies and blocked 3rd party cookies, marketers scrambled to have mechanisms to keep users logged into systems so that they rely less and less on cookies.

With mobile devices, we are in a new world where cookies have no place. Marketers need to rely on ways to identify user by device identifiers. Many companies attempted to build device fingerprinting mechanism to identify users when they are in mobile apps vs mobile web, it is still ongoing effort as there is no easy way to identify users across apps, mobile web and devices. Meanwhile Mobile OS developers (iOS, Android etc.) provided controls for users to reset advertising id on device and easy ways to opt-out of advertising.

Pattern through all these changes are more and more controls are being provided for users to handle privacy. But tools and mechanisms to control privacy are hidden from real world. How easy it is to opt-out of twitter’s or facebook’s mobile app usage data collection, most of us aren’t aware the fact that Twitter and Facebook collect apps we have on our devices that has nothing to do with twitter and facebook.

Future has to be much more transparent as users see benefits of personalized advertising that is not intrusive and caters to their needs. Less data they provide will make them vulnerable to junk ads and unwanted interruptions.

Data collection organizations will be more transparent and make it easy for users to see what data is being collected and how it is being used.

This is big opportunity and at the same time challenging as well given the fact that it involves user trust.
CONCLUSION

Digital Ad spend is growing year by year triggered by mobile devices adoption. Over 60% of digital ad spend, 200B out of 300B total, is going to be on mobile by 2020. More and more devices and exploding space of connected devices is going to dominate future of advertising.

Technological advances in the space of connected devices, augmented reality with sophisticated big data processing systems and increased privacy controls are going to make it enjoyable and personalized experience for consumer to see ads, as they will be timely and addressing specific need.

Most recently Native ads revolutionized advertising experience by reducing/eliminating flashy take over and rich media ads, sponsored content along with better context of user’s surroundings will improve native ads so that content and ads will become indistinguishable.

With Big Data evolution which can crunch and co-relate online and offline data in real time, Technological evolution in wearables and IOT users will be able to get extremely optimized, enjoyable, personalized Ads delivered to their devices which will increase user engagement, help users to buy the necessary goods with a pleasant experience to the users.

In conclusion technology advances combined with transparent privacy laws and tools will enable advertisers to earn users trust to deliver extremely personalized ads when user needs them and make advertising as pleasant experience as well as deliver better ROI for businesses.

Picture below summarize the future.
REFERENCES


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The Center for Entrepreneurship & Technology (CET) seeks to foster entrepreneurship within the University and to bring Berkeley’s research capability to industry collaborations. To these ends, the CET hosts multi-disciplinary research projects in collaboration with industry stakeholders; as well as provides mentoring and support to new Berkeley ventures.

National rankings consistently place UC Berkeley’s undergraduate and graduate programs among the world’s best. Berkeley is home to top scholars in every discipline, accomplished writers and musicians, star athletes, and stellar scientists—all drawn to this public university by its rich opportunities for groundbreaking research, innovative thinking and creativity, and service to society.