

Consumer Perceptions of Online Behavioral Advertising

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Abstract—Online behavioral advertising, on websites and in online applications, requires companies to make intricate trade-offs between promises of increased revenue and potential risks for alienation of consumers. To guide companies in making such trade-offs, we answer the research question: How do consumers perceive online behavioral advertising? We consolidate our findings in a process model linking consumer awareness of and knowledge about online behavioral advertising with their attitude towards online behavioral advertising, which shows that consumer perceptions of online behavioral advertising are not stable; instead, they constantly evolve, triggered by confrontations with online behavioral advertising. For consumers, online behavioral advertising is a feature until they get annoyed and it becomes a nuisance. This is a tight rope walk for providers of websites and online applications. Consumers want personalized content, but they do not want content that is too personal. Companies should aim to arouse positive consumer attitudes by creating added value and should revise their online behavioral advertising practices before consumer attitudes shift.

Keywords—online behavioral advertising, behavioral targeting, profiling, marketing, consumer, perception, process model, exploratory research, qualitative research

I. INTRODUCTION

Online behavioral advertising fuels the internet and will not go away any time soon. Online behavioral advertising allows companies to target consumers more accurately by studying consumer data trails, such as browsing or shopping histories [1]. Consumers may perceive advertisements tailored to their interests as useful and enjoy the more tailored online experience. However, consumers may also perceive online behavioral advertising as creepy and intimidating and, ultimately, avoid companies financing their websites and online applications with online behavioral advertising [2]. Online behavioral advertising can be employed to assist consumers with making better decisions; just as well, it can be employed to manipulate consumers to make decisions desirable to others [3]. Effective integration of new technologies into websites and online applications cannot only be focused on new opportunities but must also remedy and account for unintended side effects [4]. Purposeful exploitation of online behavioral advertising in websites and online applications requires companies to make intricate trade-offs between promises of increased revenue and potential risks for alienation of consumers. Good decision

making when faced with such trade-offs requires companies to have a thorough understanding of consumer perceptions of online behavioral advertising. To guide such decision making within the context of websites and online applications, we answer the research question: How do consumers perceive online behavioral advertising?

In this manuscript, we give a brief overview of prevalent tracking and targeting methods and explore consumer perceptions of online behavioral advertising in websites and online applications in a qualitative, empirical study. We consolidate our findings in a process model linking consumer awareness of and knowledge about online behavioral advertising with their attitude towards online behavioral advertising—the consumer online behavioral advertising perception (COBAP) model. The COBAP model presents a systematic conceptualization of consumer perceptions of online behavioral advertising and is useful for practical audiences and policy makers to gain a better understanding of online behavioral advertising from a socio-technical perspective, so that marketing strategies and corresponding regulation can be designed more effectively.

II. ONLINE BEHAVIORAL ADVERTISING IN WEBSITES AND ONLINE APPLICATIONS

Online behavioral advertising is a pervasive technology to deliver online advertisements tailored to consumer interests and tastes based on information gathered from consumer online behavior [5]. The main goal of online behavioral advertising are increases in sales and profit by personalizing advertisement (ad) content based on consumer characteristics [6]. Online behavioral advertising leverages consumer information, such as web searches, visited websites, purchases made, and information published in consumer profiles, in algorithms that predict advertisements that seem most appealing to an individual consumer [7]. Consumer knowledge about online behavioral advertising remains however relatively low [2]. Although privacy concerns impede consumer willingness to use websites and online applications that leverage online behavioral advertising [8], perceived relevance and entertainment value of presented ads often mitigates their privacy concerns [9], [10]. A 2012 Pew telephone survey reported that 68% of participants were “not okay with targeted advertising because [they do not] like having [their] online behavior tracked and analyzed” [11]. Negative consumer attitudes towards online behavioral

advertising have more negative effects on consumer behavior if consumer awareness of online behavioral advertising is increased [12]. Consumers also have negative feelings towards ads on mobile devices due to perceived intrusions of their personal sphere [13]. Some consumers also tend to change their privacy settings when confronted with information about how much information is accessed by the mobile applications they use [14]. A main threat of online behavioral advertising to consumers is its potential to manipulate consumer behavior [15].

The main stakeholders involved in online behavioral advertising are advertisers, ad networks, content providers, and consumers [16]. Advertisers are the owners of ads. Their aim is to reach as many consumers willing to pay as possible with their advertisements. Accordingly, they try to place their ads at websites with high traffic. Advertisers usually pay per click on their ads and aim to increase their conversion rates by targeting consumers who conduct follow-up purchases. Advertisers usually publish their ads over advertising networks or contact content providers directly. Content providers operate websites and sell advertising space to ad networks or advertisers. Content providers often depend on revenue from advertising to serve their consumers for ‘free’. Ad networks serve as intermediary between advertisers and content providers and publish ads at websites that participate in their network [17]. Ad networks are able to match advertisers with fitting content providers by tracking consumers across websites they cooperate with [5]. Some ad networks offer thousands of options to configure target audiences and to send ads to those consumers who will likely generate the most revenue. Internet giants like Google or Facebook serve as a content provider and as an ad network [18]. Due to their wide reach they can compile very detailed behavioral information of consumers and target them in thousands of affiliated websites and mobile applications. Consumers are the sources of behavioral information, which they provide to ad networks and content providers in exchange for ‘free’ services.

Websites and online applications usually use cookies or tracking pixels to track consumer behavior. Other mechanisms include tracking by first or third parties through consumer identifiers (eg, logins) and fingerprinting of consumers or their employed soft- and hardware [19]. Cookies are small files saved on consumers’ computers to track them across visits to websites [20]. When a consumer revisits a website or online application the content of the cookie is sent to the provider. Cookies are not only placed by content providers but also by third parties (ad networks) to track consumer behavior across many websites [21]. Tracking pixels are invisible one pixel images embedded in websites or e-mails [22] and allow to monitor consumer activity on websites. On mobile devices, many sensors are available to advertisers so that more advanced methods, leveraging information such as device fingerprints, WiFi and Bluetooth connections, or location coordinates, can be employed to target consumers [23]. The combination of cookies, tracking pixels, and mobile tracking information gives online marketers an almost complete picture of consumer online behavior [7], [24]. Once enough information is tracked,

clustering algorithms are employed to profile consumers and serve them ads that should interest them [16], [20].

Consumers often underestimate the extent to which their information is collected and used [25], [26]. Although companies often claim that collected information is not personal, combination of collected information with other databases allows for the creation of detailed personal profiles [5]. Even if consumers were to take precautions, such as disabling cookies or trying to opt-out of data collection, they can hardly be expected to keep up with the rapid innovation in the tracking industry and to master the complexity of the internet [27]. As beneficial as it might be, the extensive tracking of consumer online behavior leaves consumers open to a wide range of privacy threats [28], [29]. To avoid consumer backlash once undesirable tracking practices become known, companies need to carefully design the tracking mechanisms in their websites and online applications. To support companies therein, we explore consumer perceptions of online behavioral advertising in this manuscript.

III. METHODS

We conducted semi-structured interviews to elicit consumer perceptions of online behavioral advertising. Interviews are suitable for generating deep insights into a topic and to gain a better understanding about attitudes and opinions of interviewees [30]. Semi-structured interviews employ a set of well-designed open-ended questions but do not prevent the interviewer from asking follow-up questions to clarify interviewee responses and explore mentioned themes in more detail [9]. Moreover, semi-structured interviews allow the interviewer to account for newly emerging themes that were not considered or mentioned before.

Our interview guide was designed to avoid yes/no and invasive questions [30]. To avoid misconceptions of online behavioral advertising, we talked with interviewees about ‘ads that relate to what they did online’. To familiarize interviewees with the topic, we asked them to define the difference between TV advertisements and internet ads. Afterwards, we asked them to recall and describe an encounter with behaviorally targeted ads. Interview questions were organized in three categories—awareness of, knowledge about, and attitude towards online behavioral advertising. Initial questions about awareness of online behavioral advertising were based on questions about previous experience and perceived ubiquity in a study on privacy concerns in the context of mobile advertising [31]. Initial questions on knowledge about online behavioral advertising were based on questions about targeting mechanisms, tracked data, and stakeholder benefit in a study of user opinions and knowledge about online behavioral advertising [2]. Initial questions on the attitude towards online behavioral advertising were derived from a study on user perceptions of privacy notices [32], on the personalization-privacy paradox in location-based mobile commerce [33], and on advertisement relevance [9]. After each interview the interview guide was revised based on participant responses and our study progress [34]. Questions that resulted in limited

insights were modified or dropped and new themes raised by interviewees were added to the interview guide. The final interview guide is listed in Appendix A.

At the end of the interview, participants were presented with a video that explains how tracking and online behavioral advertising works (see the interview guide in the appendix for a link to the video). The video was selected because it was available in German and English and employed plain language. Videos are a useful addition to interviews because they motivate interviewees to describe and share their feelings and promote more information sharing [35]. After watching the video, interviewees were tasked to comment on the video and elaborate more on the topic of online behavioral advertising based on the content of the video.

After a pilot interview, interviewees were recruited through theoretical sampling [36]. Theoretical sampling is a useful strategy for exploratory research [37] because it is of an emergent nature so that the required sample cannot be determined *ex ante*. Interviewees were recruited until no new insights were revealed in the interviews and theoretical saturation was reached. We interviewed a diverse range of participants who owned a computer, smartphone, or tablet. We recruited interviewees until theoretical saturation was reached.

At the beginning of the interviews, permission for recording the interview was requested. We also informed interviewees that the recordings will be kept confidential. All interviews were recorded and subsequently analyzed through content analysis [38]. Each interview was analyzed prior to conducting the next interview to facilitate timely improvement of the interview guide. Ultimately, we consolidated participant responses in the COBAP model.

We interviewed 13 persons (see Appendix B for an overview). Interview participants were between 23 and 41 years old with a mean age of 31.1 years. 6 interviewees were female. Most interviewees were from Germany (Germany: 7, China: 4, Spain: 1, Denmark: 1). Most interviewees were employed as computer or web specialists or had management positions (online applications: 3, management: 3, Marketing: 2, Student: 2, Other: 3). In the following, we attribute participant quotes to their pseudonyms P1–13.

IV. CONSUMER PERCEPTIONS OF ONLINE BEHAVIORAL ADVERTISING

A. Consumer Awareness of Online Behavioral Advertising

All interviewees reported to have noticed some targeted ads showing “exactly the same” (P11) product as they searched before. Consumers become aware of online behavioral advertising by seeing the ads, chatting with friends, or through their work.

P10: [...] all of my friends are getting the commercial about race cars, but for me it was different. I'm getting all the horse running. Then we start to talk about it. OK, how is it possible, and we meet more and more people who had the same experience.

Twelve interviewees recalled specific experiences with targeted ads. After searching for a product, a similar item

would appear in Google search, the Facebook sidebar, on other websites, or their e-mail. These ads were recognized shortly after web searches and noticed for days or weeks. Yet, interviewees sometimes found it difficult to realize that they were targeted. When ads presented interesting products, they could not discern whether it was a coincidence or “very clever retargeting” (P10).

B. Consumer Knowledge about Online Behavioral Advertising

Interviewees exhibited little to extensive knowledge about online behavioral advertising. Although some interviewees claimed to not understand the technical mechanisms of online behavioral advertising, they still brought up keywords like ‘cookie’ or ‘adblocker’. When asked what technologies and mechanisms facilitate online behavioral advertising, some participants called it a magic trick of the internet and the engineers working behind it. All interviewees could, at least roughly, explain the function of a cookie in online behavioral advertising. Interviewees also believed that there are some connections between websites. These connections were perceived to allow cookie information to be passed between third parties to “follow user across web and add more information” (P9).

P4: I know there are advertising networks or display networks that share data with their clients, which are the shops that try to advertise. So if the shop tells them I want to target people interested in shoes, the network knows it because maybe they collaborate with Adwords, and Google knows who those people are, and deliver to those people, and that would be me in that case.

Some interviewees also differentiated between retargeting and look-alike audience targeting. They pointed out that targeting is not only simply based on consumers’ own search patterns but also on consumer groups with similar patterns, so that it is possible to predict consumer behavior based on information about consumer groups.

Interviewees believed that their information is widely tracked and that big internet players know almost everything about them. Mentioned types of tracked information ranged from basic information like search terms, e-mail content, and IP addresses to details on browsing behaviors on specific websites and interactions on social network services to very personal details on the life of consumers. Interviewees believed that companies like Google and Facebook have massive amounts of information on them because of their wide reach and the intensive levels of consumer interaction with them.

P9: Especially Facebook should have a lot of information about me. Because I have Facebook on my mobile and desktop, so they should be able to know really a lot.

Interviewees were well informed about options to avoid online behavioral advertising, including ad blockers, deletion

of cookies, or opting out. However, some interviewees reported that their approaches do not work all the time.

P2: Yeah, I know that people log out after using it, but I know it doesn't make a real difference because when they have your device ID, Facebook, for example, even if you log out, they still know it's you.

With respect to benefits for advertisers, interviewees pointed out the relevance of presented ads. They believed that online behavioral advertising enables advertisers to know their audience, to save on advertising cost, and to increase the revenue.

P9: You have the possibility to really narrow it down and to really meet the person you want to talk to. The more information you have, the better it is. If you sell a specific car, there's someone who can give you the name with all the people that are interested in this car and are looking for this car. It is worth a lot.

With respect to benefits for content providers, interviewees exhibited a uniform understanding of the business model. They were willing to obtain free services in exchange for displayed ads. Still, P10 pointed out that benefits of showing behavioral target ads are debatable for content providers.

P10: They just agree to keep the space away and they get some money of course, but they have no idea what's been showing. That's why I don't think there is a particular benefit for them.

C. Consumer Attitude towards Online Behavioral Advertising

Interviewees' attitudes towards online behavioral advertising are paradox. They simultaneously expressed appreciation of and concerns about targeted ads. These mixed feelings form four categories—positive, negative, indifferent, and ambivalent (Fig. 1).

1) Positive Consumer Attitudes

Positive attitudes result from benefits consumers see in online behavioral advertising. Interviewees talked about the pleasure and surprise they felt when seeing targeted ads. If advertisements were well done, they felt naturally attracted. Online behavioral advertising is also a useful channel for consumers to discover new products. Interviewees perceived ads as helpful because they might have never discovered some products without ads. An often-emphasized benefit of online behavioral advertising was being exposed to relevant ads. Interviewees characterized online behavioral advertising like an experience of being talked to:

P4: They present it in a way that you feel it's personal. Even if it's not personal, even if it's random, they try to express it in a way that you think: OK, this is meant for you.

P4: My parents own a shop. So if people go to that shop and behave in a way that my parents see it [...] because we know what people like. So we don't ask them you want ketchup or mayo on your fries, we just ask "you want ketchup?"

P6: I'm surprised that sometimes I scroll down my stream in Facebook and I don't get it's an advertisement, and I still think some friends liked it, and then well oh no it's an advertisement. But it's completely in the stream, so it fits.

Consumers perceived targeted ads as an opportunity to focus on their own thoughts and to filter the deluge of signals in online environments. Online behavioral advertising reminds consumers of their desires as they travel across websites. In addition, online behavioral advertising was perceived as an opportunity to save money and time. Interviewees recalled spotting cheap prices for certain products in targeted ads. For P8, who is in a long-distance relationship, targeted ads are especially valuable to buy cheap flight tickets between her city and the city of her partner.

P9: The internet is full of information, thousands of products, if someone gives a tailored product, if they see you are looking for something and they recommend the ideal solution to you, it always brings a lot of value. Cause you save the time and, in the best case, also money.

2) Negative Consumer Attitudes

Targeted ads also spurred negative feelings. Ads are generally annoying if they are repeatedly displayed. Interviewees reported to become annoyed when forced to view the same ad over and over.

P10: I often see sometimes all the banners on the web page get filled with the same retargeting commercial. Maybe I searched for this pair of shoes and I decided to not have it anyway, or I already ordered it. But for this week I'm gonna see the same commercials.

Stronger negative feelings are induced if consumers are exposed to ads that are of no interest to them. Interviewees reported cases where they searched for a product out of curiosity but with no intention to buy and got confronted with corresponding ads for days. Interviewees perceived such cases as very inflexible and "stupid" (P10). Online behavioral advertising algorithms being not 'smart' enough seems to be the source of most complaints.

P3: If I go shop and say I just want to look around and inspire myself. Then I don't want someone running around with a sign saying "speaker, speaker". No one will do that. I actually want that also happens online.

P4: Sometimes I'm pressured by ads. I can resist but it's stressful. In the back of your head it reminds you there's something unfinished.

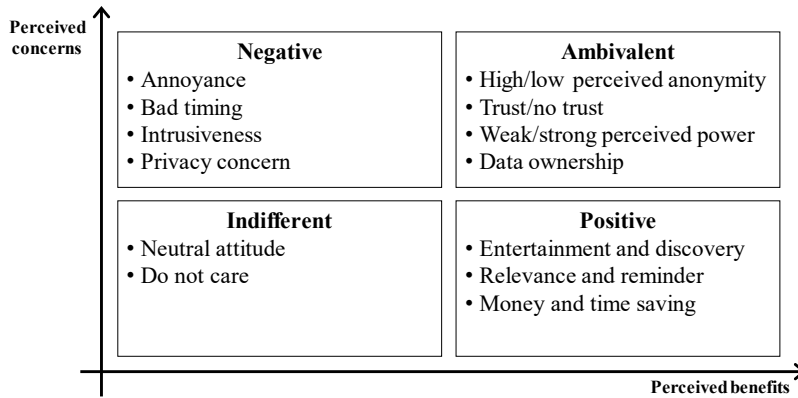


Fig. 1. Four types of consumer attitudes towards online behavioral advertising.

Interviewees were also surprised about the extent to which they are tracked and felt uncomfortable being watched. Ads can be embarrassing in situations where consumers are not alone in front of their screen.

P1: I feel quite embarrassed when those unwanted keywords are shown on my screen. Especially if someone is also behind the screen.

P2: It happened that I wanted to buy laundry and I was with a guy from work and these ads keep coming on Skype with all these sexy underwear [...] it was really not nice.

Some interviewees reported feelings of being manipulated and loosing their freedom of choice because their decisions were guided by advertisers. Interviewees felt overanalyzed and that advertisers intruded their personal sphere. They perceived a lack of politeness. "It's like they know me better than I do." (P4)

P8: If they could guess what I want [...] But I guess that will also freak some people out. "How could you know that I want a couch right now?" [...] It's like I'm watched by so many people and the single pieces from me. You are alone but, actually, you are not.

Interviewees also mentioned privacy concerns. Interviewees were scared that their information is stored forever and subjected to nearly unlimited computing power. In addition, interviewees felt to lose control over who has access to their information.

P3: In civil life people will probably remember their visitors or when people go to a bar [...] but no one will record who has eaten what, who had sat where at what time. No one will do that. But Google and online platforms are doing this, they save this data, who had eaten what and so on [...] I find it a bit questionable.

P6: For example, a health insurance company decides that it's super interesting to know what he shopped. He told us that he only shopped healthy stuff, but we saw him buying products with 95% fat. That's not perfect.

Negative attitudes led some interviewees to take actions, such as being careful in social media and not sharing home addresses or restaurants they go to. As a former advertising company programmer, P10 posited that the stance of the public toward information privacy is largely influenced by the media.

P10: Then people start to worry who's watching them. They might start to think that someone is watching where they click like a person. While it's only a computer, there's only a few things and they can guess the rest. News articles might say: "This is horrible, you've been followed." So I think when the public get to know it, it would be in a negative way, with misunderstanding.

3) Indifferent Consumer Attitudes.

To some degree, interviewees exhibited an indifferent attitude towards online behavioral advertising. They perceived the information being tracked as not confidential, thought of themselves as internet-literate, realized that they are reimbursed with free services, and did not experience too severe consequences of online behavioral advertising.

P6: What are the risks? Besides those tracking companies know who I am and where I live? That's not the thing.

P9: I have no problem of sharing my user data with companies [...] If you asked me what websites have you visited today, I would also tell you. I could also tell you how long I visited them. I take my user behavior as no secret.

P13: As a Chinese I'm quite OK with the exposure. It's really related to the culture. In China I would even not care at all. But since now I'm in Germany, I care more and more because people around me are talking about it. But, still, I think I can accept it.

4) Ambivalent Consumer Attitudes

For some issues, interviewees voiced ambivalent attitudes. Most interviewees perceived themselves as anonymous, having nothing to hide, and not being famous enough to be tracked online. They believed that only commercial information would be of interest to advertisers.

P11: Why do they bother to know me as a person? [...] They don't need to know me, what colors do I like, do I like seeing films. They just need to know what kind of things I buy usually or where do I shop online, this kind of commercial side of me.

Interviewees also expected that information sharing between third parties would be limited. "So it's not like I go to a next shop buying a shirt and they know I'm someone who searched for porn." (P4) Other interviewees expressed higher concerns about being exposed online. They thought that websites could easily identify consumers and wished to have had shared less information on the internet.

Five interviewees reported to trust websites with online behavioral advertising because they are familiar with the company and believe that their services create value. Trust is nourished by company size and reputation. Google was, for instance, trusted by some interviewees because it is an international company and perceived as not likely to sell customer information. Online behavioral advertising at Amazon was perceived as acceptable due to its proficiency.

P13: I prefer Amazon, Because Amazon does e-commerce, so it's OK that they recommend things. It's not that they are anyone, they are professional.

Interviewees preferred companies who are upfront about their practices. "If they are hiding it is bad, if they tell me, it's good. Since they tell me, I trust that." (P2) Interviewees also felt protected by watchful eyes of other consumers and government agencies.

P10: Facebook can do it but would probably not do it because they will immediately get the attention from all the government. There are a lot of people, professionals, conspiracists, they are all the time watching what Google and Facebook are doing. Because they would love to break the news, "oh Google is actually misusing your data". As long as they are interested, then I believe these companies need to protect themselves.

Interviewees also exhibited mistrust in governments. In countries where they did not trust the government they were concerned about confidentiality breaches:

P2: I was really scared in China [...] You have to give your phone number to get a WiFi [...] oh my god and they will share it with anyone.

P8: If I shop in Germany, the ads are only shown on the website, they will not be sent to my phone. But if I enter my personal information in Chinese websites, sometimes I just receive really weird messages, and I know that this is the leak of my personal information.

Interviewees reported having strong and weak power about online behavioral advertising. Interviewees perceived to make decisions themselves while being aware of potential dangers. Interviewees felt satisfied with their ability to influence the ads they see within minutes. Some interviewees were also intrigued by online behavioral advertising and wanted to investigate and understand its underlying mechanisms. Power was perceived as weak in take-it-or-leave-it situations with no other viable alternative service providers. When deleting cookies, interviewees remained unsure whether their information was not already "externally saved" (P7). Interviewees sometimes admitted that they have little control but did not feel weak; in other situations, they were aware about a range of options available but still exhibited a weak and pessimistic attitude.

Interviewees supported three different views about information ownership—information belongs to consumers and companies misuse it, information belongs to companies, and information is free for anyone to use once it is in the public domain.

P4: My parents own a shop. So if people go to that shop and behave in a way that my parents see it and those people couldn't say that you are not allowed to use this behavior data. So we used data, it's not like saved data that we can analyze it, but data was there in the end. So I think of it in a same way.

P10: I would say [it belongs to] myself, but that's not how it is anymore. We long gave up our online data. Every time we sign online that "we agree to use Gmail" with this checkbox, every time you do this we out our data. They more likely to say we own this part of data, we own that part of data, and just combine them I would say that's all your data, so you gave it away.

V. DISCUSSION

We consolidated our principal findings in the COBAP model (Fig. 2), which captures how consumer awareness of, knowledge about, and attitude towards online behavioral advertising is shaped by continuous confrontation with online behavioral advertising. Consumer awareness of and knowledge about online behavioral advertising are shaped by continuous confrontation with ads. Increases in awareness increase consumer knowledge. However, increases in knowledge do not make consumers more aware of online behavioral advertising. Many participants showed well-equipped knowledge of online behavioral advertising but did

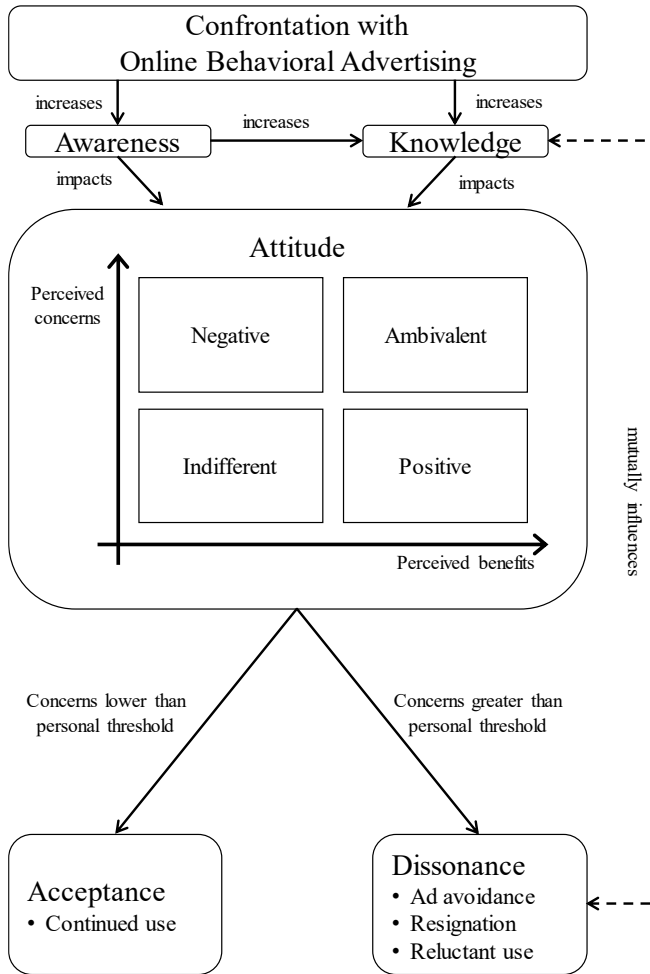


Fig. 2. The consumer online behavioral advertising perception (COBAP) model.

not report being aware of or experiencing it in real life. Consumer attitude towards online behavioral advertising depends on their awareness and knowledge. The four types of consumer attitudes (indifferent, positive, negative, and ambivalent) determine consumer concern about online behavioral advertising and motivate them to either continue use of websites and online applications, to take protective measures (eg, employ tools such as adblockers or privacy browsers [19]), or to learn about protective measures. Consumers do not seem to constantly change their attitudes about online behavioral advertising; they rather seem to adjust their attitudes whenever they see or learn something new about online behavioral advertising. Consumers do not engage in an active online behavioral advertising calculus, but they seem to passively judge whether the current situation is acceptable or satisfying. “It’s not perfect, but I don’t mind” (P11).

Consumers want to be informed about online behavioral advertising practices. They desire that companies provide them with easy to use tools showing what information is accessed and how it is shared and giving them control about tracking practices. Seals attesting that no information is

tracked were also perceived as a viable solution [39]. Privacy notices or terms of service forms were not perceived as useful.

Consumers want online behavioral advertising to be more relevant and to show diverse ads instead of ad repetitions. “I wish there’s a button that says I don’t need this advertisement on this product anymore, recommend me other stuff.” (P8) Some interviewees were also interested in preselecting categories of ads of interest to them and wanted more control about ad frequency and timing.

Consumers with higher perceived levels of awareness and knowledge tend to be less concerned about online behavioral advertising. Interviewees believed that common sense or the knowledge they have makes them less concerned about online behavioral advertising. This does not imply that they appreciate ads more; they rather feel less insecure when confronted with online behavioral advertising. Consumers also turned to the offline world to evaluate whether online behavioral advertising practices are justified. If they can identify similar practices in real-life, they are more inclined to accept online behavioral advertising practices, otherwise, suspicion is easily aroused. This finding aligns well with the framework of contextual integrity [28], which posits that consumers desire information to flow as they would expect it to flow within the respective context. More research is required to enable consumers to assess the appropriateness of information flows for online behavioral advertising [40].

Consumers do not seem to pay strong attention to information privacy within the context of online behavioral advertising. Consumers are passively accepting that they do not have much choice about online behavioral advertising. They only realize that their information is used once they receive relevant ads. Consumers generally do not care much about tracking and being exposed to targeted ads. It appears that information privacy remains a dormant concern and consumers focus on more pressing issues in daily online interactions.

Some interviewees had only limited knowledge about online behavioral advertising, which spurred their concerns. Consumers seem to either not care about online behavioral advertising or to become oversensitive towards it. Consumers do not have to be internet experts to react rationally when confronted with online behavioral advertising, but some foundational knowledge is useful to empower them to purposefully engage with online behavioral advertising and to protect themselves from undesirable practices.

Ads would become more useful and appear less creepy to consumers if they clearly conveyed how they were tailored. Some ad networks and content providers present comprehensive texts on their tracking practices, but consumers do not read them [41]. New approaches are required to inform consumers about tracking practices. Spotify presents, for example, a short notice on every file they recommended based on past listening behaviors; such approach could also work for ads. Only if consumers are transparently informed about tracking practices, they will be able to perceive online behavioral advertising as a useful feature instead of a mystery. Still, further research is required to foster understanding what information about targeting practices consumers find useful. A study on the effect of

adding friend referrals to ads found, for instance, that ads with friend referrals were less effective than native ads [42].

Our work contributes to the scientific knowledge base by consolidating consumer perceptions of online behavioral advertising in the COBAP model. The COBAP model shows that consumer awareness of, knowledge about, and attitude towards online behavioral advertising are not stable. Instead, they constantly evolve, triggered by confrontations with ads. In contrast, to a decision calculus, such as the privacy calculus [43], online behavioral advertising appears to be judged passively by consumers. As long as consumers do not get annoyed so much that an individual threshold is violated, they seem to, at least, tolerate online behavioral advertising but often also see value in it.

For advertisers it is important to post fitting ads that do not induce negative consumer attitudes. Good advertising algorithms should focus on accuracy instead of a wide reach. Advertisers should become better at posting the right ads with a reasonable frequency and at a fitting time. When consumers perceive to be in a position of weak power, they tend to form negative attitudes. It is important for advertisers to give consumers control over ads to make consumers feel dominant about the content they see instead of to be manipulated. Advertisers should also strive to make their ads not too personal. Perceived anonymity appears to make consumers feel more at ease in online environments. If ads are too personal, such positive attitudes are quenched by perceptions of intrusiveness.

In the end, effective online behavioral advertising is a tight rope walk. Consumers want personalized content and ads but do not want it to be too personal. Whether ads are too personal depends, however, on consumers' individual awareness and knowledge about online behavioral advertising. There is no global optimum for the level of personalization in ads. Advertisers, ad networks, and content providers should aim to arouse positive consumer attitudes by creating added value and should revise their online behavioral advertising practices before attitudes of too many consumers shift from positive over indifferent or ambivalent to negative.

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APPENDIX A—INTERVIEW GUIDE

The interview guide was used to guide the interview process. The following questions were asked.

A. Introduction

- 1) *Welcome and ask for permission to record*
- 2) *Introduction to the purpose of the interview*
- 3) *General questions about the interviewee*
 - a) *Gender*
 - b) *Age*
 - c) *Nationality*
 - d) *Job*
 - e) *Educational level*
 - f) *Owned devices (computer, mobile phone, tablet)*

B. Questions regarding perception

- 1) *Awareness*
 - a) *What do you think is the difference between TV ads and internet ads?*
 - b) *What do you think of these targeted ads compared to random ads?*
 - c) *Describe ads that are very personal/ based on your previous online activity?(on your computer, on your mobile devices, across your devices)*
 - d) *What have you searched before and where did you see the ads?*
- 2) *Knowledge*
 - a) *Why would an ad show up on an irrelevant website/ app?*
 - b) *What do you think of the word of behavioral targeted ads?*
 - c) *Can you explain what a cookie is?*
 - d) *What kind of information do you think websites track?*
 - e) *How much do you think the advertisers know about you?*
 - f) *Who do you think your online behavior information belongs to?*

g) What benefits do the targeted ads bring to advertisers?

h) What is cross-device targeting in your understanding?

i) What do you think is the difference between this kind of online behavioral advertising compared to web/mobile/cross-device contexts?

j) What actions did you take to avoid seeing more of targeted ads on web/mobile? Why?

3) Attitude

a) How do you feel when you see the targeted ads? (on your computer, on your mobile devices, across your devices)

b) How relevant are these ads to you?

c) What kind of benefits do you think the ads yield for you?

d) What do you think about the websites that show these ads? Why?

e) What kind of negative feelings did you feel?

f) What control do you think you have over the content of the ads presented to you?

g) Would you like to see more or to avoid behavioral targeted ads in the future? Why?

h) Will you use/trust the advertiser's website in the future? Why?

i) What do you think of the statement that 'it is possible for websites to know your true identity with the information they collect'?

j) To what extent do you think you are identifiable/anonymous on the internet?

k) What actions did you take/do you know to prevent seeing this kind of ads? (on your computer, on your mobile devices, across your devices)

l) What options are you aware of that can avoid being tracked? (on your computer, on your mobile devices, across your devices)

m) Do you want to be informed when your information is being tracked?

n) Please rank the value of targeted ads in web, mobile, and cross-device scenarios. Explain the reason of the sequence.

o) Please rank the level of risks entailed by targeted ads in web, mobile, and cross-device contexts. Explain the reason of the sequence.

C. After presenting the video

(<https://www.youtube.com/watch?v=YNNulgHYAbo>)

1) What expectations do you have about the targeted ads?

2) What expectations do you have about the advertisers doing online behavioral advertising?

3) Please comment on the video you just saw.

4) Do you have anything to add?

APPENDIX B—INTERVIEW PARTICIPANTS

TABLE I. OVERVIEW OF INTERVIEW PARTICIPANTS.

#	Gender	Age	Nationality	Occupation	Education
P1	female	23	Chinese	housewife	bachelor
P2	female	27	Spanish	app marketing	bachelor
P3	male	41	German	creative production	master
P4	male	32	German	mobile software developer	bachelor
P5	male	25	German	janitor	high school
P6	male	38	German	iOS developer	diploma
P7	male	40	German	priest	master
P8	female	30	Chinese	key account manager	master
P9	male	35	German	emerging market manager	master
P10	male	34	Danish	entrepreneur	high school
P11	female	27	Chinese	medicine student	master
P12	female	26	German	sociology student	master
P13	female	27	Chinese	analyst	master