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APRIL 28 >>> 2022

MARKETING TECH
REVS UP

TABLE OF CONTENTS

THE TAKEAWAYS

TOP DIGITAL MARKETING TRENDS FOR 2022

WHAT'S IN:

- Social consumers in broad digital and social media networks
- Video analytics, especially on TikTok, YouTube, and social media
- Measuring consumer engagement with machine learning automation
- Combining AI and experiments to maximize consumer value
- Adding "good friction" to reduce AI bias

WHAT'S OUT:

- Third-party cookies and surveillance
- Emojis as customer interest indicators
- Long-term analysis based on false, short-term proxies
- "Analytics" as gut feeling
- Assuming AI is neutral—it's not

IDE RESEARCH DRIVES DIGITAL MARKETING OUTCOMES

BY SINAN ARAL

Director, MIT Initiative on the Digital Economy (IDE)

Finding the perfect match between businesses and customers is an age-old quest. But today, digital tools are making the task more precise and efficient than ever. Marketing tech helps global brands—from beer to newspapers—identify, attract, and retain customers in a fast-paced, omnichannel world.

At the same time, success requires a unique mix of data scientists and creative marketers. Under the hood of today's social media, TV, video, and print ad campaigns, data engineers and researchers are crunching numbers and experimenting with machine learning (ML) and AI algorithms to sharpen marketing investments. All the while, they need to protect privacy and create meaningful customer engagement and communities; not just clicks. These trends and partnerships between researchers and industry executives were highlighted at the first **CMO Summit@MIT** on April 28.

Researchers at the MIT IDE collaborate every day with marketing executives to understand today's networked consumer and to use cutting-edge data science to meet customer's needs. In the process, our work is upending conventional approaches and strategies.

Marketing and consumer engagement strategies are constantly changing. Since about 2010, we have been in an era of the socially linked consumer who gets information and makes brand decisions based on a very broad set of digitally connected networks, whether on Facebook or WhatsApp. Given the speed of social media and tech advances, if your brand is still focused on segmentation, you're about three decades behind; consumers are affected by so much more than targeted ads.

That's the value of field studies and digital experimentation. Findings from IDE research, for instance, will show whether to bid more for social ads on Facebook or whether to pivot to new markets. There are no one-size-fits-all decisions or metrics; that's why new methods are far more sophisticated than random A/B tests of the past. At the IDE we are a year or two ahead of what other people are thinking about. We invite your business to join us. Become a sponsor and member like the Boston Globe, WPP, AB InBev, VidMob, and others who shared their wins at the CMO Summit. Like them, you can benefit from having the best and brightest minds solve your business problems and produce better outcomes.

"THERE'S A LOT OF VALUE TO APPLYING STATISTICAL MACHINE LEARNING TO PREDICT LONG-TERM AND HARD TO MEASURE OUTCOMES."

DEAN ECKLES

Social Networks & Digital Experimentation Research Group Lead, MIT IDE

THE RESEARCH

TARGETING FOR THE LONG TERM

MIT Assistant Professor, **Dean Eckles**, who leads the Social Networks and Digital Experimentation Research Group at the IDE, talked about ways to update customer targeting by using machine learning (ML) to forecast outcomes more quickly and accurately.

His **recent study** examined long-term customer retention and revenue at the Boston Globe Media Company. Most marketers are concerned about retention and revenue, but without good forecasts, decisions about effective marketing interventions—such as discounts or special promotions—can be arbitrary, Eckles said. Moreover, waiting months or years to measure the results of promotional incentives can waste precious time and dollars.

In collaboration with the Boston Globe, IDE researchers tried new marketing intervention strategies instead of traditional approaches such as customer lifetime value models. Eckles' team took a statistical ML approach to analyze the results of a discount offer on customer behavior after the first 90 days. They then used those findings to create a "surrogate index" to predict the results of the next intervention and adjusted the recipient list for greatest impact.

The result? The short-term surrogate prediction was just as accurate as a prediction made after 18 months. Also, the team discovered that sending a discount to all subscribers actually had a worse payoff than sending no intervention at all. The key was picking the right subscribers—and that's where ML helped the most.

Eckles also examined conventional CRM wisdom about customer churn. "We typically target people who are likely to churn, but ideally, we want to think about the effects of our intervention on the outcome that we care about," not just current customers.

"There's a lot of value to applying statistical machine learning to predict long-term and hard to measure outcomes," Eckles said, "and to use that to target interventions." As proof, Eckles estimates that these experiments helped the Globe realize a revenue increase of $4 million to $5 million over a three-year period. The Globe now is applying these churn-management techniques to its half-a-million print readers and 200,000 digital subscribers.

NEW WAYS to CONSIDER a HISTORIC BUSINESS

THE OUTCOME

DIGITAL EXPERIMENTS MAKE HEADLINES AT THE BOSTON GLOBE

THOMAS BROWN

Vice President of Consumer Revenue, Boston Globe Media

The 150-year-old Boston Globe Media company has worked closely with the MIT IDE to keep pace with marketing technologies and industry pressures. And as executives explained during the CMO Summit@MIT, that research has resulted in measurable improvements.

"The Boston Globe is certainly a success story in an industry that has seen tremendous challenges over the last two decades," said IDE director Sinan Aral.

Working with the IDE to make data-based decisions, the Globe has overhauled its marketing strategy and pricing and has dissected its audience in many new ways. "So much of what has gone into our strategy has been based on the learnings we've come to together over the years," said Thomas Brown, Boston Globe Media's VP of consumer revenue.

One experiment to address churn and retention involved subscription discounts and incentives to bump up renewals. Dean Eckles, MIT Sloan assistant professor and the IDE researcher who led the project, explained that the campaign was more nuanced than it seemed. If Globe subscribers liked the discount enough to renew, that could help reduce churn. But if the discounts didn't trigger more renewals, the discounts would lower revenue and hurt the Globe's profits.

To help predict these long-term but hard-to-measure outcomes, Eckles and his colleagues conducted two experiments. In the first, they sent a discount to 1,000 eligible subscribers who were judged at high risk of churn. The second intervention offered a wider set of discounts to a group of 6,000 readers. The IDE team then monitored the subscribers' retention rates over 18 months [**see related story on page 4**]. "It's nice that we've had some really big wins," Brown said.

Peggy Byrd | CMO, Boston Globe Media   ✕

NEW CMO EXPANDS THE GLOBE'S REACH

Part of the marketing change at Globe Media was the appointment of the company's first CMO, Peggy Byrd, in late 2020. As the company transitions from home delivery to digital distribution, she told CMO Summit attendees, "the challenge is what to focus on, what to prioritize, how are you going to harness all that historical beauty." Ultimately, she added, "our goal is to create this amazing consumer journey and attract people wherever they are."

CMO Byrd enthusiastically supports using data analysis to identify new audiences and platforms. She noted that the Globe now publishes more than 30 newsletters, sponsors about 300 live and virtual events a year, and has just launched a radio show, "Black News Hour," aimed at Black listeners.

PARAMVEER DHILLON

Assistant Professor, University of Michigan and Digital Fellow, MIT IDE

THE RESEARCH

MODELING DYNAMIC USER INTERESTS

In another effort to better understand media audiences, the MIT IDE and the Boston Globe built a model to track the dynamic news consumption interests of readers over five years. Through qualitative studies, including a crowdsourced evaluation, researchers identified subtle consumption patterns very accurately, said **Paramveer Dhillon**, Assistant Professor, University of Michigan, and a recent postdoctoral associate at the MIT Sloan School of Management.

Dhillon said the idea was to pinpoint reader interests—say, sports, business, or politics—and then model how consumers' preferences for news consumption change over time.

Dhillon's team harvested clickstream data from the Globe site, then used machine learning (ML) to identify patterns and to generally optimize the user experience. The challenge, Dhillon explained, was in understanding the dynamics of users' latent or hidden interests. (**Read the paper here**.)

ML and neural network models followed the preferences of roughly 500,000 unique users over nearly five years, for a total of some 5.6 million observations. By analyzing headlines, the model discovered latent interests in 30 categories including local politics, vacations, entertainment, social issues, baseball and basketball. To protect subscriber privacy, all data was encrypted and anonymized before the analysis.

BREWING UP CONSUMER DEMAND AT AB INBEV

Today's marketing depends on "deeply understanding communities and the customers we serve," said **Marcel Marcondes**, Global CMO, AB InBev and former CMO, Anheuser-Busch—the world's largest brewer. And AB InBev seems to be crafting the right mix. The global maker of Budweiser, Corona, and Stella Artois beers, reported 2021 revenue of $54.30 billion—more than half that now generated through B2B digital platforms including BEES and Zé Delivery, according to **Yahoo!Finance**. The monthly user base of its proprietary BEES e-commerce app for retailers reached 2.7 million and Zé delivers cold beer to consumers within an hour by leveraging its retail store network.

Marcondes told CMO Summit attendees that the company is digitizing consumer interactions as much as possible "so that we can transform data into insights in a much more effective way." For instance: How does the company reach more female customers, expand its

non-beer offerings, and become a part of people's life 'occasions'—not just at sports arenas?

One approach is to use social media differently than in the past by tracking social mentions, Marcondes said. "It's all about how much people are talking about what we do, how much are we part of the conversation, instead of how much of the media pie we are buying." We want "to make sure that we are culturally relevant, not just visible.

Digital marketing also helps the giant firm become more agile, innovative, and effective, because "we can have online conversations with a big base of consumers, and we can interact with them in a much faster way to check concepts, to prototype, and also to get input once something is already out in the market," Marcondes said.

> "WE WANT TO MAKE SURE THAT WE ARE CULTURALLY RELEVANT, NOT JUST VISIBLE"

MARCEL MARCONDES

Global CMO, AB InBev and Former CMO, Anheuser-Busch

MADHAV KUMAR

PhD Candidate, MIT Sloan School of Management

THE RESEARCH

SCALABLE BUNDLING: COMBINING MACHINE LEARNING & FIELD EXPERIMENTATION

While advertising is seen as a glamorous field of creative content and celebrity brands, marketing research often is exacting and massive in scale.
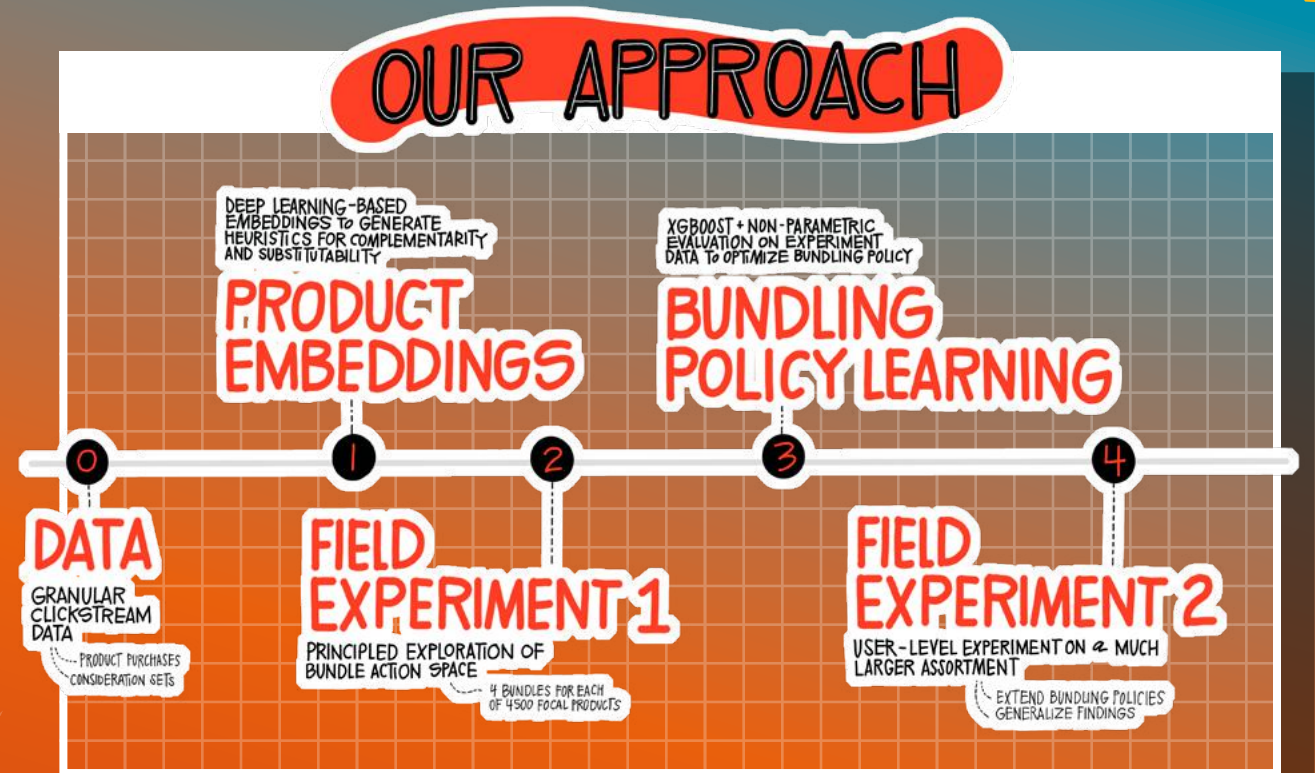
For instance, marketers have long grappled with how to bundle goods—which consumer products to combine for co-purchase from a huge assortment. Do people always buy chips and dips together? Which products should a retailer pair to form promotional bundles that increase sales? Finding the right matches will boost revenue and customer satisfaction, **Madhav Kumar**, PhD Candidate, MIT Sloan School of Management said.

But there are billions of options—including those with positively related demand (complements) or negatively related demand (imperfect substitutes), and data analysis can be daunting.

His solution was to develop an end-to-end machine learning-based framework for solving this core marketing problem at scale. Using product pairs from purchase baskets in a test set, Kumar then predicted the likely purchase of the other product. The ML programs ran random experiments to find successful and less successful pairs.

By conducting field experiments with more than 4,500 products, Kumar analyzed clickstream data about purchases. "The optimized bundling policy is expected to increase revenue by 35%—$5 per 100 visits. It proved to be robust across product categories and can be generalized well to the entire assortment," he said.

OUR APPROACH

0 DATA — GRANULAR CLICKSTREAM DATA — PRODUCT PURCHASES CONSIDERATION SETS

PRODUCT EMBEDDINGS — DEEP LEARNING-BASED EMBEDDINGS TO GENERATE HEURISTICS FOR COMPLEMENTARITY AND SUBSTITUTABILITY

1 FIELD EXPERIMENT 1 — PRINCIPLED EXPLORATION OF BUNDLE ACTION SPACE — 4 BUNDLES FOR EACH OF 4500 FOCAL PRODUCTS

BUNDLING POLICY LEARNING — XGBOOST + NON-PARAMETRIC EVALUATION ON EXPERIMENT DATA TO OPTIMIZE BUNDLING POLICY

4 FIELD EXPERIMENT 2 — USER-LEVEL EXPERIMENT ON a MUCH LARGER ASSORTMENT — EXTEND BUNDLING POLICIES GENERALIZE FINDINGS

RENÉE RICHARDSON GOSLINE

Human/AI Interface, Research Group Lead, MIT IDE

THE RESEARCH

AI & COGNITIVE BIAS

In the rush to adopt digital technologies, marketing leaders must also recognize the importance—and challenges—of behavioral science and the study of human nature. In her presentation at the CMO Summit, **Renée Richardson Gosline**, IDE Human/AI Interface Research Group Lead, explained the intersection of AI and cognitive bias and how bias can be introduced when AI is used for decision-making and media campaigns.

One big buzzword of digital marketing transformation is reducing customer "friction" points by using AI and automation to ease the customer experience. "In fact, it has become quite a popular and robust approach," Gosline said, "and we've all caught what I like to call frictionless fever." Retailers such as Aldi, Hudson, and Amazon Go, "allow you to skip the checkout and use facial recognition or hand-scans as your wallet. The future of investing is frictionless and autonomous," too, she noted.

Yet, most executives don't understand what's going on with AI, Gosline maintains. They don't understand that 100% of AI is biased. "Since all AI is trained on historical data, and humans program AI, and organizations have very clear goals, AI is not neutral; it is biased toward those goals and toward what has come in the past," she said.

Gosline suggests that marketers have "avoided friction at their own peril. Have we adopted all of this AI and this automation and lost the central human behind the data points?"

Going forward, she said that "rather than thinking about friction as bad and something to be eradicated, we also should think about when friction could actually be helpful" and when adding friction in the use of AI could improve trust and reduce harm and bias.

Gosline presented research that demonstrates the relationship between cognitive style and trust in AI versus humans. "We need to think about who is using algorithms and when it makes sense for us to potentially add friction to interrupt the automatic and potentially uncritical use of algorithms."

4 CONSIDERATIONS FOR BETTER AI OUTCOMES

Renée Richardson Gosline offered four points to consider before introducing AI tools and 'good friction.' "Adding these points of friction in our processes may help us center our customers and not just talk about customer centricity," she told CMO Summit attendees. In turn, that will increase trust and reduce harm. Gosline strongly believes "using AI in a way that's human-centered as opposed to exploitative will be a true strategic advantage" for marketing. The considerations are:

1. **ASK:** Should AI even be doing this or can it be done better by humans?

2. **AUDIT** user journeys—whether they are customers or employees—to identify touchpoints that would benefit from the addition of friction.

3. **EMBRACE** inclusivity in terms of who's developing these models and what data is being used to train these models. "Who is in the room when we decide who's going to be affected by these models?"

4. **IDENTIFY** asymmetric friction. Don't create a "lobster trap" that is frictionless to get in but creates a lot of friction to get out.

> *"CREATIVE QUALITY AND CREATIVE EXECUTION ARE ACTUALLY MORE IMPORTANT THAN TARGETING CUSTOMER IDENTITY."*

STEPHAN PRETORIUS
Chief Technology Officer, WPP

THE OUTCOME

MARKETING AUTOMATION & CREATIVE ADVERTISING AT WPP

Even the largest global firms are looking for new approaches to long-standing challenges: better consumer engagement, super-competitive markets, and the impact of social media advertising. **Stephan Pretorius**, Chief Technology Officer at **WPP**, oversees tech communications, public relations technology, and advertising at the largest advertising company in the world. "No one who works in marketing or advertising today can survive, without having extremely strong, intimate relationships with [firms] from Google to Meta, to Amazon, to TikTok," he said.

"Enterprises can't survive without having marketing technology and consumer data management as part of the enterprise technology strategy. It is absolutely essential," he said at the CMO Summit.

"[At WPP,] we're trying to crack the combination of highly dynamic and intelligent content with a very real time, very accurate understanding of consumers… and bring the two together," Pretorius said. And even though marketers increasingly seek to collect "first-party data" directly from consumers, privacy needs can still be protected, he said.

"We don't need to know who the person is, or have any personal information about them to execute accordingly." Despite all of the new technologies, he said, "creative quality and creative execution are actually more important than targeting customer identity.

"In virtually every study we've done, the quality of the creative, the strength of the offer and the brand, and the contextual relevance of the message are more important than who the person is. Collectively, the industry became so obsessed with understanding who someone is we forgot about the importance of understanding the context."

In a conversation with IDE Director, Sinan Aral, Pretorius agreed that using "third-party cookies as a way to track consumers is an awful idea. I would argue that they were never a good idea in the first place. It was done for conversion tracking back in the day … and there was no ill intent, but surveillance is not a good consumer experience." Unfortunately, he added, "it's become surveillance—no one likes that, it's creepy."

Pretorius also said that it's vital to have "completely integrated marketing technology architectures with consumer data at the center. You can't have a fragmented technology architecture where social media runs on one platform, experiences run on something else, and paid media or commerce run on a different platform…that creates completely fragmented consumer experiences."

WPP'S KEY TRENDS TO WATCH

- The rapid transformation in marketing has been a result of technology automation, machine learning, and more sophisticated omnichannel conversations.

- Tech is used both to create better content and to understand it better. Content intelligence, which is different from auto tagging, is the study of programmatically knowing why certain pieces of creative perform better than others.

- Whether we like it or not, machine-generated content is a growing trend that is both "frightening, and fascinating."

- All of the cutting edge marketing is happening on video. In the future video advertising, regardless of the platform, is going to be addressable and dynamic. Audio is a hugely underestimated driver of creative performance, too.

> ## "CONSUMERS ARE GETTING THEIR INFORMATION AND MAKING BRAND AND PRODUCT DECISIONS BASED ON A VERY BROAD SET OF DIGITAL NETWORKS"

SINAN ARAL

Director, MIT IDE

THE RESEARCH

DECONSTRUCTING SOCIAL ADVERTISING

At the CMO Summit@MIT IDE Director Sinan Aral emphasized the need for very granular analysis to really understand the role of social media marketing today.

Advertisers spend millions of dollars to reach socially linked consumers, Aral said, but consumers are getting their information and making brand and product decisions based on a very broad set of digital networks—whether it is Facebook or the people they speak to on WhatsApp.

While marketers strive for direct consumer engagement, they also need to acknowledge that online interaction is driven by what social network peers, as well as the crowd, thinks about different products and services—also known as social proof.

Customers are not only influenced by things like Google's friendorsements, "where you see in a search result that, for example, a particular product has 2,500 reviews and is given 4.5 stars out of 5," Aral said. They're also swayed by a review from a trusted friend who gives it five stars and says, "Great value!"

When Aral conducted a very large experiment on WeChat looking at these types of social cues he found that they improve response to the ad. But he also found that the importance of social proof to online advertising depends on the product itself. After examining 71 different products in 25 categories purchased by 30 million people, the experiment found significantly positive effects from inserting social proof into an ad, although the effectiveness varied. For example, Heineken—the brand that saw the greatest lift from social proof—had a 271% increase in the click-through rate,

while Disney had a minimum lift of 21%. There were no brands for which social proof reduced the effectiveness of the ads, Aral said.

"The main takeaway is that adding social proof really does improve the effectiveness of ads for status goods compared to non-status goods, but doesn't really have an effect for experiences versus searched goods."
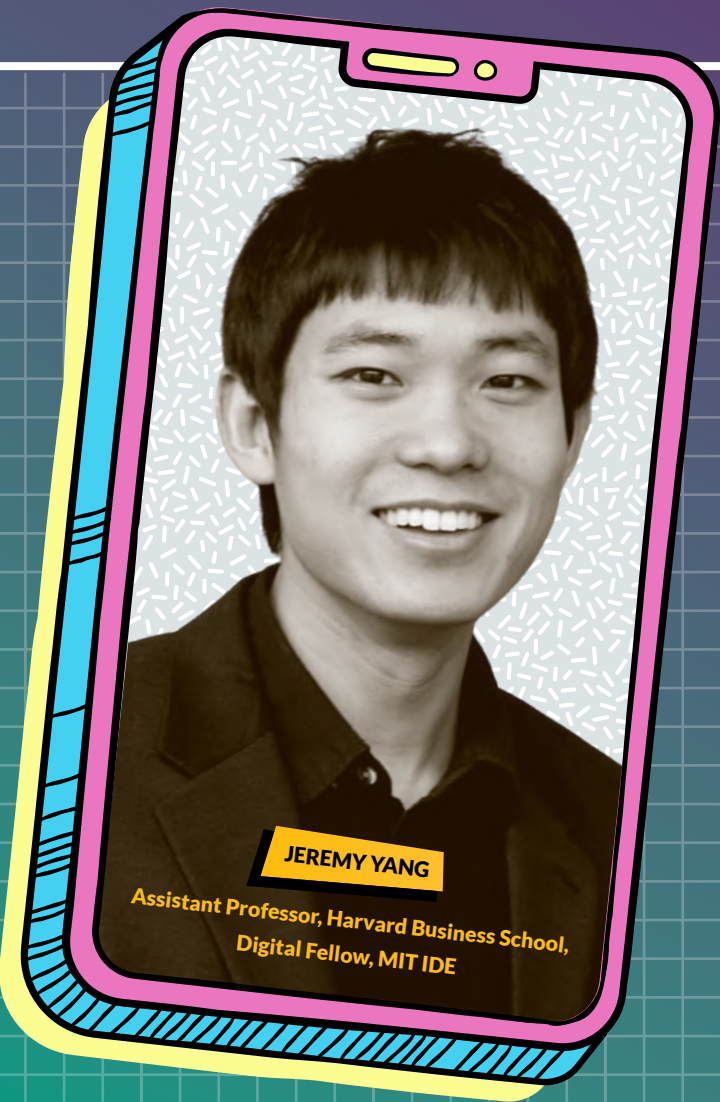
Taking these factors into account can help ad managers differentiate budgets and invest more in social ads that are most effective for their product and audience. Platform providers can consider pricing social ads based on heterogeneous performance and they can pursue personalized social advertising, where they choose specific people to feature based on who might be the most influential.

4 DECADES of CONSUMER ENGAGEMENT

80s — SINGLE MESSAGE
90s — SEGMENTED MESSAGES
00s — PERSONALIZED MESSAGES
10s — NETWORK of MESSAGING
SOCIALLY LINKED CONSUMER — FACEBOOK / REVIEWS / RATINGS / PEERS / YOUTUBE / TIKTOK

IS YOUR BRAND STILL HERE?

JEREMY YANG
Assistant Professor, Harvard Business School,
Digital Fellow, MIT IDE

THE RESEARCH

TIKTOK INFLUENCERS GO BIG

At the heart of all marketing are two basic questions: How do you reach and engage customers? What leads them to a purchase?

A good place to find answers is with one of the newest and fastest growing forms of social media today: TikTok. Harvard Business School Assistant Professor, Jeremy Yang, studied the huge influence of TikTok on sales and its overall impact on digital marketing while he was a PhD student and researcher at MIT IDE. (**Read his research paper here**.)

Yang cited the "shocking" billion-dollar sales of one TikTok lipstick seller in China who, in a single day, sold more items than most physical shopping malls do in a year. And "he is just one of over 3 million influencers on TikTok"—the social media platform for short videos, Yang said. "TikTok is getting more and more popular as a new venue for influencer advertising," he said at the CMO Summit.

Yang said the platform has been growing at a "whopping 50% growth rate" and influencers are both content creators "who create engaging materials to captivate a sizable number of followers," and also "marketers who monetize the attention of followers usually through advertising and commerce."

Yang's research addressed what makes a good influencer video and more importantly, how marketers can advance from getting customer's attention to making actual sales transactions. The dilemma, he said, is that even though this is a red hot marketing segment, "video ads that generate a lot of engagement and attention do not necessarily drive more sales" because engagement may have little to do with the product itself. "We may be engaged, but we have no idea what this ad is actually advertising. What's the brand, what's the product?"

Yang and his team developed an algorithm—called M Score—to predict the sales lift of video ads based on content and to turn the unstructured video data into structured information, he said. "The M score of a video ad quantifies how engaging the product is as presented by the influencer. Once we define this metric, we validate it empirically by combining the TikTok video ad data with the product sales data on Taobao, the Chinese equivalent of Amazon."

Yang found that what's really important is not engagement or product appearance alone. "It's more about the complementarity, or how synchronized they are in the video ad." They also found that the effect is more pronounced for product purchases that tend to be more impulsive, hedonic, and lower priced, he said.

Yang noted that influencer marketing has unique issues compared with other ads: the incentives of influencers and advertisers are not always aligned. Influencers might care more about their own reputation, image, and followers than sales of the product that they promote.

Nevertheless, it's valuable for advertisers to use the M-Score metric to predict ROI before launching a campaign, Yang said, and influencers can use it to aid their creative process. For platforms, it's a way to match advertisers and influencers—making that elusive goal a bit more attainable.

HOW BRANDS USE DATA CREATIVELY

> ## "CMOS WERE REALLY STARTING TO VALUE ANALYTICAL EXPERTISE OVER CREATIVE EXPERTISE, EVEN THOUGH RESEARCH CONSISTENTLY SHOWS THAT CREATIVE DRIVES PERFORMANCE."

ANDREA WARD

CMO, VidMob

Like Andrea Ward, CMO of VidMob, many marketing executives are finding that their jobs increasingly require a mix of left brain and right brain thinking.

"I love data science, finding the target audiences, making sure that you're serving the right content," Ward told CMO Summit attendees. But increasingly she saw the need for more connection with the creative side of marketing, which is at the heart of campaigns and ads. VidMob uses data to support creative decisions, she said.

So-called "intelligent creative," elevates creative development as a real driver for marketing and business performance," according to Ward. Often the creative side of the business is underfunded, even though it is getting more complicated and important. Part of the problem is that creative processes and performance are hard to measure and therefore, harder to value.

In addition, in the push for more data analytics, Ward said, "CMOs were really starting to value analytical expertise over creative expertise, even though research consistently shows that creative drives performance."

It's also clear that new platforms—audio, video, and now Augmented Reality (AR) and Virtual Reality (VR)—are changing the creative landscape, and "we've got to understand it" to make sound investments. "Really getting to that granular detail" about engagement, performance, completion rates, or click-through rates, and "understanding what you're trying to achieve with your creative is job number one," Ward said.

One of the challenges to getting better insights is bringing "intelligent creative" into an organization in a simple way. "A lot of times, teams are just struggling with getting creative ads completed in time for their campaigns. So thinking about setting aside time to do data and analytics around creative seems overwhelming."

"If you're going to put something on TikTok, it's going to be different than something that you put out on Facebook," Ward explained, so you need to be sure creative content is meeting each channel's best practices.

From there, she suggests building "a data driven-production team so that you can eventually get to this loop where you're continually measuring everything from the higher level brand metrics to very tactical engagement and conversion rates." Once machine learning "really kicks in you're getting better and better insights across your creative."

When you build data-informed creative, it yields better overall performance, according to Ward. It also creates "a connection and common language to drive performance to support the overall corporate marketing objectives."

MEASURING CREATIVE

Smarter
Moving from 'Guess and learn' To Knowing
Cafe to Counter
How does the color perform?

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Marketing tech has entered a new era, and so has work at the MIT Initiative on the Digital Economy. We will continue our cutting-edge research to help stakeholders keep pace and thrive in a competitive field.

The IDE examines the benefits and opportunities from advances in technology and digitization in economies, societies, and lives. Our research and dissemination aim to advance knowledge and help businesses, governments, and individuals adapt to a world in transformation.

We hope you'll support the IDE and keep us at the forefront of these issues with your sponsorship and membership. To learn more about the IDE and to see how you can take part in our important research and events, please reach out to **Devin Cook** or **David Verrill**.

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Diagrams and diagram artwork provided by Dpict. **See the full diagrams here.**

ADDITIONAL RESOURCES

For more information on the topics covered at the CMO Summit@MIT please see these research papers and resources:

▸ **TARGETING FOR LONG-TERM OUTCOMES**
Jeremy Yang, Dean Eckles , Paramveer Dhillon , and Sinan Aral.

▸ **INFLUENCER VIDEO ADVERTISING IN TIKTOK**
Jeremy Yang, Juanjuan Zhang, Yuhan Zhang. For supplemental reading, **the paper can be viewed here**.

▸ **SOCIAL INFLUENCE MAXIMIZATION UNDER EMPIRICAL INFLUENCE MODELS**
Sinan Aral and Paramveer S. Dhillon

▸ **SCALABLE BUNDLING VIA DENSE PRODUCT EMBEDDINGS**
Madhav Kumar, Dean Eckles, Sinan Aral.

▸ **RENÉE RICHARDSON GOSLINE EXAMINES HUMAN-AI INTERACTION**

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Thank you to our CMO Summit@MIT channel partners. The MIT CMO Summit was made possible by:

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