

# Moving Sales With Trajectory-Based Mobile Advertising

Frontiers • Blog • July 19, 2017 • Reading Time: 13 min

Theodore Kinni

## A curated excerpt from *Tap* by Anindya Ghose.

What a difference a decade can make. In June 2007, Apple released the iPhone; now, mobile internet usage outstrips desktop usage. In the United States, consumers spend more time on mobile apps than watching television, and m-commerce is rapidly approaching \$100 billion annually.

Given the fast rise of mobile, it's no surprise that marketers are well aware of it as a sales channel. But mobile isn't just a new channel for reaching consumers with the same old offers. It provides marketers with valuable new sources of information about consumers, and it enables them to deliver new kinds of offers.

Anindya Ghose, Heinz Riehl Chair Professor of Business at New York University's Stern School of Business, is one of the pioneering explorers of the intersection of mobile and marketing. In his new book, *Tap*, he collects his findings and weaves them together into a set of nine forces that marketers can wield to drive sales via mobile technologies.

One of the forces that Ghose explores is *trajectory*. "In the online world, it took us only a few years to get accustomed to, and often even embrace, the idea that firms — including e-commerce firms, search engines, and website publishers — can track our browsing behavior and predict our next steps," he explains. "A similar revolution is about to hit us off-line. The springboard for this revolutionary leap is the individual's trajectory. An individual's trajectory is the physical and behavioral trace of his or her off-line movements."

Free access to this article is provided to you courtesy of your library's subscription.

advertisement

### MIT SMR FRONTIERS

*This article is part of an MIT SMR initiative exploring how technology is reshaping the practice of management.*

Mobile devices allow marketers to track a consumer's walking pattern and predict where he or she will go next. Moreover, they can create and deliver offers based on that trajectory. In the following excerpt, Ghose describes what he and his colleagues learned when they used trajectory-based advertising in one of Asia's largest shopping malls.

WHAT'S HOT > Learning to Love the AI Bubble The World in 2030: 9 Megatrends to Watch Spring 2019 Issue Sports Analytics Po



An excerpt from

## Tap: Unlocking the Mobile Economy

BY ANINDYA GHOSE

Published by The MIT Press. Copyright 2017, Massachusetts Institute of Technology. All rights reserved.

On paper, the idea of using people's trajectories to help customize and target mobile advertisements is tantalizing. But does it work in the real world? If it does, how well? To find out, Beibei Li, Siyuan Liu, and I conducted a set of elaborate studies at one of the largest shopping malls in Asia. The mall contains over 300 stores spanning 1.3 million square feet. On average, it attracts more than 100,000 visitors per day. The experiment took place from June 9 through June 22, 2014, and 252 stores in the mall participated. We then analyzed the data from 83,370 unique user responses, using data from indoor positioning systems such as Wi-Fi systems. (Outdoor positioning systems such as GPS or cellular towers would not have worked so well indoors, and as a result the location data wouldn't have been precise.)

The design helped to ensure that we would have a rich and diverse set of data to work with, not just a large one. In many large malls, a broadband internet connection such as LTE or 4G does not work very well, especially when we go deep inside. This is important because many customers like to engage in mobile showrooming. In order to deal with this inconvenience, many malls and large department stores have begun to offer free Wi-Fi access to their customers.

In 2013, *The New York Times* ran a story about how the retail chain Nordstrom uses Wi-Fi to track shoppers' movements around a store. Nordstrom installed sensors in its stores to scan for smartphones. Any phone that had its Wi-Fi turned on would get picked up by the sensors, which would then make note of the device's MAC address (an address that's unique to a phone) and use it to identify and follow the device as it moved about the store. Mass-market chains such as Family Dollar and specialty retailers such as Cabela's, Mothercare, Benetton, and Warby Parker have been testing various kinds of indoor positioning technologies, typically based on widely available wireless radio technologies (such as Wi-Fi and Bluetooth) and on short-range proximity sensor technologies (such as RFID). They are using the data to design store layouts and to offer customized coupons.

At the entrance of the mall we studied, customers were offered the option of accessing free Wi-Fi service. At the same time, they were notified that logging on to the Wi-Fi would enable the mall to monitor their shopping trajectories, and that in return for sharing their data they would receive personalized coupons

Free access to this article is provided to you courtesy of your library's subscription.

and ads as they went about their shopping. Full transparency between consumers and brands with respect to the use of their data was critical for us in order to evaluate the extent to which consumers were willing to share their personal information and be monitored in real time in order to receive relevant offers on mobile devices.

WHAT'S HOT > Learning to Love the AI Bubble The World in 2030: 9 Megatrends to Watch Spring 2019 Issue Sports Analytics Po

My initial expectation was that a very small number of customers would opt in to this kind of explicit data-sharing relationship with the mall. But as it turned out, more than three-fourths of customers basically told us “Take my data and give me an offer I can’t refuse.” This brings up a behavioral contradiction: People think they care a lot about data privacy, but they are willing to use their data as currency. This increasing recognition of give-and-take between customers and businesses is a good thing. If consumers want to avoid intrusive or irrelevant ads, they should help businesses help them. By sharing their data, they make it much easier for businesses to curate relevant offers for them in a way that does not make the whole process annoying or overwhelming. To businesses, I say: Mobile should be used to perform as a butler or a concierge, not as a stalker.

Once a consumer in our study had connected to the mall’s Wi-Fi, we were able to track the detailed mobile trajectory information during his or her visit in the shopping mall with precise time stamps. But before a consumer received Wi-Fi access, he or she was required to complete a form that asked about age, gender, income range, type of credit card (gold, platinum, gift card, other), and phone type (iPhone, Android, other). At each store, when consumers purchased a product, they were required to complete another form, which asked for some similar personal data as well as the amount spent and whether the purchase was related to a mobile coupon. Later we cross-validated the information on the two forms to make sure the information was accurate.

Every day for two weeks we randomly assigned around 6,000 mall visitors to one of four groups:

- a control group, which would not receive any mobile ads
- a random advertising group, which would receive a mobile ad from a randomly selected store
- a location-based (“where you are”) advertising group, which would receive a mobile ad based on current location information
- a trajectory-based (“where you’ve been”) advertising group, which would receive a mobile ad based on a consumer’s trajectory information

Consumers in the last three groups received their mobile coupons in text messages linked to their phone numbers, so that the coupons could not be exchanged with others. To reduce the risk of bias, we randomized the 252 stores that took part, representing the range of categories we would expect in any large shopping mall. We also randomized the design of the coupon (e.g., 10% off, 20% off, 30% off, or 50% off) for the same store, and even randomized the format (“price 50% off” vs. “buy one get one free”).

**Free access to this article is provided to you courtesy of your library's subscription.**

Using previous studies as a guide, we tried to track several aspects that we thought would help us trace individual trajectories. To do so, we deployed ShopProfiler, a shop-profiling system that crowdsources data solely from sensor readings from mobile devices. Data collection is automatic and runs in the background. For a customer, the data show what stores that customer visited, how long he or she stayed in each store, and how fast he or she was walking. From the stores' viewpoint, the mobile-sensing data reveal information about the shop's inside layout and how many people visit the shop in a particular time period.

After the consumers left the mall, we conducted a short follow-up survey via the mobile phone, asking each consumer whether he or she had redeemed any of the targeted mobile offers that were sent to them or wanted to receive such offers in the future, and what his or her degree of overall satisfaction with the shopping experience was. We also asked for a small amount of additional personal information, such as whether the person had been a first-time visitor to the mall, whether he or she had shopped alone or with others, how much he or she had spent in the store that had sent the advertisement, and how much he or she had spent in the mall that day.

To understand the shopper's stage in his or her purchase process, we used a simple rubric: We labeled a consumer who had consecutively visited multiple stores in the same product category "focused." We labeled a consumer whose last few store visits were from different product categories an "explorer." We took this snapshot at least 10 minutes after a shopper entered the mall, but before sending the shopper a coupon. Of course, a shopper could also be "focused" with a to-do list that included many different shopping needs (e.g., birthday card, kid's shoes, shirt for work, wedding gift). These labels were meant for illustrative purposes only, to help us distinguish between these two kinds of customers. We could just as easily have come up with other labels.

## The Value of Off-Line Data in an Online World

We learned that trajectory-based advertising — in general — significantly increases mobile coupon redemption rates, but we also learned in what contexts it has its greatest power, and in what contexts it actually underperforms other forms of advertisements. The most compelling insight is that trajectory-based coupons have much higher redemption rates than location-based and random ones: On average, the redemption rate was 35% higher than that of location-based ads and 94% higher than that of random ads.

Although we found the mobile trajectory-based advertising more effective for attracting the focused shoppers than the other advertising approaches, we also found that random ads and location-based ads were more effective in attracting the explorers. If a shopper is exploring rather than focusing (meaning that the shopper is prone to an impulse or unplanned purchase), random ads outperform trajectory-based ones, especially on weekends. This is one of the biggest arguments for a mindful, data-driven advertising strategy that makes use of all three forms — random, location-based, and trajectory-based — depending on the consumer's context and needs.

This article is provided to you courtesy of your library's subscription.

All these results hold up just as robustly when we look at individual customers rather than at groups. We find that, on average, trajectory-based mobile advertising outperforms all the baseline advertising strategies, followed by location-based and then random advertising.

WHAT'S HOT > Learning to Love the AI Bubble The World in 2030: 9 Megatrends to Watch Spring 2019 Issue Sports Analytics Po

## Efficiency of Trajectory-Based Advertising

Trajectory-based advertising increases consumers' spending and simultaneously makes them more efficient. A shopper who received a trajectory-based ad from a store spends 38% more in that store than a consumer who received a location-based ad, and also spends 26% less time in the store. The insight into efficiency is especially important, because it emphasizes the benefit that consumers receive when they exchange data with brands or retailers — the value creation, as I often call it. Yes, we find advertising annoying, but at the same time we fear missing out and dislike the time wasted in the trial-and-error process of searching for what we need. Trajectory-based advertising tilts the scale even more in favor of advertising that is immediately helpful, not annoyingly intrusive.

A shopper who received a trajectory-based coupon spent just under 10 minutes in the store that sent the ad, and spent, on average, \$56.78 at the store. A shopper who received a location-based coupon for the same store spent about 13½ minutes in the store, and spent \$41.25, whereas a recipient of a random coupon roamed the store for more than 28 minutes and spent just \$23.50 on average.

## Demographic Differences

Age and income also make a difference in response rates. Trajectory-based ads work very well on high-income individuals. There is a preconceived notion that this group normally is not responsive to promotions, but in reality we saw repeatedly that this group is the most receptive to highly targeted offers. The high-income group is not as responsive to random ads or location-based ads, but shows an extremely strong preference for trajectory-based ads. This further supports the idea of efficiency, meaning that high-income people appreciate the kind of curated, targeted advertisement that trajectory-based advertising delivers. Shoppers with lower monthly income are, on average, more active in redeeming mobile ads, again regardless of the type of ad. This finding is reasonable, because we assume that low-income customers are often highly sensitive to price and will find any mobile ads attractive if they are price promotions.

Younger shoppers (aged 20 to 30) are more responsive than older shoppers (aged 40 to 50+), regardless of the type of mobile ads. Female shoppers tend to spend more than male shoppers in the stores that sent the coupons, but male shoppers are much more responsive to trajectory-based ads than the other two forms. This result is in line with previous findings that men prefer more guidance while shopping than women do. Our result suggests that well-designed mobile advertising campaigns can serve the purpose of providing better shopping guidance.

Free access to this article is provided to you courtesy of your library's subscription.

# Can Trajectory-Based Advertisements Really Alter Our Behavior?

WHAT'S HOT > [Learning to Love the AI Bubble](#) [The World in 2030: 9 Megatrends to Watch](#) [Spring 2019 Issue](#) [Sports Analytics Po](#)

An interesting question is whether shoppers fundamentally change their behavior patterns after receiving a mobile ad. Are we really malleable and trainable? Do we have fundamental, fixed traits, or are we subject to influence? These questions are important because the answers will enable us to better understand how to drive the incremental revenue for stores, and to examine the effects of advertising in the short term vs. the long term.

When we did the analyses described above, we divided all the consumers (and their respective trajectories) into 10 groups, each of which showed behaviors similar to other members of that group, but different from anyone else. The challenge to test this idea of influence is to see whether receiving a mobile ad causes someone to diverge momentarily from a behavioral pattern, or whether the behavioral change after the ad is so pronounced that the shopper actually leaves one group and “joins” another.

In the control group, which received no advertisements at all, 1.8% of customers naturally diverged from their original behavioral patterns in the mall. Interestingly, by comparing the data before and after, we could ascertain that 13.1% of customers in the trajectory group changed from their original segment to a different segment, followed by the location group (11.28%) and then the group that received random ads (7.8%). Customers from the trajectory group, on average, visited the highest number of new store categories (five) after receiving their advertisement. The shoppers in the location and the random groups visited an average of three new categories, and the control group visited only one new category on average. These findings suggest that the effectiveness of trajectory-based advertising lies not only in the way it can make the shopping experience more efficient but also in its apparent ability to nudge customers toward changing their future shopping patterns, generating even more additional revenues for the stores.

All these findings underscore several important aspects about our understanding of our smartphone culture, the marketing opportunities it creates, and the attention it deserves. The first point is how dynamic this market is. Location-based advertising (LBA) is poised for rapid growth, and companies are about to reallocate and optimize their advertising spend. But in industries such as retail, trajectory-based advertising may soon supersede LBA as the primary form of mobile marketing. This is different from saying LBA will become obsolete. Location-based advertising, as the study in the mall demonstrates clearly, also has a positive impact on generating revenue, increasing customer satisfaction, and making people more comfortable with sharing data when they know that doing so can make their shopping experience more efficient. The impact pales, however, in comparison with the performance of trajectory-based advertising.

advertisement

## ABOUT THE AUTHOR

Theodore Kinni is a contributing editor for *MIT Sloan Management Review*. He blogs at *Reading, Writing re: Management* and tweets @tedkinni.  
Free access to this article is provided to you courtesy of your library's subscription.