

May 2018

ARTIFICIAL INTELLIGENCE ROUNDUP

Investment and interest in artificial intelligence (AI) remains high, though large-scale adoption is happening more slowly. Still, many companies have ambitious plans for AI systems and are looking to them to improve their business operations. eMarketer has curated this Roundup of articles, insights and interviews to help you understand today's AI landscape and how marketers are putting it to work.

presented by



OVERVIEW

All the forecasts for the artificial intelligence (AI) market size, revenues and spending on hardware, software and services predict very healthy growth over the next few years. It's also clear that although businesses of many sizes are interested in the technology, the bulk of investment continues to come from the largest tech enterprises. Over time, though, a wider array of global companies is expected to invest.

Here, a quick glance at what various research has been reporting on about the size of the AI market.

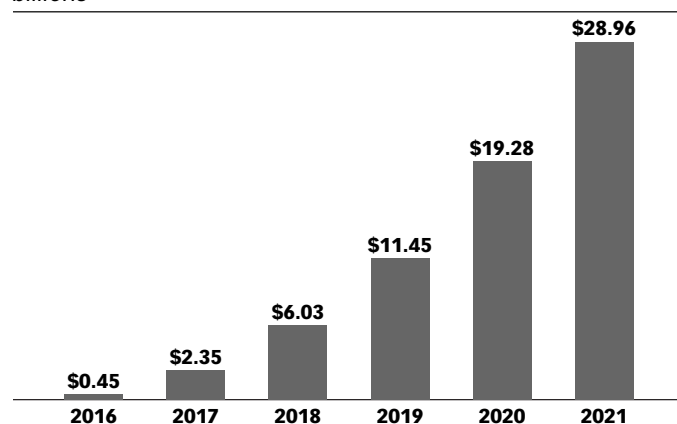
- In a June 2017 discussion paper, McKinsey & Company estimated that companies worldwide invested between \$26 billion and \$39 billion in artificial intelligence in 2016, with Google, Baidu and other tech giants contributing between \$20 billion and \$30 billion. Startups added another \$6 billion to \$9 billion.
- Grand View Research predicted that the worldwide AI market would reach nearly \$36 billion by 2025 from "direct revenue sources," and would grow at a compound annual growth rate (CAGR) of 57.2% between 2017 and 2025.
- Gartner predicted that worldwide spending on AI technology—which includes some types of consulting services—was poised for precipitous growth over the next four years. Its estimates show \$6.03 billion in investment in 2018 and nearly \$29 billion by 2021.
- A Q1 2017 forecast from International Data Corporation (IDC) and Salesforce, which included AI-related hardware, software and services, anticipated spending would more than double between 2018 and 2020, from \$20 billion to \$46 billion.
- Research firm Tractica revised its previous forecasts upward in May 2017 and predicted that worldwide revenues from the direct and indirect application of AI software would reach almost \$60 billion in 2025, up from just \$1.4 billion in 2016.

While investment in AI is high, adoption isn't quite there—yet. In fact, according to research in McKinsey's paper, just 20% of firms whose C-suite executives were aware of AI had actually adopted at least one of its technologies at scale or in a core part of their business; 31% were "partial adopters," 40% were contemplating its use and 10% were experimenting. More than four in 10 (41%) of these firms reported being uncertain about AI's benefits, specifically the business cases and return on investment (ROI).

Results from May 2017 research from automation platform Linc were similar. Among the US retail executives surveyed, just 7.7% said AI played a regular role in their customer service at the time the survey was taken. Another 34.1% were experimenting, while 56.0% were not using it at all.

These patterns are common across industries. "AI has the capacity to revolutionize every business in every market sector; its potential is broad and unlimited," Ron Tolido, CTO for the Insights & Data Practice at Capgemini, told Computer Business Review in September 2017. "However, we are seeing a large contrast between those who are rolling out applied AI solutions at scale and reaping tangible business benefits, vs. those who are simply trialing the technology."

Artificial Intelligence Technology* Spending Worldwide, 2016-2021
billions



*Note: includes consulting and within company implementation; *cognitive computing, intelligent automation, machine learning and deep learning*
Source: Gartner as cited in press release, Dec 15, 2016

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Machine Learning Edges Out Other AI Tech, Study Says

52% of execs say they've put the AI technology into action

From chatbots to natural language processing, the variety of artificial intelligence (AI) technologies really run the gamut. Machine learning, according to a recent study, appears to have an edge over most of these tools.

A little over half of executives and IT decision-makers told Infosys this past January that they deployed machine learning, ahead of others like computer vision (48%) and natural language processing (38%). Machine learning refers to computers or software that can “learn” without being explicitly programmed. It takes the heavy lifting out of interpreting and responding to the vast swathes of digital data available in the world today.

John Walsh, co-founder and president, media at AdTheorent said machine learning will be a big driver of growth for AI. Recently, the predictive advertising agency partnered with a big box retailer and drove a 6.6% lift in sales resulting in more than \$6.3 million in incremental sales revenue—thanks in large part to technology.

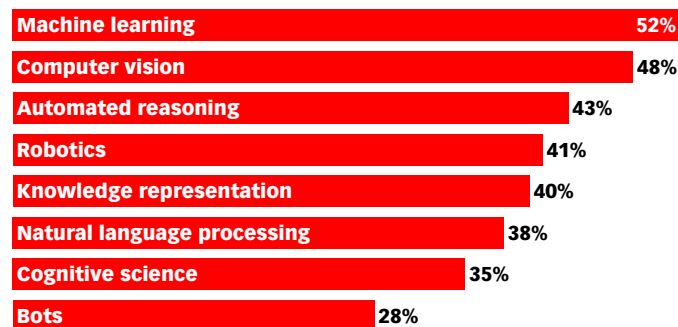
“Through machine learning we were able to further refine this target,” he said about the campaign. “We leveraged custom machine learning models across custom interactive mobile ads to reach only those in demo consumers with the highest likelihood of engagement and purchase.”

There has been a huge increase in the amount of data that consumers are creating on their connected devices, but it's worthless without a way to make sense of it, Walsh added.

“Machine learning allows us to meaningfully access, organize and make decisions off of this data to inform targeting, creative and insights with great efficiency,” he continued. “It allows marketers to engage with the right consumer with the optimal creative experience, at the right moment at scale.”

Artificial Intelligence (AI) Technologies Implemented by Executives/IT Decision-Makers Worldwide, Jan 2018

% of respondents



Source: Infosys, "Leadership in the Age of AI: Adapting, Investing and Reskilling to Work Alongside AI," Jan 23, 2018

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Machine Learning and More: The AI Terms You Should Know

In broad terms, AI terms usually fall into one of three categories: specific branches of computer science that deal with emulating human intelligence, commercialized applications of this technology, or business buzzwords that are often used interchangeably with more scientific AI terms.

Some of the most common AI terms are explained below. It is important to understand that though discrete types of AI exist for classification purposes, many business solutions actually involve more than one type, and many companies may have different names for the same kinds of technology.

Chatbot: An AI-powered virtual agent computer program that uses a set of rules to conduct a speech- or text-based conversation with a human over an online chat interface. Chatbots use machine learning to detect and mimic human conversation. They are commonly developed to provide specific content or automated service or utility to users.

Computer vision: Also called machine vision. The branch of AI that deals with how computers emulate the human visual system and their ability to view and interpret digital images from the real world. It also incorporates image processing, pattern recognition and image understanding (turning images into descriptions that can be used in other applications).

Machine learning: The branch of AI computing that involves training algorithms to perform tasks by learning from previous data and examples rather than explicit commands programmed by humans. When companies talk about AI capabilities in their products and services, they are often referring to machine learning. Within machine learning, three of the most popular types of algorithms are neural networks, induction algorithms and genetic algorithms. Many applications of AI, such as computer vision and natural language processing, also rely heavily on machine learning.

Natural language processing: A branch of AI that deals with a machine's ability to understand spoken or printed words in human (natural) languages, as opposed to computer programming languages. These technologies are heavily used by search engines, for spam filtering and for their ability to extract information from large and complex documents.

Neural networks: Machine learning algorithms and computational models designed to function like neurons in the human brain. As such, they can progressively "learn" from data by example, without being explicitly programmed. They are trained with specific sets of data points, which they use to guess at an answer to a query. This guess is then compared with the correct answer for each data point. If errors occur, the "neurons" are tweaked and the process repeats itself until error levels decrease.

Predictive analytics: A business term used to describe programs that use a combination of techniques from data science, statistics and AI to analyze sets of structured and unstructured data, uncover patterns and relationships, and use them to make predictions about probable future outcomes and events and identify risks and opportunities.

Some Marketers Feel Unprepared for AI

Over a third say they're not ready for the technology

Marketers may be intrigued by new developments like artificial intelligence, augmented reality and voice search. But plenty worry that they are unprepared to work with emerging tech.

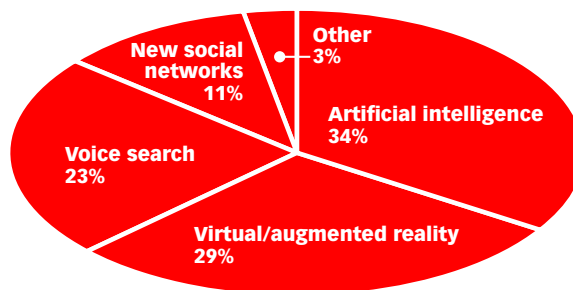
Indeed, of the 500 marketing executives surveyed by web presence management and SEO company Conductor in November 2017, 34% said they felt most unprepared to deal with AI in 2018—the highest rate of any technology mentioned.

But their unease didn't stop there. Nearly three in 10 respondents said the virtual and augmented reality trend is something they don't feel prepared for, while 23% named voice search. Fewer respondents (11%) said they weren't ready to handle new social networks.

Marketers are likely unprepared for these emerging trends because they may not necessarily understand them. AI firm GumGum polled marketing and advertising executives in North America last June to gauge how these respondents were feeling about the technology and whether they were incorporating it into their marketing efforts. While a significant number (61%) said they were generally aware of AI, only 3% considered themselves experts in the area.

One thing's for sure, though: Marketers are thinking harder about these emerging technologies. For example, a June 2017 survey from NewBase asked marketers worldwide which technologies they were prioritizing over the next year. Three in 10 respondents said they planned to prioritize AI, compared with only 13% who felt the same a year earlier.

Primary Marketing Trend for Which Marketing Executives Worldwide* Feel Most Unprepared in 2018
% of respondents



*Note: *50% of respondents were from the US*
Source: Conductor, "500 Marketing Executives Reveal Their 2018 Strategy," Dec 12, 2017

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Listen in!

Check out an episode of the "Behind the Numbers," podcast, where eMarketer's Victoria Petrock discusses how companies in various industries are experimenting with AI.

Why Building AI Products Requires Big Investment

Application is making inroads in marketing technology

Artificial intelligence might be overhyped, but that hasn't stopped it from invading marketing technology.

Ad agencies and tech vendors are adopting AI to restructure their data sets and increase their odds of winning programmatic auctions. The giant cloud companies have gotten in on the action, too: Salesforce, IBM, Oracle and Nielsen all have AI products. Their investment makes sense given that 83% of companies with more 1,000 employees use or plan to use AI in the next 12 months, according to an August 2017 Dynatrace survey of chief information officers worldwide.

While tacking the term "AI" onto a press release can generate buzz, building actual AI products is a big undertaking for most companies. Kevin Lyons, senior vice president of data science and digital technology at Nielsen Marketing Cloud, estimated that it cost roughly "millions if not tens of millions" of dollars for Nielsen to build its AI platform, which automates the creation of custom audience segments for marketers.

To create the AI product, Nielsen needed to have engineers to build the tech infrastructure, product developers to implement best practices and data scientists to monitor, test and tweak the product's models and algorithms. Four to seven people worked full time on building the platform for a few years and several others got pulled in occasionally, according to Lyons.

The promise of AI is that it will help automate everything from car driving to ad buying. But it is an uplift to get the automation flowing.

For instance, to build AI models, Nielsen researchers analyzed academic papers that discuss theoretical applications of AI. Then an engineer had to determine how to create code to make the academic's ideas become a reality. And since AI is an emerging field with little to no standards, coders had to continuously tinker with their projects until they found the combination of code that actually worked.

Even after an AI product comes out, there's still more work to do. To boost efficiency, algorithms have to be perpetually adjusted.

If an AI product is part of a larger platform, it also has to be embedded in a seamless way if customers are going to use it at scale. Nielsen's AI product came out last April, but its data management platform's interface still has to be altered to make the AI tools more smooth for customers, Lyons said.

CIOs in Select Countries Whose Company Uses or Plans* to Use Artificial Intelligence, Aug 2017

% of respondents

China	96%
Brazil	94%
Germany	85%
Mexico	84%
France	83%
US	82%
Singapore	82%
Australia	74%
UK	72%
Worldwide	83%

Note: *in the next 12 months

Source: Dynatrace, "Lost in the Cloud? Top Challenges Facing CIOs in a Cloud-Native World" conducted by Vanson Bourne, Jan 31, 2018

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Not Everyone Is Worried About AI Taking Over Their Jobs

Many believe it will create new opportunities

November 2017 data from Accenture Strategy finds that a good number of people are more willing to work with intelligent machines than public opinion suggests.

The study polled 14,078 working professionals ages 18 and older and 1,201 senior executives in 11 countries worldwide.

Over two-thirds of respondents stressed the importance of learning new skills to work with emerging technologies, such as AI, within the next three to five years. A similar proportion said they believe these technologies will create more opportunities for their company. What's more, 45% felt encouraged about AI, believing it will help them do their job more efficiently.

But it's important to note that not everyone feels the same way.

For example, an October 2017 survey from Gallup and Northeastern University found that a significant majority (73%) of US consumers said AI will eliminate more jobs than it creates. Just 14% of respondents thought that the technology would create more roles.

By and large, there's been a lot of chatter around AI displacing human jobs. And that likely won't stop anytime soon.

Attitudes Toward Artificial Intelligence (AI) in Relation to Their Job According to Working Professionals Worldwide, Nov 2017

% of respondents

67% Believe it will be important/very important to learn new skills to work with intelligent technologies in the next 3-5 years

62% Believe intelligent technologies will create opportunities for their work

45% Believe AI will help them do their job more efficiently

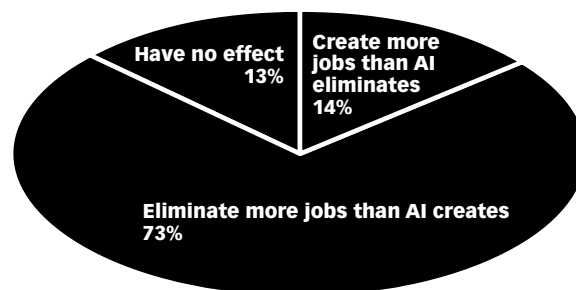
Source: Accenture Strategy, "Reworking the Revolution," Jan 22, 2018

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Extent to Which Increased Usage of Artificial Intelligence (AI)* Will Affect Jobs According to US Consumers, Oct 2017

% of respondents



Note: ages 18+; *defined as computers, robots or other technology that can accomplish tasks humans can do, as well as learn and accomplish tasks that humans may not be able to do

Source: Gallup and Northeastern University, Jan 31, 2018

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Retailers Are Making Strides with In-Store Data

Facial recognition software and “magic mirrors” are moving mainstream

Instead of fearing technology, retailers in the know are embracing new digital tools to help gather consumer information and improve the shopping experience.

Indeed, many are implementing a variety of in-store technologies to stay competitive with ecommerce. These include face-recognition software that alerts staff when members of a loyalty program enter the store, and so-called magic mirrors, which assist consumers with beauty products and allow them to virtually try on clothing and accessories. These techniques could provide retailers with information about popular products or individual preferences to target promotions.

Upscale department store Neiman Marcus was an early adopter of magic mirrors (it started using the technology in 2015). But these experimental tools are starting to become more mainstream—even sporting goods store Finish Line is employing augmented reality in-store. Saks Fifth Avenue has used facial recognition since 2016 to identify VIPs—as well as shoplifters. It is also being used at regional fast-food chain CaliBurger to identify loyalty members, which aims to enable face-based payments this year.

Meanwhile, Amazon recently patented a virtual reality mirror, which signals mass potential, and with the popularity of iPhone X, consumers will likely become acclimated to using their face to log in on smartphones and elsewhere.

By and large, harnessing the power of technology to better understand in-store habits can help retailers better target consumers. And many are already seeing how important tech will be in their marketing efforts. October 2017 data from IHL Group and RIS News revealed that many retailers in North America are placing technology bets for 2018, ranging from AI to location-based marketing.

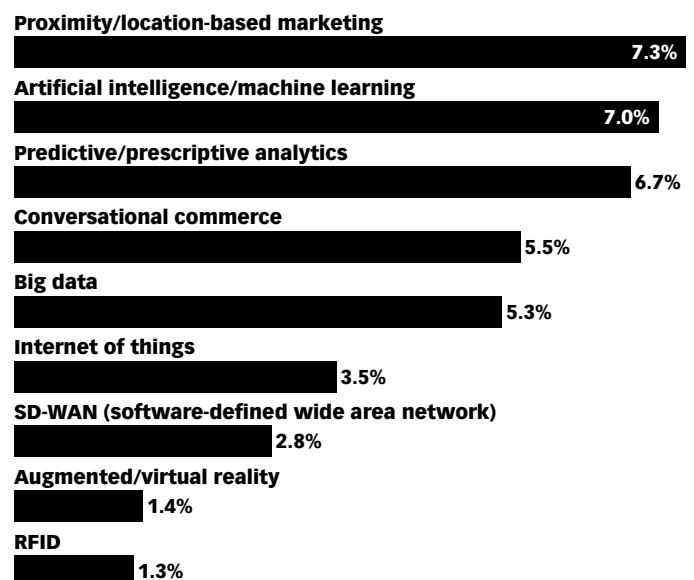
But all the bells and whistles in the world won't matter if retailers are opaque about data being collected, even if it helps a shopper identify a perfect shade of plum lipstick.

One of the surest ways to entice consumers is with coupons since many feel this is a fair value exchange for giving up a little privacy.

An October 2017 Facebook IQ survey of in-store shoppers in the UK, Germany, France, Italy, Spain and the US about mobile usage found that 52% of respondents would be open to receiving personalized offers on their phones while shopping (US shoppers were most receptive). The number of consumers who said they weren't open to this was the same as those who said they didn't know (31%). As far as Facebook serving ads for products available in a particular store, 63% said that would be useful, and 61% said that would be relevant.

Expected Growth in Spending on Select Emerging Technologies According to Retailers in North America, Oct 2017

% change



Note: vs. 2017

Source: IHL Group and RIS News, "Store Experience Study 2018: Retail Tech Spend Trends," Jan 9, 2018

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Utilizing Machine Learning to Drive Real-World Success Metrics

This post was contributed and sponsored by [AdTheorent](#).

By using a custom machine learning model, AdTheorent drives incremental visitors in-store. This ML model optimizes, in real-time, towards incremental in-store visits.

What is AdTheorent's Cost Per Incremental Visit (CPIV) Ad-Pricing Model?

AdTheorent's CPIV ad-pricing model utilizes third-party location measurement data to identify location visits that are truly incremental and representative of lift caused by exposure to an ad campaign. Under this performance-based pricing model, advertisers only pay for incremental visits and do not pay for those that would have occurred without campaign exposure. By working with a third-party measurement partner, AdTheorent delivers visitation numbers from a trusted, non-biased partner.

Cost Per Incremental Visit Case Study for Large QSR Company

A Client Objective

Reach new customers to drive trial and repeat visits for a large QSR company during key promotion windows.

AdTheorent's Solution

Leveraged custom location models in conjunction with predictive targeting to engage consumers near key locations with the highest probability of visitation to drive consideration and increase incremental visits.

Activated our direct placed integration to make real-time optimizations towards consumers most likely to convert and increase foot traffic, only charging the brand for those incremental visits.

RESULTS

103% 
In-Store Visitation Lift
4x Benchmark

\$4.22 
Cost Per Incremental Visit
20% below contracted CPIV



At SAP, Machine Learning Is Imperative for Content Marketing Personalization



David Jonker

Vice President, Thought Leadership Marketing

SAP

When SAP wanted to create a truly bespoke experience for readers of its content websites, the enterprise software company turned to machine learning. David Jonker, SAP's vice president of thought leadership marketing, spoke with eMarketer's Jillian Ryan about his team's journey to implement artificial intelligence (AI) technology and why it's an essential part of the company's content marketing strategy.

eMarketer: How have you expanded the use of technology specifically for content marketing at SAP?

David Jonker: I have a small team that works on how we use data, machine learning and predictive algorithms to improve our content marketing efforts. We've been building a number of systems that use machine learning to analyze our content. For example, on our thought leadership website, the Digitalist Magazine, we're analyzing all of the content and mapping every article's relationship to one another based on the themes within those pieces of content.

eMarketer: It sounds like you're assigning affinities between all of your content assets, but what's the larger goal behind this investment in AI technology?

David Jonker: We're aiming to personalize customer engagement through content. We're at an early phase of the project. Visitors don't see it in action just yet, but the goal is to let our audience find more relevant articles based on their behaviors and search history.

Through machine learning, we're building more sophisticated algorithms to understand our published content and match it to people's interests. If people show up to our site and the article they see isn't quite what they're looking for, we could lose them. We want to make sure the content we deliver to them is as precisely targeted

as possible. The better we can target the content, the more engaged visitors will be—and the more satisfied they'll be in the education they received on issues they're trying to address.

eMarketer: What was the genesis behind this development in SAP's marketing technology?

David Jonker: Our sales team was asking how the marketing department could provide prospects with a more tailored experience. If we know a certain customer is interested in a particular topic or issue, can we make a landing page that's relevant to them? A standard recommendation engine doesn't work for this level of personalization, so we spent some time dreaming up a new way to build machine-learning algorithms that would make recommendations and tailor content.

"A standard recommendation engine doesn't work for this level of personalization."

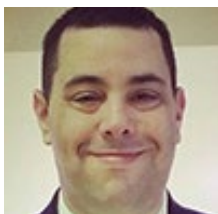
One of our clients, the Toronto International Film Festival, had a similar problem and we built this technology for them. The personalized experience more than doubled performance results and engagement for them, so we figured we could test it for our purposes.

eMarketer: Is the machine-learning mechanism only used for content delivery, or do you also implement AI to create the assets?

David Jonker: The machine-learning side tinkers with how we deliver content. We don't use it to drive the content creation.

We have two approaches to content creation as it relates to thought leadership marketing. First, we're very deliberate about curating high-quality original content and long-form research on topics like digital transformation. The second element is community-sourced content. We're building a community of experts, writers and thought leaders in their industries and lines of business to contribute to our content properties.

How Artificial Intelligence Can Transform the Digital Out-of-Home Marketplace



Omer Golan

Founder and CEO

Outernets

While artificial intelligence (AI) is changing many facets of digital marketing, few marketers have considered incorporating that technology into the offline world. But that could change in 2018 as marketers learn how to incorporate AI, along with the hoard of data they have about their customers, into physical touchpoints. eMarketer's Tricia Carr spoke with Omer Golan, founder and CEO of Outernets—a technology company that works with retail brands like McDonald's and Dylan's Candy Bar to create personalized window displays—about how AI is improving the digital out-of-home industry.

eMarketer: Why should marketers explore different uses for AI this year—even if what they're currently doing is working for them?

Omer Golan: The typical audience today is more sophisticated and they demand more mindfulness from advertisers. They want ads to be more conversive than they are with a big data approach. AI technology can solve these pain points by helping marketers personalize content and make it interactive. Their products become a part of a conversation, and consumers can relate more to what they see if it's something that matches their interests.

eMarketer: Outernets plays in the out-of-home space. Is there consumer demand for a higher level of personalization in the offline world? Or are marketers providing personalization offline just to get ahead of the curve?

Golan: I wouldn't say there's a demand—there's an expectation. Audiences today are expecting everything to be smarter, better, faster, digital and interesting. Everything

has to be an experience. If there weren't experiences outside or at the store, we would all just shop online.

For example, many retailers today are missing a way to offer compelling experiences that differentiate them from ecommerce. Remember that a small percentage of shopping happens online—everything else still happens offline. Even Amazon is going offline now. Brick-and-mortars shouldn't be too alarmed, but they should try to figure out how to leverage technology to make the offline experience better.

"Audiences today are expecting everything to be smarter, better, faster, digital and interesting. Everything has to be an experience."

eMarketer: Your company works with marketers to create window displays that are powered by AI. How does the technology work?

Golan: We think of the storefront as similar to the homepage online. You're trying to understand where people come from, what they're looking for, how to retain them, how to pique their interest, how to increase their basket size and how to make them come back. The way to do that is to offer experiences that consumers remember and make them want to come back—in addition to convenience and relevance.

We create video displays in storefronts that give consumers interactive experiences, and we use machine learning and computer vision to understand everything we can about what happens in front of the displays—who is there, what they're looking for, how they behave, how they respond and how they engage with the content. We leverage many different types of data to do this. And we do this in real time so retailers are able to personalize the content. Consumers can also buy the product they see, so as a result, a window advertisement becomes another ecommerce platform.

eMarketer: Even with digital out-of-home advertising, it's often impossible for marketers to measure ROI [return on investment]. Will AI help change that?

Golan: Out-of-home used to be the last medium on every media planner's list because they had no idea if it worked or if people saw it. The entire strategy was around brand awareness. With AI, their goal is changing. Marketers will start to shift from brand awareness to actually seeing sales from their ads. Digital out-of-home advertising and AI should generate real revenue for advertisers this year.

"Retailers had no data-driven processes for designing their storefront. They didn't take into account who was passing by and looking in."

eMarketer: How will AI change the creative process for digital out-of-home?

Golan: When we started in out-of-home advertising, we realized there was no science behind it. Retailers had no data-driven processes for designing their storefront. They didn't take into account who was passing by and looking in.

For example, when I pass a department store, I see dresses and other women's items that don't interest me. But I'm a frequent customer of that store—why don't they show something that interests me as well? Once you digitize displays and feed in data, you're not stuck with one item. When I go to the store, I'll see a guy with my body type wearing a suit that fits and is in stock.

Or when you display a video without AI behind it, that's it. Even if you get feedback, you can't do anything about it because it could take a retailer six months to produce a good video—all you can do is take it off. But AI helps everything work faster and more efficiently and give better ROI. You can personalize the content in real time.

eBay Incorporates Machine Learning to Overhaul Email Marketing Platform



Alex Weinstein

Director, Marketing Technology and CRM
eBay

eBay is no stranger to sending batch-and-blast emails—for years, that was the company's primary email strategy. But as customer expectations grew, the strategy—and the technology that supports it—had to mature. Alex Weinstein, director of marketing technology and CRM (customer relationship management) at eBay, spoke with eMarketer's Maria Minsker about how the company built its own personalization platform, and explained how the platform now supports a number of marketing and advertising channels.

eMarketer: For a while, eBay's approach to email marketing was largely batch-and-blast. Why did that eventually stop working for you?

Alex Weinstein: In the past, we had our marketing operations organization handle email. If our fashion marketing team wanted to let customers know about a shoe sale, they would ask our marketing operations team to create an ad hoc email that would go out to several million customers and advertise that shoe sale. That approach was OK, but the problem was that it was addressing our customers in large groups. There wasn't as much one-to-one personalization as we wanted.

eMarketer: How did you change your approach to email?

Weinstein: We understood that we needed to reinvent our strategy to be more customer-focused and treat each customer as an individual, rather than a member of a group [of millions]. That's why we decided to invest quite meaningfully into a one-to-one personalization platform. We created an approach where humans make the creative and the raw materials, but machines do the personalization.

eMarketer: Can you talk more about this personalization platform? How does it work?

Weinstein: Imagine a customer is browsing eBay for shoes. Marketers constantly create deals—there are some deals on shoes, some on electronics and some on accessories for cars. As those deals are created, they're placed into virtual "buckets."

For every piece of marketing content, such as our newsletter, a machine learning model looks through all these buckets and decides that based on a customer's browsing history, a shoe deal would be most relevant. It's the best of both worlds—content is filled by a machine learning model selecting from deals that humans have created.

eMarketer: Why did you decide to build this platform in-house instead of buying a prebuilt one?

Weinstein: We evaluated a bunch of third-party offerings, but there were two reasons for doing this in-house. The first reason was eBay's sheer scale. We are one of the largest marketplaces on the planet, with a billion items for sale and 167 million active buyers. Third-party solutions struggled with the scale.

The second reason was our internal decision to prioritize this work and be one of the best in the world at it. That's why we decided we have to develop in-house expertise that will enable us to deeply understand every element of the stack, develop machine learning models and create real-time data processing pipelines to differentiate ourselves.

eMarketer: What role does real-time data play in your personalization platform?

Weinstein: With the batch-and-blast approach, we struggled with data delays. When someone made a purchase, that data had to be processed and eventually placed in a data warehouse. Our marketing system would operate on top of that data warehouse, but by the time a purchase was processed, a campaign that would have benefited from that data may have already run.

"The moment the price changes on an item a customer has viewed, we can automatically send that customer an email. No batches involved."

Now, we have a real-time data pipeline that powers our downstream marketing campaigns. Whenever an action takes place on the site—a customer buying an item,

browsing or just seeing an ad—the activity is tracked by our real-time engine, which updates the profile of the customer and sets off triggers that we have embedded in the system. The triggers apply to both customers and items: For example, the moment the price changes on an item a customer has viewed, we can automatically send that customer an email. No batches involved.

eMarketer: What other challenges has real-time data helped you solve?

Weinstein: Another problem we faced is we would send an email to our customers with a great deal, but by the time they opened that email a few hours later, the item advertised was already sold.

As a result, we decided to use the real-time data pipeline to provide customers with the most relevant offer for them at the moment they open the email, not the moment we send it. This was a huge technological challenge because it meant that the email would have to render dynamically the instant it's opened, but we've made sure that every ad slot loads in 20 milliseconds or less.

eMarketer: How does the personalized email platform fit into your CRM system?

Weinstein: Our journey with CRM started with building this real-time data pipeline for email. Our next step was adding machine learning to that pipeline. And the third step was expanding this system to all outbound channels, including the customer's experience on-site.

It's not just about being personalized in email, but also in our display ads, which is why we connected our display stack to the same pipeline. As we continue to add channels, we're developing a cross-channel CRM system.

eMarketer: You mentioned that machine learning is a component of your platform. What's your outlook on where machine learning is heading?

Weinstein: Machine learning has become foundational to how we see personalization. My invitation to my colleagues in the industry is to not try to boil the ocean, but rather dip their toes in a little bit. For example, use a light machine learning model to improve your newsletter. Try it, and you'll see results.



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